**Graphical user interface, application

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| **Course Code** | **14CE2002** | **Duration** | **3hrs** |
| **Course Name** | **MECHANICS OF SOLIDS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define Stress. | | CO1 | R | 1 |
| 2. | State Hooke’s law. | | CO1 | R | 1 |
| 3. | Express the relation between Young’s modulus and Bulk modulus. | | CO1 | U | 1 |
| 4. | Define the term Principal Planes. | | CO1 | R | 1 |
| 5. | Define resilience. | | CO1 | R | 1 |
| 6. | Recall different types of beams based on the support condition. | | CO2 | R | 1 |
| 7. | Infer Bending moment diagram. | | CO2 | U | 1 |
| 8. | Define the term Pure Bending. | | CO2 | R | 1 |
| 9. | Recite the meaning of strength of a section. | | CO2 | R | 1 |
| 10. | Define the term Torsion. | | CO2 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Distinguish Stress and Strain. | | CO1 | U | 3 |
| 12. | Determine the diameter of a circular bar which is subjected to an axial pull of 160 kN, if the maximum allowable shear stress on any section is 65 N/mm2. | | CO1 | A | 3 |
| 13. | Construct the Shear force and Bending moment diagram for a cantilever of length L carrying a point load W at free end. | | CO2 | A | 3 |
| 14. | List the different types of loads acting on the beam. Differentiate the Point load and uniformly distributed load. | | CO2 | R | 3 |
| 15. | Discuss the assumptions made in the theory of simple bending. | | CO3 | U | 3 |
| 16. | A solid shaft of 20 cm diameter is used to transmit torque. Find the maximum torque transmitted by the shaft if the maximum shear stress induced in the shaft is 50 N/mm2. | | CO3 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. |  | A bar of 30 mm diameter is subjected to a pull of 80kN. The measured extension on gauge length of 200 mm is 0.2 mm and change in diameter is 0.004mm. Calculate  a. Young’s modulus b. Poisons ratio c. Bulk modulus. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. |  | The principal stress at a point across two planes are 120 N/mm2 (tensile) and 50 N/mm2(Compressive). Determine the normal, tangential stress and the resultant stress on a plane inclined at 45oto the axis of major stresses. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 19. |  | A simply supported beam 8 m long carries a point load of 4kN and 4kN at distances of 4m and 4m from the left end. Draw Shear Force and Bending Moment diagrams for the beam. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | A timber beam is 120mm wide and 200mm deep and is used on a span of 4metres. The beam carries a UDL of 2.8 kN/m run over the entire length. Find the maximum bending stress induced. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | A hollow shaft of external diameter 100 mm transmits 200 kW power at 150 r.p.m. Determine the maximum internal diameter if the maximum stress in the shaft is not to exceed 60 N/mm2. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | Explain in detail the theories of failure   1. The maximum principal stress theory 2. The maximum strain theory 3. The maximum shear stress theory | CO2 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | The following data refer to a tensile test conducted on a mild steel bar.   1. Diameter of the steel bar = 30mm 2. Gauge length = 200mm 3. Extension at the load of 150kN = 0.15mm 4. Load at elastic limit = 250kN 5. Maximum load = 380kN 6. Total extension = 60mm 7. Diameter of the rod at failure = 23mm   Calculate  a. The Young’s modulus b. The stress at elastic limit  c. The percentage elongation d. The percentage decrease in area | CO1 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | A simply supported beam of length 8m rests on supports 6m apart, the right hand end is overhanging by 2m. The beam carries a UDL of 1500N/m over the entire length. Draw the shear force and bending moment diagrams and find the point of contra flexure. | CO2 | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Demonstrate the fundamental concepts of mechanics. |
| CO2 | Analyse the behavior of structural members under different loading conditions. |
| CO3 | Categorise suitable method for analysis of structures. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 | 3 | 27 |  |  |  | 35 |
| CO2 | 7 | 1 | 51 |  |  |  | 59 |
| CO3 | 0 | 3 | 27 |  |  |  | 30 |
|  | | | | | | | **124** |



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| **Course Code** | **17CE3013** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCED CONCRETE TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Discuss different types of polymers used for making the concrete and its chemical characteristics. | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the various types of polymers in concrete and its effects. | CO1 | An | 10 |
|  | b. | Evaluate the role of supplementary cementitious material in concrete. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 3. | a. | Discuss the stress-strain curve for concrete with suitable sketches. | CO6 | U | 10 |
|  | b. | Recognize the modern techniques in production of concrete. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain how you would obtain a workable concrete mix. | CO6 | U | 10 |
|  | b. | List the factors influencing the behavior of fresh concrete. Explain any one of the factors in detail. | CO6 | R | 10 |
|  |  |  |  |  |  |
| 5. | a. | Evaluate the factors responsible for the strength properties of  Hardened concrete. | CO4 | An | 10 |
|  | b. | Define workability and explain any two methods in detail to  determine the workability of concrete. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Discuss the care to be taken in the fresh and hardened stage of concrete subjected to marine environment. | CO4 | U | 10 |
|  | b. | Differentiate hot weather concreting and cold weather concreting. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 7. |  | Write short notes on the following  a) Ready mix concrete.  b) Light weight concrete. | CO3 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Discuss the properties and applications of High strength concrete. | CO6 | U | 10 |
|  | b. | Explain geopolymer concrete and reinforced concrete. | CO6 | An | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Design the concrete mix for the following data as per IS 10262:2009  Characteristics strength of concrete – M30  Type of cement – OPC 53  Specific gravity of sand – 2.70  Specific gravity of coarse aggregate – 2.80  Size of coarse aggregate – 20mm  Water absorption – Nil  Grading of fine aggregate – Zone III  Workability - 100mm (slump)  Exposure condition - Moderate | CO5 | An | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify suitable admixture for concreting. |
| CO2 | Explain the hydration reaction. |
| CO3 | Choose the appropriate type of concrete. |
| CO4 | Analyze the properties of hardened concrete. |
| CO5 | Recommend suitable mix proportion methods. |
| CO6 | Evaluate the quality of concrete. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 20 |  | 10 |  |  | 30 |
| CO2 |  | 10 |  | 10 |  |  | 20 |
| CO3 | 10 | 30 |  |  |  |  | 40 |
| CO4 |  | 10 |  | 10 |  |  | 20 |
| CO5 |  |  |  | 20 |  |  | 20 |
| CO6 | 10 | 30 |  | 10 |  |  | 50 |
|  | | | | | | | **180** |

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| **Course Code** | **18CE2005** | **Duration** | **3hrs** |
| **Course Name** | **DISASTER PREPAREDNESS AND PLANNING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define Disaster. | | CO1 | R | | 1 |
| 2. | Describe the term environmental hazards. | | CO1 | R | | 1 |
| 3. | Recall the meaning for the word vulnerability. | | CO2 | R | | 1 |
| 4. | Recall any three man-made disasters. | | CO3 | U | | 1 |
| 5. | Identify any two environmental impacts of disasters. | | CO4 | U | | 1 |
| 6. | Name any three agencies which support forecasting disasters. | | CO4 | R | | 1 |
| 7. | Describe the role of NDMA. | | CO6 | A | | 1 |
| 8. | Classify floods. | | CO5 | U | | 1 |
| 9. | Recall any three climate change mitigation plans. | | CO5 | A | | 1 |
| 10. | Identify negative mitigation measures of disasters. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List the administrative decisions and operational activities involved in disaster management act 2005. | | CO1 | | R | 3 |
| 12. | Describe relief and recovery process. | | CO2 | | R | 3 |
| 13. | Define the term cyclone. | | CO3 | | U | 3 |
| 14. | Identify the key elements of disaster preparedness. | | CO4 | | U | 3 |
| 15. | Recall climate change adaptation strategies. | | CO5 | | R | 3 |
| 16. | Describe the term “Climate change mitigation”. | | CO4 | | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Discuss with neat sketch about disaster management cycle with its phases. | CO1 | | R | 12 |
|  |  |  |  | |  |  |
| 18. | a. | Describe structural and non-structural measures of disaster. | CO2 | | U | 6 |
|  | b. | Explain in detail on vulnerability assessment. | CO2 | | R | 6 |
|  |  |  |  | |  |  |
| 19. |  | Summarize types of disasters. | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 20. |  | Explain the impact and response components of a disaster. | CO4 | | A | 12 |
|  |  |  |  | |  |  |
| 21. |  | Describe in detail on Climate change adaptation and mitigation. | CO4 | | A | 12 |
|  |  |  |  | |  |  |
| 22. |  | Discuss on the approaches to disaster risk reduction. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 23. |  | Examine the vulnerability profile of India. | CO6 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Discuss a case study on natural disaster. | CO6 | | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recall the types of disasters and its causes. |
| CO2 | Understand disaster cycle and assess the risks. |
| CO3 | Apply disaster concepts to disaster management. |
| CO4 | Analyze relationship between development and disasters. |
| CO5 | Decide the roles and responsibilities of organizations and institutions to society and its organizational structure. |
| CO6 | Design the disaster management and mitigation plan. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 17 | - | - | - | - | - | 17 |
| CO2 | 10 | 6 | - | - | - | - | 16 |
| CO3 | - | 16 | - | - | - | - | 16 |
| CO4 | 4 | 4 | 24 | - | - | - | 32 |
| CO5 | 3 | 13 | 1 | - | - | - | 17 |
| CO6 | 1 | - | 25 | - | - | - | 26 |
|  | | | | | | | **124** |

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| **Course Code** | **18CE2006** | **Duration** | **3hrs** |
| **Course Name** | **CONSTRUCTION ENGINEERING AND MANAGEMENT** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | | | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | | |
| 1. | List any 3 components of temporary facilities in the site. | | CO1 | | | R | | 1 |
| 2. | Define shoring. | | CO1 | | | R | | 1 |
| 3. | Name any two types of joints in concrete construction. | | CO2 | | | R | | 1 |
| 4. | Great accuracy and high quality – Interpret shortly with reference to precast concrete construction. | | CO2 | | | U | | 1 |
| 5. | Define modern day formwork. | | CO3 | | | R | | 1 |
| 6. | Write any 2 criterions for selection of material for flooring. | | CO3 | | | R | | 1 |
| 7. | Discuss the application of emulsion paint. | | CO4 | | | U | | 1 |
| 8. | Explain the base course of brick flooring. | | CO4 | | | U | | 1 |
| 9. | Define dummy activity in any project. | | CO5 | | | R | | 1 |
| 10. | Recall total float in any project. | | CO5 | | | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | | |
| 11. | | Discuss the process of anti – termite treatment along outside the foundation. | | CO1 | U | | 3 | |
| 12. | | Differentiate English Garden Wall Bond and Flemish Garden Wall Bond. | | CO2 | U | | 3 | |
| 13. | | Tell how curing of concrete affects the striking period of concrete. | | CO3 | R | | 3 | |
| 14. | | Draw elevation of ledged door and explain. | | CO4 | R | | 3 | |
| 15. | | Discuss the classification of construction industry. | | CO5 | U | | 3 | |
| 16. | | Recall the components of material management. | | CO5 | R | | 3 | |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23)** | | | | | |
| 17. | a. | Differentiate sump pumping method of dewatering and deep well method of dewatering. | CO1 | U | 8 |
| b. | Write the various types of anti – termite treatment that are done to buildings. | CO1 | R | 4 |
|  |  |  |  |  |  |
| 18. | a. | Discuss the need and characteristics of expansion joint. | CO2 | U | 6 |
| b. | Explain transporting, placing and compaction of concrete (Any two) | CO2 | U | 6 |
|  |  |  |  |  |  |
| 19. | a. | Classify scaffold and present about any two types of scaffold. | CO3 | A | 7 |
| b. | Summarize the factors affecting striking of formwork. | CO3 | U | 5 |
|  |  |  |  |  |  |
| 20. | a. | Explain the application of oil emulsion washable distemper. | CO4 | U | 6 |
| b. | Discuss the sloped or pitched roof – types and components. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 21. | a. | Discuss resource allocation and resource leveling and their benefits. | CO5 | U | 8 |
| b. | List the various stakeholders of construction industry. | CO5 | R | 4 |
|  |  |  |  |  |  |
| 22. | a. | Explain neatly with sketches the construction of:  (i) Stretching Bond.  (ii) English Bond.  (iii) Flemish Bond. | CO2 | U | 9 |
|  | b. | Compare volume batching and weigh batching in production of concrete. | CO2 | An | 3 |
|  |  |  |  |  |  |
| 23. | a. | List the process of material management. | CO6 | R | 5 |
| b. | Write classification of materials on ABC analysis. | CO6 | R | 4 |
| c. | Using EOQ Analysis discuss the formula for evaluation of optimum order quantity. | CO6 | U | 3 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Summarize the objectives and functions of material management. | CO6 | U | 8 |
| b. | Explain routine maintenance and preventive maintenance of construction equipments. | CO6 | U | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recall the basics of building components. |
| CO2 | Understand the items / facets of construction engineering. |
| CO3 | Apply the construction engineering techniques for various components. |
| CO4 | Classify the various techniques for different project. |
| CO5 | Explain the importance of project management. |
| CO6 | Propose an Engineering and Management Plan. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 6 | 11 | - | - | - | - | 17 |
| CO2 | 1 | 25 | - | 3 |  |  | 29 |
| CO3 | 5 | 5 | 7 | - | - | - | 17 |
| CO4 | 3 | 14 | - | - |  |  | 17 |
| CO5 | 9 | 11 | - | - | - | - | 20 |
| CO6 | 9 | 15 | - | - | - | - | 24 |
|  | | | | | | | **124** |

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| **Course Code** | **18CE2009** | **Duration** | **3hrs** |
| **Course Name** | **INSTRUMENTATION AND SENSOR TECHNOLOGIES FOR CIVIL ENGINEERING APPLICATIONS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Enumerate the two parts of a result of measurement. | | CO1 | R | | 1 |
| 2. | Define standard in the measurement process. | | CO1 | R | | 1 |
| 3. | Name a sensor used to measure pore water pressure. | | CO2 | R | | 1 |
| 4. | Tell the material used to fill the area between the sensors in the installation of piezometer. | | CO3 | R | | 1 |
| 5. | Define discrete signal. | | CO4 | R | | 1 |
| 6. | Paraphrase signal to noise ratio. | | CO4 | U | | 1 |
| 7. | Describe a transducer. | | CO5 | U | | 1 |
| 8. | Recall the phenomenon on which thermocouples work. | | CO2 | R | | 1 |
| 9. | Tell an example for middleware. | | CO6 | R | | 1 |
| 10. | Describe Internet of Things gateway. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Give example of an automatic process control system as an application of measurement systems. | | CO1 | | U | 3 |
| 12. | List atleast three applications of strain gauges in civil engineering. | | CO3 | | R | 3 |
| 13. | Illustrate the process of spike removal. | | CO4 | | U | 3 |
| 14. | Compare and contrast sensors and actuators. | | CO5 | | An | 3 |
| 15. | List the characteristics of cloud computing. | | CO6 | | R | 3 |
| 16. | Compare RFID and barcode. | | CO5 | | An | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Classify instruments based on their types. Compare and contrast them. | CO1 | | U | 6 |
|  | b. | Interpret accuracy, precision, tolerance, span, threshold, and resolution of measurements. | CO3 | | U | 6 |
|  |  |  |  | |  |  |
| 18. | a. | Plan the installation of a sensor to measure lateral movements in soil and rock. | CO5 | | C | 6 |
|  | b. | Show the working of LVDT. | CO2 | | U | 3 |
|  | c. | Give examples of atleast three applications of load cells in civil engineering. | CO2 | | U | 3 |
|  |  |  |  | |  |  |
| 19. | a. | Interpret the fundamental statistical concepts mean, standard deviation, median, mode, and range. | CO3 | | U | 10 |
|  | b. | Discuss aliasing. | CO4 | | U | 2 |
|  |  |  |  | |  |  |
| 20. | a. | Illustrate the working of pressure transducers by using strain gauge as an example. | CO2 | | A | 4 |
|  | b. | List the four types of optical sensors. | CO5 | | R | 4 |
|  | c. | Illustrate the working of thermocouples. | CO2 | | U | 4 |
|  |  |  |  | |  |  |
| 21. |  | Explain the essential characteristics, service models, and deployment models of cloud computing. | CO6 | | U | 12 |
|  |  |  |  | |  |  |
| 22. | a. | List the characteristics of Internet of Things. | CO6 | | R | 3 |
|  | b. | Articulate IoT using a practical example. | CO6 | | A | 5 |
|  | c. | Establish atleast eight applications of Machine-to-Machine communication. | CO6 | | A | 4 |
|  |  |  |  | |  |  |
| 23. | a. | Explain the simplified architecture of Internet of Things. | CO6 | | U | 7 |
|  | b. | Report the evolution of Internet of Things. | CO6 | | U | 5 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Illustrate the seven characteristics of big data. | CO6 | | U | 7 |
|  | b. | Collect atleast ten applications of RFID. | CO5 | | A | 5 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the principles of operation and characteristics of instrumentation and integrated sensor systems. |
| CO2 | Predict sensor technologies for specific applications along with limitations. |
| CO3 | Specify the requirements in the calibration of sensors and instruments. |
| CO4 | Analyze the errors during measurements. |
| CO5 | Design sensor systems and set up measurement systems. |
| CO6 | Implement smart systems using IoT. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 9 | - | - | - | - | 11 |
| CO2 | 2 | 10 | 4 | - | - | - | 16 |
| CO3 | 4 | 16 | - | - | - | - | 20 |
| CO4 | 1 | 6 | - | - | - | - | 7 |
| CO5 | 4 | 1 | 5 | 6 | - | 6 | 22 |
| CO6 | 9 | 32 | 9 | - | - | - | 48 |
|  | | | | | | | **124** |

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| **Course Code** | **18CE2018** | **Duration** | **3hrs** |
| **Course Name** | **STRUCTURAL ANALYSIS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define catenary shape. | | CO1 | R | | 1 |
| 2. | Find FEM for the member BC (MFCB) of the portal frame shown in fig. | | CO2 | R | | 1 |
| 3. | Recall how many numbers of slope deflection equation for two span continuous beam. | | CO2 | R | | 1 |
| 4. | Define rotational stiffness. | | CO1 | R | | 1 |
| 5. | The moment required to rotate the near end of a prismatic beam through a unit angle without translation, the far end being fixed supported, is given by | | CO1 | U | | 1 |
| 6. | Outline the reason for sinking of supports in the beam. | | CO1 | R | | 1 |
| 7. | For drawing ILD, recall the value of test load is assumed. | | CO2 | R | | 1 |
| 8. | Recall the location of maximum shear force in a simple beam with any kind of loading. | | CO5 | R | | 1 |
| 9. | Under what conditions will the bending moment in an arch be zero throughout. | | CO5 | R | | 1 |
| 10. | Recall the minimum tension in the cable when loaded uniformly throughout the span. | | CO2 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Compare statically determinate and indeterminate structures. | | CO3 | | R | 3 |
| 12. | Explain the use of moment distribution method. | | CO2 | | U | 3 |
| 13. | Find the fixed end moments for the beam shown in fig. | | CO1 | | U | 3 |
| 14. | Explain the uses of influence line diagrams. | | CO4 | | U | 3 |
| 15. | Explain with the aid of a sketch, the normal thrust and radial shear in an arch rib. | | CO5 | | U | 3 |
| 16. | Compare load factor and shape factor. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Analyze the structure loaded as shown in fig. by moment distribution method and sketch the bending moment diagram. | CO4 | | E | 12 |
|  |  |  |  | |  |  |
| 18. |  | Draw the influence line diagram for shear force and bending moment for a section at 5m form the left hand support of a simply supported beam 20m long. Hence, Determine the maximum shear force and bending moment at the section due to an uniformly distributed rolling load of length 8m and intensity 10kN/m run. | CO4 | | An | 12 |
|  |  |  |  | |  |  |
| 19. |  | A three hinged parabolic arch hinged at the supports and at the crown has a span of 24 m and rise 4 m. It carries a concentrated load of 50 kN at 18 m from the left support and a uniformly distributed load of 30 kN/m over the left half portion. Determine the moment, thrust and radial shear at a section 6 m from the left support. | CO4 | | An | 12 |
|  |  |  |  | |  |  |
| 20. |  | A three hinged parabolic arch has a span of 60m and a central rise of 12m. A concentrated load of 8kN acts at 15m from the left hinge. Find the reactions at the supports. | CO3 | | E | 12 |
|  |  |  |  | |  |  |
| 21. |  | A suspension cable is supported at 2 points 25m apart. The left support is 2.5 m above the right support. The cable is loaded with a uniformly distributed load of 10 kN/m throughout the span. The maximum dip in the cable from the left support is 4m. Find the maximum and minimum tensions in the cable. | CO5 | | E | 12 |
|  |  |  |  | |  |  |
| 22. |  | Analyze the continuous beam shown in fig. and draw the bending moment diagram using Stiffness martix method. Assume EI is constant | CO4 | | An | 12 |
|  |  |  |  | |  |  |
| 23. |  | Analyze the continuous beam loaded as shown in fig.by moment distribution method. Take E = 2 x 105 N/mm2 and I = 16 x 107 mm4. Sketch the bending moment diagram. | CO3 | | An | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Determine the shape factor for a.  a) rectangle section of breadth ’b’ and depth ‘d’ .  b) diamond section of breadth ’b’ and depth ’d’. | CO6 | | An | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Illustrate the concepts and principles. |
| CO2 | Explain the behaviour of structural elements. |
| CO3 | Analyze the structural members for various forces. |
| CO4 | Estimate the response of the Structural elements. |
| CO5 | Develop suitable response intricacies. |
| CO6 | Adapt suitable analysis procedure. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 3 | 10 | - | - | - | - | 13 |
| CO2 | 4 | - | - | - | - | - | 4 |
| CO3 | 3 | - | - | 12 | 12 | - | 27 |
| CO4 | - | - | - | 36 | 12 | - | 48 |
| CO5 | 2 | - | 3 | - | 12 | - | 17 |
| CO6 | - | 3 | - | 12 | - | - | 15 |
|  | | | | | | | **124** |

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| **Course Code** | **18CE2020** | **Duration** | **3hrs** |
| **Course Name** | **REINFORCED CONCRETE ELEMENTS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome / Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1. | What is the partial safety factor for concrete? | CO1/ R | 1 |
| 2. | In a beam, the actual neutral axis is 203 mm and the critical neutral axis is 251. Classify the beam. | CO2/ U | 1 |
| 3. | The length and breadth of a slab are 7 m and 3 m respectively. Classify the slab. | CO4/ U | 1 |
| 4. | Construct the strain diagram for a beam under limit state method. | CO3/ A | 1 |
| 5. | What is the limiting value of l/d ratio for a simply supported beam? | CO4/R | 1 |
| 6. | The height of a column is 3.9m and the size of the column is 300 mm. Classify the column. | CO2/ A | 1 |
| 7. | The effective length of a column is 3000 m and the size of the column is 300 x 300 mm. Estimate the value of minimum eccentricity. | CO2/ E | 1 |
| 8. | Identify the critical section for one way shear in case of a footing for a column. | CO4/ A | 1 |
| 9. | Estimate the self-weight of the footing if the load on the column is 1500 kN. | CO6/ E | 1 |
| 10. | Identify the condition for maximum positive bending moment in a beam at the support while using substitute frame method. | CO6/ A | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Explain about working stress method of design. | CO2/ E | 3 |
| 12. | The size of a slab is 6m x 5m. Draw the plan of the slab and mark the middle and edge strips. | CO5/ E | 3 |
| 13. | If the grade of concrete is M30 and the percentage of tension reinforcement is 0.8, discover the permissible shear stress under limit state method of design. | CO3/ A | 3 |
| 14. | Explain about short columns. | CO4/ E | 3 |
| 15. | Discover the choice of raft foundation. | CO6/ A | 3 |
| 16. | List two methods available for the analysis of building frames subjected to horizontal loads only. Also list tow methods suitable for the analysis of frames with vertical loads. | CO6/ R | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is Compulsory)** | | | | | | | | | | | | | | |
| 17. | a. | | List the merits and demerits of ultimate load method of design. | | | | | | CO1/ A | | | 3 | | |
| b. | | Evaluate the moment of resistance of a rectangular beam of size 300mm x 450mm by limit state method of design. The beam is reinforced with 4 number of 16 mm dia Fe 500 rods. The grade of concrete is M25. | | | | | | CO2/ E | | | 9 | | |
| 18. |  | | Design a simply supported slab of size 9m x 3m. Adopt M25 grade concrete and Fe 500 steel. The live load is 2000 N/m2. [Draw a neat sketch and indicate the design details] | | | | | | CO5/ C | | | 12 | | |
|  |  | |  | | | | | |  | | |  | | |
| 19. |  | | Design a rectangular beam to carry a UDL of 15 kN/m over a span of 6m by limit state method of design. Apply the check for shear also. . [Draw a neat sketch and indicate the design details] | | | | | | CO5/C | | | 12 | | |
| 20. | a. | | What is a helical column? | | | | | | CO4/ R | | | 3 | | |
| b. | | Design a column with the following data.  Pu – 1600 kN, Size = 300 mm x 450mm, Grade of concrete = M25, Grade of steel – Fe 415, Mu = 95 kN.m | | | | | | CO4/ C | | | 9 | | |
| 21. |  | | The load on a column of size 450mm x 450mm is 3000 kN. Design a footing to support the column on a soil having a safe bearing capacity of 200 kN/m2. | | | | | | CO6/ C | | | 12 | | |
| 22. |  | | Design the interior panel of size 5m x 4m. The live load is 3000 N/m2. [Draw a neat sketch and indicate the design details] | | | | | | CO5/ C | | | 12 | | |
|  |  | |  | | | | | |  | | |  | | |
| 23. |  | | A column of size 450mm x 600mm has to carry a factored load of 2000 kN and factored moments of 125 kNm and 100 kNm along the longer and shorter planes respectively. The grade of concrete is M30. Design the column and decide on the safety of the column. | | | | | | CO4/ E | | | 12 | | |
| **COMPULSORY QUESTION** | | | | | | | | | | | | | | |
| 24. | The plan of the building is given below.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | 6 | 6 | 6 |  | | 3.5 |  |  |  |  | | 3.5 |  |  |  |  | | A  3.5 | B1 | B2 | B3 | A |   Section AA is given below:   |  |  |  |  | | --- | --- | --- | --- | |  | 6 | 6 | 6 | | 3 |  |  |  | | 3 |  |  |  | | 3 | B1 | B2 | B3 | |  |  |  |  |   If the live load is 3000 N/m2 and the unit weight of brick masonry is 19 kN/m2, determine the loads on beams B1 and B3. | | | | | | | | | CO6/ E | | | 12 | |
|  | **COURSE OUTCOMES** | | | | | | | | | | | | |
| CO1 | Identify the design philosophies for RCC elements. | | | | | | | | | | | | |
| CO2 | Demonstrate the behaviour of elements for load calculations. | | | | | | | | | | | | |
| CO3 | Illustrate the LSM for estimating stress resultants. | | | | | | | | | | | | |
| CO4 | Design the section and reinforcement for the structural elements. | | | | | | | | | | | | |
| CO5 | Develop suitable detailing diagrams. | | | | | | | | | | | | |
| CO6 | Prepare the design for buildings. | | | | | | | | | | | | |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | | | | | | | |
| CO / P | | **Remember** | | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | | | **Total** | | |
| CO1 | | 1 | |  |  | 3 |  |  | | | 4 | | |
| CO2 | |  | | 1 |  | 1 | 13 |  | | | 15 | | |
| CO3 | |  | |  | 1 | 3 |  |  | | | 4 | | |
| CO4 | | 4 | | 1 | 1 |  | 15 | 9 | | | 30 | | |
| CO5 | |  | |  |  |  | 3 | 36 | | | 39 | | |
| CO6 | | 3 | |  | 1 | 3 | 13 | 12 | | | 32 | | |
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| **Course Code** | **18CE2023** | **Duration** | **3hrs** |
| **Course Name** | **FOUNDATION ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | |
| 1. | Define foundation Engineering. | CO 1 | R | 1 |
| 2. | List out the purpose of site investigation. | CO 1 | R | 1 |
| 3. | Recall the term bearing capacity. | CO 2 | R | 1 |
| 4. | Define settlement. | CO 2 | R | 1 |
| 5. | Describe isolated footing. | CO 3 | R | 1 |
| 6. | Recall the circumstances; a strap footing could be adopted. | CO 3 | R | 1 |
| 7. | List the types of settlement. | CO 4 | R | 1 |
| 8. | Tabulate the uses of pile. | CO 4 | R | 1 |
| 9. | Define retaining wall. | CO 5 | R | 1 |
| 10. | Write the applications of retaining wall. | CO 5 | R | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | | |
| 11. | Explain the types of Samples. | CO1 | U | 3 |
| 12. | Differentiate general and local shear failure. | CO2 | U | 3 |
| 13. | Explain shallow foundation. | CO3 | U | 3 |
| 14. | List the types of pile based on function. | CO 4 | R | 3 |
| 15. | Compare Friction and end bearing pile. | CO 5 | An | 3 |
| 16. | Explain in detail about load cell. | CO 6 | U | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. |  | Explain the various methods of soil exploration. | CO1 | E | 12 |
|  |  |  |  |  |  |
| 18. |  | Explain Standard penetration test (SPT) with sketch. | CO2 | E | 12 |
|  |  |  |  |  |  |
| 19. |  | Design a square footing of square isolated column having size 400 x 400 mm carrying 1800 kN axial load. Safe bearing capacity of soil is 200 kN/m2. Use M20 and Fe 415 grades. Check for one way and two way shear. | CO3 | C | 12 |
|  |  |  |  |  |  |
| 20. |  | A group of 16 piles with 4 piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length of piles were 30 cm and 10 m respectively. The unconfined compression strength of clay is 70 kN/m2. If the piles were spaced at 90cm centre to centre, compute the allowable load on the pile group on the basis of shear failure criteria for a factor of safety of 2.5, neglect bearing at the tip of piles, take m = 0.6 for shear mobilization around each pile. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 21. |  | A retaining wall is 4 m high. Its back is vertical and it has got sandy backfill up to itstop. The top of the fill is horizontal and carries a uniform surcharge of 85 kN/m2. Determine the active pressure on the wall per metre length of wall. Water table is 1m below the top of the fill. Dry density of soil = 18.5 kN/m3. Moisture content of soil above water table =12%. Angle of internal friction of soil = 30°, specific gravity of soil particles = 2.65. Porosity of backfill = 30°. The wall friction may be neglected. | CO5 | An | 12 |
|  |  |  |  |  |  |
| 22. |  | Compare the different ground improvement techniques and write which circumstances it can be used. | CO4 | E | 12 |
|  |  |  |  |  |  |
| 23. | a. | List the factors affecting the selection of pile. | CO3 | R | 4 |
|  | b. | Explain the different types of pile foundation. | CO3 | U | 8 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain the different sensors used in geotechnical engineering with their applications. | CO6 | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recall the various site investigation methods. |
| CO2 | Calculate the bearing capacity of soils and foundation settlements. |
| CO3 | Analyze the various foundation system. |
| CO4 | Design the foundation system for larger depths. |
| CO5 | Suggest retaining structures catering to earth pressure conditions. |
| CO6 | Adopt suitable subsurface instrumentation. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 3 | - | - | 12 | - | 17 |
| CO2 | 2 | 3 | - | - | 12 | - | 17 |
| CO3 | 6 | 11 | - | - | - | 12 | 29 |
| CO4 | 5 | - | - | 12 | 12 | - | 29 |
| CO5 | 2 | - | - | - | 15 | - | 17 |
| CO6 | - | 15 | - | - | - | - | 15 |
|  | | | | | | | **124** |

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| **Course Code** | **18CE2025** | **Duration :** | **3hrs** |
| **Course Name** | **HYDROLOGY AND WATER RESOURCES ENGINEERING** | **Max. Marks:** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome / Pattern** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1. | Define Hydrological cycle. | CO2 / R | 1 |
| 2. | Discuss about precipitation. | CO1 / U | 1 |
| 3. | Define runoff. | CO2 / R | 1 |
| 4. | Discuss about maximum flood discharge. | CO1 / U | 1 |
| 5. | Discuss about components of hydrograph. | CO3 / U | 1 |
| 6. | Describe the base flow separation. | CO3 / U | 1 |
| 7. | Define flood routing. | CO4 / R | 1 |
| 8. | Define flood control. | CO4 / R | 1 |
| 9. | Discuss about aquifers. | CO5 / U | 1 |
| 10. | State Darcy’s Law. | CO5 / R | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Interpret the measurement of infiltration capacity. | CO1/ A | 3 |
| 12. | Appraise the factors affecting runoff. | CO2 / E | 3 |
| 13. | Appraise the derivation of unit hydrograph an isolated storm. | CO3 / E | 3 |
| 14. | Design the mass inflow curve and demand curve. | CO4 / C | 3 |
| 15. | Demonstrate the steady flow to a well in a confined aquifer. | CO6 / A | 3 |
| 16. | Construct in detail about the Control structures. | CO5 / C | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is Compulsory)** | | | | |
| 17. | a. | Design Hydrologic cycle. | CO1 /A | 4 |
| b. | Assemble the empirical methods of precipitation. | CO1 / C | 4 |
| c. | Design the estimation of transpiration. | CO1 / C | 4 |
|  |  |  |  |  |
| 18. | a. | Construct the Estimation of Runoff and yield. | CO2 / C | 4 |
| b. | Design the Runoff coefficient method. | CO2 / C | 4 |
| c. | Appraise the envelope curves. | CO2 / E | 4 |
|  |  |  |  |  |
| 19. | a. | Construct the components of hydrograph. | CO3 / C | 4 |
| b. | Design the derivation of unit hydrograph an isolated storm. | CO3 / C | 4 |
| c. | Appraise in detail about the base flow separation. | CO3 / E | 4 |
|  |  |  |  |  |
| 20. | a. | Appraise the types of reservoirs. | CO4 / E | 4 |
| b. | Construct the types of flood control reservoirs. | CO4 / C | 4 |
| c. | Select the possibility of a site for a reservoir. | CO4 / E | 4 |
|  |  |  |  |  |
| 21. | a. | Design the steady flow to a well in an unconfined aquifer. | CO5 / C | 4 |
| b. | Design the steady flow to a well in a confined aquifer. | CO5 / C | 4 |
| c. | Appraise the pumping test method. | CO5 / E | 4 |
|  |  |  |  |  |
| 22. | a. | Assemble the empirical methods of evapotranspiration. | CO1 / C | 4 |
| b. | Design the measurement of infiltration capacity. | CO1 / C | 4 |
| c. | Design the measurement of rainfall. | CO1 / C | 4 |
|  |  |  |  |  |
| 23. | a. | Design the types of Geologic formation and aquifers. | CO2 / C | 4 |
| b. | Construct the water table and piezometer surface. | CO2 / C | 4 |
| c. | Construct elaborately the Dupuite and Thiem’s theory. | CO2 / C | 4 |
|  |  | **COMPULSORY QUESTION** | | |
| 24. | a. | Design the river training and control dams and its types. | CO6 / C | 4 |
| b. | Assemble the canal regulation works. | CO6 / C | 4 |
| c. | Design causeways and culverts. | CO6 / C | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the concepts to manage water resources and apply for hydrological modeling. |
| CO2 | Decide and plan basic water resources projects. |
| CO3 | Solve water related environment problems. |
| CO4 | Appreciate the importance of reservoirs and hydraulic structures. |
| CO5 | Plan structures for recharging groundwater. |
| CO6 | Maintain hydraulic structures. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 2 | 3 | - | - | 24 | 29 |
| CO2 | 2 | - | - | - | 7 | 20 | 29 |
| CO3 | - | 2 | - | - | 7 | 8 | 17 |
| CO4 | 2 | - | - | - | 8 | 7 | 17 |
| CO5 | 1 | 1 | - | - | 4 | 11 | 17 |
| CO6 | - | - | 3 | - | - | 12 | 15 |
|  | | | | | | | **124** |

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| **Course Code** | **18CE2028** | **Duration** | **3hrs** |
| **Course Name** | **QUANTITY SURVEYING AND ESTIMATION** | **Max. Marks** | **100** |

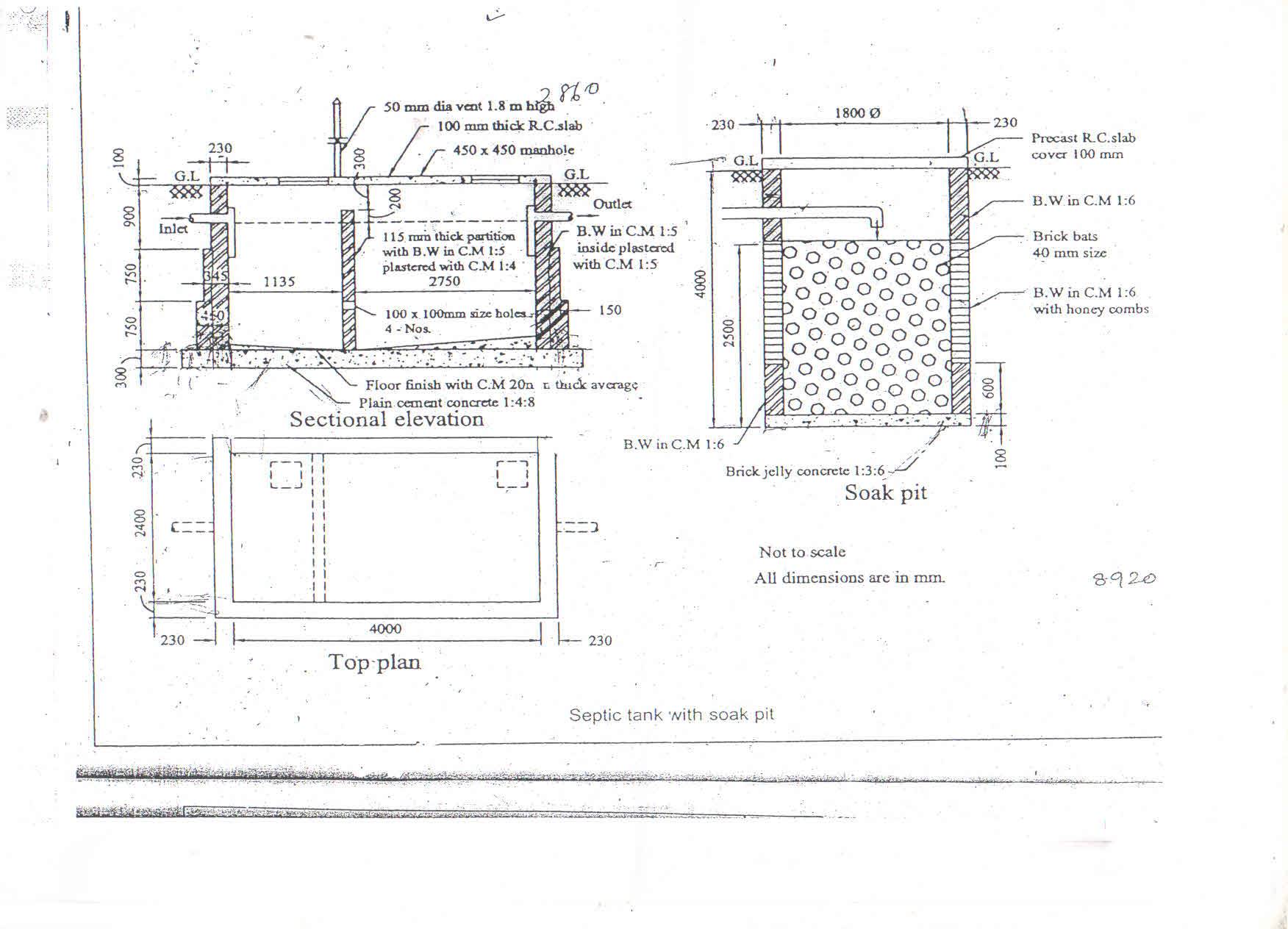
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| --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | |
| 1. | Recall the order of booking dimensions, according to ISI method of measurement. | CO1 | R | 1 |
| 2. | List the data required for preparing an estimate. | CO1 | R | 1 |
| 3. | Define lead. | CO2 | R | 1 |
| 4. | Determine the total Center line of the Wall shown in fig. | CO3 | E | 1 |
| 5. | List the different method of estimation. | CO1 | R | 1 |
| 6. | Recall the nominal size of modular brick. | CO2 | R | 1 |
| 7. | Workout the quality of stone metal required for 2Km.Length for wearing coat of a 4mwide road. The thickness of the metal road required is 12cm loose. | CO2 | A | 1 |
| 8. | Write the purpose of wingwall in culvert. | CO4 | R | 1 |
| 9. | Define carpet area. | CO5 | R | 1 |
| 10. | Recall the important factors influencing the value of building. | CO5 | R | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | | |
| 11. | Explain the general rules for measurement of each item. | CO1 | U | 3 |
| 12. | Determine the dry mortar required for the brick masonry - 1 m3 | CO2 | E | 3 |
| 13. | Determine the Quantity of Lime Concrete in foundation from the given plan and section. | CO3 | E | 3 |
| 14. | Determine the Length of the rod for a beam shown in fig. Assume side cover is 40mm. | CO3 | E | 3 |
| 15. | List the necessity of valuation. | CO4 | R | 3 |
| 16. | Define quotation and its requirements. | CO6 | R | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. | a. | Explain the purpose of giving specifications. | CO1 | U | 5 |
|  | b. | Summarize the different types of specifications. | CO1 | U | 7 |
|  |  |  |  |  |  |
| 18. |  | Analyse the rates of the following. Cement concrete 1 : 2: 4 with Coarse aggregate in foundation 2 mason, 26 mazdoors and 2 bhistes can lay 20 cum of cement concrete in one day.  Basic rates of materials are as below:  Cement – Rs. 450/- per 50 kg bag.  Fine Aggregate (river sand) – Rs. 1,450/- per cum.  Coarse aggregate - Rs. 1,200/- per cum  Assume suitable data wherever required. | CO2 | An | 12 |
|  |  |  |  |  |  |
| 19. |  | Prepare the quantity estimation of the following items, using given plan and section  D = 1 x 2.1 m  W = 1 x 1.2 m   1. Earthwork excavation in foundation. 2. Lime concrete in foundation. 3. Brick work in substructure. 4. Damp proof course. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Determine the quantities of following works in the septic tank and soak pit given in sketch A.   1. Earthwork in excavation for septic tank and soak pit. 2. Plain cement concrete 1:4:8 3. Brick jelly concrete 1:3:6 4. Brickwork in C.M 1:5 in septic tank | CO3 | E | 12 |
|  |  |  |  |  |  |
| 21. |  | Prepare a Detailed estimation of RCC beam shown in fig. Assume side cover is 40 mm and clear cover is 20 mm.    Assume suitable data wherever required. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | Illustrate the purpose of Estimation. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 23. | a. | Explain the different types of valuation. | CO5 | U | 8 |
|  | b. | A three storied building is standing on a plot of land measuring 800 sq.m. The total builtup area of the building is 4000 sq.m. The building fetches a gross rent of Rs. 15000 per annum. Calculate the capitalized value of property on the basis of 5 % net yield. Assume total outgoings per annum is Rs. 8300. | CO5 | A | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Distinguish security deposit and earnest money deposit. | CO6 | An | 4 |
|  | b. | Explain different classification of contracts. | CO6 | U | 8 |

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|  | **COURSE OUTCOMES** |
| CO1 | List the detailed specification for different types of structures. |
| CO2 | Plan the rate analysis of civil engineering works. |
| CO3 | Determine the rates of various items of civil works. |
| CO4 | Justify estimated cost of civil construction projects. |
| CO5 | Evaluate the actual value of any property. |
| CO6 | Explain specifications and tendering process for contracts. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 3 | 27 | - | - | - | - | 30 |
| CO2 | 2 | - | - | 13 | 4 | - | 19 |
| CO3 | - | - | 12 | - | 18 | - | 30 |
| CO4 | 4 | - | - | - | - | - | 4 |
| CO5 | 2 | 8 | 16 | - | - | - | 26 |
| CO6 | 3 | 8 | - | 4 | - | - | 15 |
|  | | | | | | | **124** |



**SKETCH ‘A’**

Graphical user interface, application

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| **Course Code** | **18CE2051** | **Duration** | **3hrs** |
| **Course Name** | **BASICS OF REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | |
| 1. | Name the type of remote sensing is used for the study of mineral exploration, glacial geology. | CO1 | R | 1 |
| 2. | What is the wavelength of the visible light? | CO1 | R | 1 |
| 3. | Define Platforms. | CO2 | U | 1 |
| 4. | Recall the use of unmanned vehicle. | CO2 | R | 1 |
| 5. | Discuss the term spectral reflectance curve. | CO3 | U | 1 |
| 6. | Enumerate Geoid | CO3 | U | 1 |
| 7. | Infer the types of sensors used in remote sensing. | CO4 | R | 1 |
| 8. | Define Blackbody radiation. | CO4 | R | 1 |
| 9. | Name any two GIS software. | CO5 | R | 1 |
| 10. | Recall digitization process. | CO6 | R | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | | |
| 11. | State thematic Maps and give some examples. | CO1 | R | 3 |
| 12. | Define GIS. | CO2 | U | 3 |
| 13. | Enumerate the usage of visual interpretation Keys. | CO3 | U | 3 |
| 14. | Summarize Cartography. | CO4 | U | 3 |
| 15. | Illustrate the tool used in QGIS for setting the projection. | CO5 | U | 3 |
| 16. | Explain the georeferencing. | CO6 | U | 3 |

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|  | | **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23)** | | | | |
| 17. | a. | | Examine the spectral signature and spectral curve. Interpret its usage in identifying the features. | CO2 | A | 6 |
|  | b. | | Review the Scattering, Absorbing and Reflection taken in the atmosphere. | CO4 | U | 6 |
|  |  | |  |  |  |  |
| 18. | a. | | Explain any three basic theories of remote sensing. | CO1 | U | 6 |
|  | b. | | Classify satellites based on the altitude and explain its applications. | CO5 | U | 6 |
|  |  | |  |  |  |  |
| 19. | a. | | Define data products and how it should be chosen for the project. | CO3 | An | 6 |
|  | b. | | Compare the Supervised and Unsupervised image classification techniques. | CO3 | R | 6 |
|  |  | |  |  |  |  |
| 20. | a. | | Elaborate the important components of Map Layout process. | CO3 | U | 6 |
|  | b. | | Explain the process digitization and extraction of layers in QGIS software. | CO4 | A | 6 |
|  |  | |  |  |  |  |
| 21. | a. | | Analyze the types of data models and its usage. | CO1 | An | 6 |
|  | b. | | Discuss all the visual interpretation keys. | CO3 | U | 6 |
|  |  | |  |  |  |  |
| 22. | a. | | Summarize the different types of Map projection. | CO6 | U | 6 |
|  | b. | | Devise the step for land parcel analysis using GIS and RS techniques. | CO3 | U | 6 |
|  |  | |  |  |  |  |
| 23. | a. | | Enumerate the Civil Engineering applications used in the RS and GIS. | CO1 | U | 6 |
|  | b. | | Delineate the QGIS software in creating vector data. | CO2 | U | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | | What are the types of platforms and its applications? | CO6 | U | 6 |
|  | b. | | Explain Remote Sensing data acquisition and data analysis process. | CO6 | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recall the principles of remote sensing and GIS. |
| CO2 | Describe the analysis methods RS and GIS data. |
| CO3 | Interpret the data for modeling applications. |
| CO4 | Distinguish sensors and satellites data for specific applications. |
| CO5 | Appraise the usage of data models. |
| CO6 | Formulate methods to solve issues related to environment using RS and GIS techniques. |

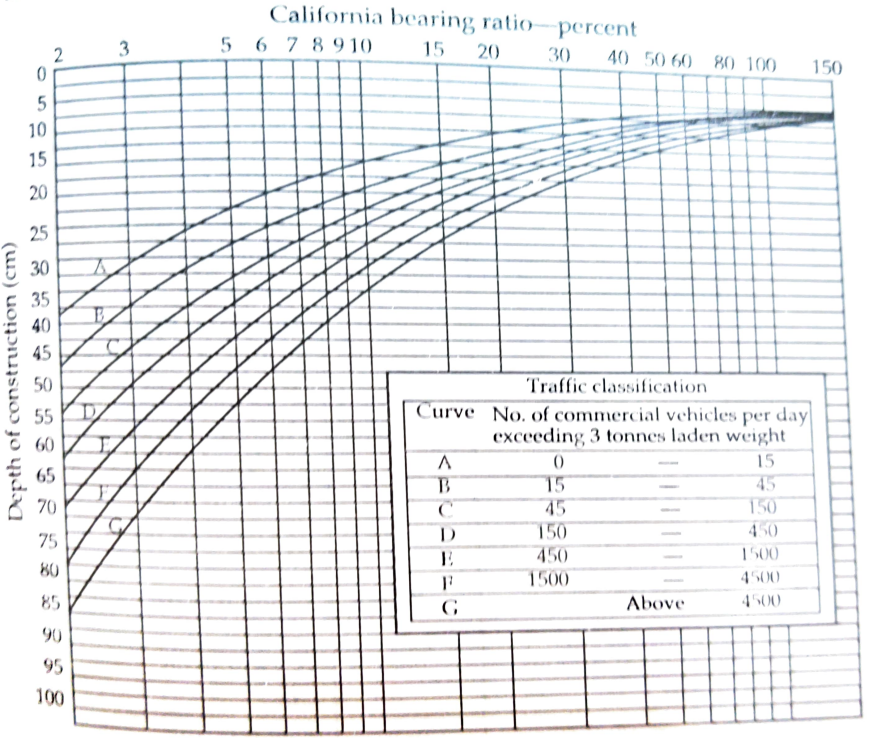
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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 3 | 16 | - | 6 | - | - | 25 |
| CO2 | 3 | 10 | 6 | - | - | - | 19 |
| CO3 | 7 | 24 | - | 6 | - | - | 37 |
| CO4 | - | 7 | 6 | - | - | - | 13 |
| CO5 | - | 9 | 1 | - | - | - | 10 |
| CO6 | 1 | 19 | - | - | - | - | 20 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **18CE2054** | **Duration** | **3hrs** |
| **Course Name** | **PAVEMENT MATERIALS AND DESIGN** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Brief the term MORTH. | | CO1 | R | | 1 |
| 2. | Define the property of aggregate is tested by conducting Abrasion test. | | CO1 | R | | 1 |
| 3. | Recall the types of axle load survey. | | CO2 | R | | 1 |
| 4. | Infer the factors affecting the pavement design. | | CO2 | R | | 1 |
| 5. | State the stress distribution in rigid pavement. | | CO3 | R | | 1 |
| 6. | Recall the IRC code book used of rigid pavement. | | CO3 | U | | 1 |
| 7. | Indicate the equivalent radius of resisting section. | | CO4 | U | | 1 |
| 8. | Visualize the wraping stress acting location in pavement. | | CO4 | U | | 1 |
| 9. | Sketch the tie bars and dowel bars. | | CO5 | U | | 1 |
| 10. | Discuss the destructive testing. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Explain the history of Evolution of pavement. | | CO1 | | U | 3 |
| 12. | Infer the term design traffic. | | CO2 | | U | 3 |
| 13. | Discuss the causes of failures in pavement. | | CO3 | | U | 3 |
| 14. | State the relationship between tyre pressure and Wheel load. | | CO4 | | A | 3 |
| 15. | Illustrate the term Wraping stress. | | CO5 | | A | 3 |
| 16. | Define Skid resistance. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Summarize the types of test conducted for the coarse aggregate. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 18. |  | Define the following terms   1. Contact shape and stress distribution. 2. Wheel load 3. Axle configuration. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | Explain the types of pavement with neat sketch. | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 20. |  | Calculate the deflection of the pavement due to the wheel load 45KN, tyre pressure is 0.6 MN/m2 and modulus of elasticity of the subgrade is 20MN/m2.  Design thickness of a flexible pavement for the given specification.   1. Wheel load is 40KN 2. Tyre pressure is 0.5MN/m2 3. Modulus of Elasticity of Bitumen is 150 MN/m2 4. Modulus of Elasticity of sub-grade is 30 MN/m2 | CO4 | | An | 12 |
|  |  |  |  | |  |  |
| 21. |  | Design size and spacing of dowel bars at expansion joint of concrete pavement thickness 25 cm. Given the radius of relative stiffness of 80 cm. Design wheel load 5000 kg. Load capacity of the dowel system is 40% of design wheel load. Joint width is 2.0 cm and the permissible stress in shear/bending and bearing stress dowel bars are 1000, 1400 and 100 kg/cm2 respectively. | CO5 | | An | 12 |
|  |  |  |  | |  |  |
| 22. | a. | A cement concrete pavement of thickness 17 cm and two lane roads with width of 7.2 m (assume allowable tensile strength 1750 kg/cm2 and allowable bond stress 24.6 kg/cm2). Design the pavement with given details. | CO5 | | An | 6 |
|  | b. | Explain the expansion joints and contraction joints. | CO5 | | U | 6 |
|  |  |  |  | |  |  |
| 23. |  | Soil sub-grade sample obtained from the site was undergone CBR test in laboratory which gives 2.5 mm penetration is 48.5 kg and 5.00 mm penetration is 75.2 kg.  Following details for different pavement layers   1. Compacted sandy soil 7% CBR 2. Poorly graded gravel 20% CBR 3. Well graded gravel 95% CBR 4. Minimum thickness of bituminous concrete surfacing is 5cm   Traffic details  Average Daily Traffic – 1200  Rate of growth – 8%  Construction period – 3 years  Design the pavement as per IRC for 10 years. | CO4 | | An | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Examine the methods used in pavement evaluation.   1. Roughness Measurement. 2. Benkelman beam deflection method. | CO6 | | A | 12 |



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|  | **COURSE OUTCOMES** | | | | | | | |
| CO1 | Understand the principles of pavement design. | | | | | | | |
| CO2 | Summarize the Traffic Considerations. | | | | | | | |
| CO3 | Choose the appropriate pavement material. | | | | | | | |
| CO4 | Analyze flexible and concrete pavements. | | | | | | | |
| CO5 | Design flexible and concrete pavements. | | | | | | | |
| CO6 | Interpret the Pavement Evaluation Techniques. | | | | | | | |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | | |
| CO / P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | | 2 | 15 |  |  |  |  | 17 |
| CO2 | | 2 | 15 |  |  |  |  | 17 |
| CO3 | | 1 | 16 |  |  |  |  | 17 |
| CO4 | |  | 2 | 3 | 24 |  |  | 29 |
| CO5 | |  | 10 |  | 18 |  |  | 28 |
| CO6 | |  | 4 | 12 |  |  |  | 16 |
|  | | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **18CE2056** | **Duration** | **3hrs** |
| **Course Name** | **TOWN PLANNING AND ARCHITECTURE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | State the brick proportion used in the towns of Harappa. | | CO1 | U | | 1 |
| 2. | Recall the city center that paves in Kabba and the scared well of Zamzam. | | CO1 | R | | 1 |
| 3. | Define smart solution. | | CO3 | R | | 1 |
| 4. | Give an example of Roman architecture. | | CO4 | A | | 1 |
| 5. | Define rhythm in architecture. | | CO5 | R | | 1 |
| 6. | List two famous national architecture. | | CO6 | R | | 1 |
| 7. | Recall the meaning of functional design. | | CO5 | R | | 1 |
| 8. | Define green belt. | | CO2 | R | | 1 |
| 9. | Name the concept for a city introduced by Ebenezer Howard. | | CO4 | R | | 1 |
| 10. | Recall the Mughal emperor that caused Indian architecture to flourish. | | CO4 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Explain the drainage system of Harappa in the period of 2200-1900BCE. | | CO1 | | U | 3 |
| 12. | State the objectives of Land use planning. | | CO2 | | R | 3 |
| 13. | Describe the outcomes of satellite township development. | | CO3 | | U | 3 |
| 14. | Interpret shell structures in Western Architecture. | | CO4 | | U | 3 |
| 15. | Generalize the characteristics of the Indo-Aryan mode of architecture. | | CO5 | | U | 3 |
| 16. | Explain Art Nouveau and its characteristics. | | CO6 | | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Explain the granary of Indus valley Civilization. | CO1 | | R | 6 |
|  | b. | Explain the London town plan. | CO1 | | R | 6 |
| 18. | a. | Describe the requirements of New towns. | CO2 | | U | 6 |
|  | b. | Explain the components, vision, and implementation of environmental planning, | CO2 | | U | 6 |
| 19. | a. | Describe the floating city and its vision and need. | CO3 | | U | 6 |
|  | b. | Explain the types of plans used in landscaping. | CO3 | | R | 6 |
| 20. | a. | Distinguish ancient Egyptian architecture and construction. | CO4 | | U | 6 |
|  | b. | Describe features of the Dravidian architecture. | CO4 | | U | 6 |
| 21. | a. | Explain the function expressive of form. | CO5 | | A | 6 |
|  | b. | Discuss the factors affecting architectural developments. | CO5 | | U | 6 |
| 22. | a. | Determine the purpose of deconstructivism in architecture. | CO6 | | A | 6 |
|  | b. | Explain postmodernism and international style. | CO6 | | U | 6 |
| 23. | a. | Illustrate the conceptual layout of Garden city. | CO4 | | A | 6 |
|  | b. | Describe the concept of indoor climate. | CO4 | | U | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Explain skyscrapers and the leaps. | CO3 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the Historical Back Ground of Town Planning and architecture. |
| CO2 | Generalize spaces of buildings using design concepts, planning principles. |
| CO3 | Identify town planning standards, landscaping features and regulations controlling expansion of the towns and the cities. |
| CO4 | Distinguish architectural styles of eastern and western world. |
| CO5 | Employ the importance of architecture design. |
| CO6 | Analyze the importance of modern architecture methods. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 13 | 4 | - | - | - | - | 17 |
| CO2 | 4 | 12 | - | - | - | - | 18 |
| CO3 | 7 | 12 | - | - | - | - | 28 |
| CO4 | 1 | 12 | 7 | - | - | - | 29 |
| CO5 | 1 | 9 | 6 | - | - | - | 16 |
| CO6 | 1 | 9 | 6 | - | - | - | 16 |
|  | | | | | | | **124** |

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| **Course Code** | **18CE2059** | **Duration** | **3hrs** |
| **Course Name** | **GREEN BUILDINGS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Recognize the codes and guidelines used for green buildings. | | CO1 | U | | 1 |
| 2. | Define green building. | | CO1 | R | | 1 |
| 3. | List the stages in site design. | | CO2 | R | | 1 |
| 4. | Quote the principles involved in the selection of green materials. | | CO2 | R | | 1 |
| 5. | Identify the construction waste. | | CO3 | U | | 1 |
| 6. | Recall the types of waste. | | CO3 | R | | 1 |
| 7. | Discover the essentials of commissioning. | | CO4 | U | | 1 |
| 8. | Define HVAC. | | CO4 | R | | 1 |
| 9. | Recognize the full form of LEED. | | CO5 | U | | 1 |
| 10. | Focus on the strategies of LEED certification process. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Interpret the green building goals and principles. | | CO1 | | An | 3 |
| 12. | Explain the green building products and practices. | | CO2 | | U | 3 |
| 13. | Appraise the methods that helps in reducing the carbon footprint of construction operation. | | CO3 | | An | 3 |
| 14. | Discuss the cost and benefit of building commissioning. | | CO4 | | U | 3 |
| 15. | Analyze green globes building assessment protocol international building assessment systems. | | CO5 | | An | 3 |
| 16. | Construct the trends in building rating systems. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Explain in detail about the strategies used in overview of rating systems. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 18. |  | Compare the ideas and methods of Waste water treatment and recycle and reuse systems briefly. | CO2 | | An | 12 |
|  |  |  |  | |  |  |
| 19. |  | Compare traditional and green building constructions with a case-study. | CO3 | | An | 12 |
|  |  |  |  | |  |  |
| 20. |  | Contrast the system of waste management. | CO4 | | An | 12 |
|  |  |  |  | |  |  |
| 21. |  | Focus on the process of assessing the IEQ and explain briefly. | CO5 | | An | 12 |
|  |  |  |  | |  |  |
| 22. |  | Discuss the green building rating system and explain any three. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 23. |  | Focus on the concept of Wind and solar energy harvesting in a deep manner. | CO5 | | An | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Illustrate with a case-study about LEED- certified rating in green building. | CO6 | | An | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the concept of holistic design. |
| CO2 | Implement green building concept. |
| CO3 | Reduce the footprint of construction operation. |
| CO4 | Design the green building systems. |
| CO5 | Evaluate the performance of green buildings. |
| CO6 | Assess and rate the green building. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 25 | - | 3 | - | - | 29 |
| CO2 | 2 | 3 | - | 12 | - | - | 17 |
| CO3 | 1 | 1 | - | 15 | - | - | 17 |
| CO4 | 1 | 4 | 12 | - | - | - | 17 |
| CO5 | - | 1 | - | 27 | - | - | 28 |
| CO6 | - | 4 | - | 12 | - | - | 16 |
|  | | | | | | | **124** |



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| **Course Code** | **18CE3034/20CE3018** | **Duration** | **3hrs** |
| **Course Name** | **DESIGN OF PRE-STRESSED CONCRETE STRUCTURES** | **Max. Marks** | **100** |

\*IS 1343:2012 and IS 456:200 is permitted

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | | |
| 1. | a. | | A prestressed concrete beam of section 120 mm wide by 300 mm deep is used over an effective span of 6 m to support a uniformly distributed load of 4 kN/m, which includes the self-weight of the beam. The beam is prestressed by a straight cable carrying a force of 180 kN and located at an eccentricity of 50 mm. Determine the location of the thrust line in the beam and plot its position at quarter and central span sections. | CO2 | A | 14 |
|  | b. | | List the types of prestressing techniques. | CO1 | R | 2 |
|  |  | |  |  |  |  |
| 2. | a. | | Explain the failure of under and over reinforced section. | CO2 | U | 5 |
|  | b. | | A prestressed girder of rectangular section 150 mm wide by 300 mm deep is to be designed to support an ultimate shear force of 130 kN. The uniform prestress across the section is 5 N/mm2. Given the characteristic cube strength of concrete as 40 N/mm2 and Fe 415 HYSD bars of 8 mm diameter, design suitable spacing for the stirrups conforming to the IS 1343 recommendations. The cover to the reinforcement as 50 mm. Assume all other relevant data. | CO4 | A | 11 |
|  |  | |  |  |  |  |
| 4. | a. | | Explain the design considerations of concrete sleepers. | CO1 | U | 4 |
|  | b. | | A simple flat slab 12 m by 9 m is supported by four columns so placed as to form a symmetrical b 4 grid, 7 m by 6m. The cantilevers formed are 2.5 and 1.5 m in the long and short directions of slab. The live load on the slab is 1 kN/m2. Prestressing cables consisting of four wires of 5 mm carrying an effective force of 100 kN are available for use. Design the number of cables required and arrange them suitably in the two principal directions. | CO3 | A | 12 |
|  |  | |  |  |  |  |
| 5. |  | | A prestressed concrete cylinder pipe is to be designed using steel cylinder of 1200 mm internal diameter and thickness 1.5 mm. the service internal hydrostatic pressure in the pipe is 0.8 N/mm2. 4 mm diameter high tensile wires initially tensioned to a stress of 1kN/mm2 are available for circumferential winding. The yield stress of mild steel cylinder is 280 N/mm2. The maximum permissible compressive stress in concrete at transfer is 15 N/mm2 and no tensile stress is permitted under service load conditions. Determine the thickness of concrete lining and the number of turns of circumferential wire winding and the factor of safety against bursting. Assume modular ratio as 6 and loss ratio as 0.8 | CO6 | A | 16 |
|  |  | |  |  |  |  |
| 6. |  | | A reinforced concrete truss with a prestressed concrete tie is to be designed for a warehouse shed to the following data.  Span of truss = 25m  Spacing of truss = 5m  Central rise of truss = 4.13m  Cross sectional dimension of the member = 200 x 250 mm  Design a suitable reinforcements in the truss members (Compression). Direct compression load is 395 kN and the bending moment is 4.3 kNm. Adopt M35 grade concrete and Fe 415 HYSD bars for main reinforcements and Fe 250 grade steel for secondary reinforcements. Freyssinet system high tensile cables comprising 12 wires of 7 mm diameter are available for prestressing the tie member. Assume (p/fck = 0) | CO4 | A | 16 |
|  |  | |  |  |  |  |
| 7. |  | | A pretensioned prestressed concrete beam having a rectangular section, 200 mm wide and 400 mm deep, has an effective cover of 50 mm. If fck = 35 N/mm2, fp = 1600 N/mm2, and the area of prestressing steel Ap = 461 mm2, calculate the ultimate flexural strength of the section using IS 1343 code provisions. | CO5 | A | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | | |
| 8. |  | A precast pretensioned beam of rectangular section has a breadth of 100 mm and a depth of 200mm. the beam with an effective span of 5 m ., is prestressed by tendons with their centroids coinciding with the bottom kern. The initial force in the tendons is 150 kN. The loss of pestress may be assumed to be 15 percent. The beam is incorporated in a composite T-beam by casting a top flange of breadth 400 mm and thickness 40 mm. if the composite beam supports a live load of 8 kN/m2, calculate the resultant stresses developed in the precast and in situ cast concrete assuming the pretensioned beam as (a) unpropped and (b) propped during the casting of the slab. Assume the same modulus of elasticity for concrete in precast and in situ cast slab. | | CO6 | A | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | List the prestressing techniques. |
| CO2 | Understand the concepts of prestressing techniques. |
| CO3 | Analyse prestressed concrete structures. |
| CO4 | Design prestressed concrete structural elements. |
| CO5 | Appraise on the quality parameters of PSC structures. |
| CO6 | Investigate the rationale for failure of PSC structures. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 4 |  |  |  |  | 6 |
| CO2 |  | 5 | 14 |  |  |  | 19 |
| CO3 |  |  | 28 |  |  |  | 28 |
| CO4 |  |  | 11 | 16 |  |  | 27 |
| CO5 |  |  | 16 |  |  |  | 16 |
| CO6 |  |  | 36 |  |  |  | 36 |
|  | | | | | | | **132** |



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| **Course Code** | **18CE3036** | **Duration** | **3hrs** |
| **Course Name** | **SURFACE FLOW HYDROLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Appraise “Hydrological cycle” describing the various processes and interactions involved in it. | CO1 | E | 10 |
|  | b. | Water is at constant rate of 370 cumec was observed to be entering into a reservoir in a certain season. If outflow from the reservoir including infiltration and evaporation lossess is 280 cumecs, find out the change in storage of reservoir for 10 days in hectare-m. | CO1 | Ap | 6 |
|  |  |  |  |  |  |
| 2. | a. | State return period and random variable with reference to precipitation and flood. | CO2 | U | 8 |
|  | b. | Elaborate about runoff estimation using a hydrological model including the effect of climate change and also state whether it is a stochastic or deterministic model. | CO3 | Ap | 8 |
|  |  |  |  |  |  |
| 3. | a. | Differentiate the types of precipitation and elaborate about their characteristics. | CO2 | U | 10 |
|  | b. | Analysis of data on maximum one day rainfall depth at Chennai indicated that a depth of 280mm had a return period of 50 years. Determine the probability of one day rainfall depth equal to or greater than 280 mm that can occur at Chennai city. | CO5 | An | 6 |
|  |  |  |  |  |  |
| 4. | a. | Enumerate the concept of flood estimation using various methods. | CO4 | Ap | 8 |
|  | b. | The annual peak flood discharges recorded at a streamgauging site for 19years during the period 1961 to 1979 in m3/s are given below:  3950,6190,7660,4220,2820,5600,7050,5280,5200,4360,6970,6240,4960,5890,5980,3590,6860,7210,5270  Construct the frequency curve and hence determine the flood peak with a return period of 50 years and 100 years. | CO5 | E | 8 |
|  |  |  |  |  |  |
| 5. | a. | Demonstrate the factors affecting evaporation process. | CO2 | U | 10 |
|  | b. | Rainfall of magnitude 3.8 and 2.8 cm occurring on two consecutive 4-h durations on a catchment of area 27 km2 produced the following hydrograph of flow at the outlet of the catchment. Estimate the rainfall excess and Ø-index.   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Time from start of rainfall (h) | -6 | 0 | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 66 | | Observed flow (m3/s) | 6 | 5 | 13 | 26 | 21 | 16 | 12 | 9 | 7 | 5 | 5 | 4.5 | 4.5 | | CO3 | Ap | 6 |
|  |  |  |  |  |  |
| 6. | a. | Discuss temporal and spatial distribution of precipitation in India. | CO1 | U | 8 |
|  | b. | Elaborate the process of finding missing precipitation data. | CO2 | U | 8 |
|  |  |  |  |  |  |
| 7. |  | Unit hydrograph ordinates of 4 hour are given below:   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Time (Hr) | 0 | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | | UHO | 0 | 17 | 28 | 42 | 72 | 60 | 47 | 32 | 15 | 0 |   Determine the ordinates of 8 hour unit hydrograph. | CO4 | An | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Enumerate the process of estimation of evaporation by pan evaporation. | CO6 | Ap | 10 |
|  | b. | Distinguish the working principle of Lysimeter for the determination of evapotranspiration. | CO6 | Ap | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Possess a thorough knowledge of the hydrological processes associated with surface water. |
| CO2 | Analyze basic hydrologic data. |
| CO3 | Estimate the surface runoff. |
| CO4 | Measure flow in the streams. |
| CO5 | Conduct probability analysis for extreme events. |
| CO6 | Conduct water budget analysis. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 8 | 6 |  | 10 |  | 24 |
| CO2 |  | 36 |  |  |  |  | 36 |
| CO3 |  |  | 14 |  |  |  | 14 |
| CO4 |  |  | 8 | 16 |  |  | 24 |
| CO5 |  |  |  | 6 | 8 |  | 14 |
| CO6 |  |  | 20 |  |  |  | 20 |
|  | | | | | | | **132** |



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| **Course Code** | **18CE3037** | **Duration** | **3hrs** |
| **Course Name** | **ENVIRONMENTAL CHEMISTRY AND MICROBIOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. |  | Discuss in detail on components of Environment. | CO1 | R | 16 |
|  |  |  |  |  |  |
| 2. |  | Explain the major regions of the atmosphere. | CO1 | U | 16 |
|  |  |  |  |  |  |
| 3. |  | Define environmental water quality and explain in detail about Water use classifications. | CO2 | A | 16 |
|  |  |  |  |  |  |
| 4. |  | Summaries a note on major water quality parameters and applications. | CO4 | A | 16 |
|  |  |  |  |  |  |
| 5. |  | Describe carbon cycle with its components. | CO5 | U | 16 |
|  |  |  |  |  |  |
| 6. |  | Describe the environmental factors that influence the health and growth of microorganisms. | CO3 | A | 16 |
|  |  |  |  |  |  |
| 7. |  | Summaries a note on Suspended and attached biomass growth. | CO2 | A | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Summarize a note on bioaugmentation. | CO6 | U | 10 |
|  | b. | Discuss in detail on biomagnifications. | CO6 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Learn basic chemical contents in the context of environmental studies. |
| CO2 | Gain competency in solving environmental issues of chemicals based pollution. |
| CO3 | Able to determine chemical calculations required for treatment purpose. |
| CO4 | Identify contaminating chemicals and learn the conceptual skills required for environmental chemistry research. |
| CO5 | Apply micro-organisms for the treatment of wastes, bioleaching and bio-augmentation. |
| CO6 | Have insight into type, growth metabolism and culturing techniques of micro- organisms and  their application to environmental engineering. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 16 | 16 |  |  |  |  | 32 |
| CO2 |  |  | 32 |  |  |  | 32 |
| CO3 |  |  | 16 |  |  |  | 16 |
| CO4 |  |  | 16 |  |  |  | 16 |
| CO5 |  | 16 |  |  |  |  | 16 |
| CO6 |  | 20 |  |  |  |  | 20 |
|  | | | | | | | **132** |

Graphical user interface, application

Description automatically generated with medium confidence

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| **Course Code** | **18CE3045** | **Duration** | **3hrs** |
| **Course Name** | **ENVIRONMENTAL IMPACT ASSESSMENT** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. |  | Explain the components of EIA. | CO1 | U | 16 |
|  |  |  |  |  |  |
| 2. |  | Recall the Principle and Purpose of EIA. | CO2 | R | 16 |
|  |  |  |  |  |  |
| 3. |  | Explain different phases of LCA. | CO3 | U | 16 |
|  |  |  |  |  |  |
| 4. |  | Write a report on Potential Environmental Impact and Mitigation Measures for a proposed highway project. | CO4 | AN | 16 |
|  |  |  |  |  |  |
| 5. |  | Prepare a report outlining projected environmental impacts and mitigation for a project to mine minerals. | CO5 | AN | 16 |
|  |  |  |  |  |  |
| 6. |  | Classify and explain LCA. | CO3 | U | 16 |
|  |  |  |  |  |  |
| 7. |  | Develop an environmental management plan for a proposed airport for an Indian city. | CO5 | AN | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. |  | Prepare a complete report of EIA for a proposed mine mineral project. | CO6 | A | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify environmental attributes to be considered for the EIA study. |
| CO2 | Prepare environmental base map based on impact evaluation and analysis. |
| CO3 | Specify methods for prediction of the impacts. |
| CO4 | Conduct environmental audit. |
| CO5 | Evaluate the audit data and prepare the report. |
| CO6 | Formulate environmental management plan. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 16 |  |  |  |  | 16 |
| CO2 | 16 | 16 |  |  |  |  | 32 |
| CO3 |  | 16 |  |  |  |  | 16 |
| CO4 |  |  |  | 16 |  |  | 16 |
| CO5 |  |  |  | 32 |  |  | 32 |
| CO6 |  |  | 20 |  |  |  | 20 |
|  | | | | | | | **132** |



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| **Course Code** | **18CE3046** | **Duration** | **3hrs** |
| **Course Name** | **CLEANER PRODUCTION AND SUSTAINABLE DEVELOPEMENT** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Discuss about the benefits, advantages and disadvantages of sustainable development. | CO1 | U | 8 |
|  | b. | Explain cleaner production and its components. | CO1 | U | 8 |
|  |  |  |  |  |  |
| 2. |  | Classify the pollution prevention approaches and its benefits. | CO2 | U | 16 |
|  |  |  |  |  |  |
| 3. | a. | Illustrate the benefits of cleaner production with diagram. | CO3 | U | 8 |
|  | b. | Explain waste management hierarchy. | CO3 | U | 8 |
|  |  |  |  |  |  |
| 4. | a. | Discuss about the information gathering tools in detail. | CO4 | U | 12 |
|  | b. | Identify the factors that are to be considered for material balance. | CO4 | R | 4 |
|  |  |  |  |  |  |
| 5. | a. | Explain the framework of Life cycle analysis. | CO5 | U | 8 |
|  | b. | Classify the guiding principles of ecolabelling in detail. | CO5 | U | 8 |
|  |  |  |  |  |  |
| 6. | a. | Recall the prevention methods of cleaner production with diagram. | CO1 | R | 12 |
|  | b. | Define industrialization and its factors. | CO1 | R | 4 |
|  |  |  |  |  |  |
| 7. |  | Explain the role of industries in pollution prevention in detail. | CO2 | U | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. |  | Discuss about the potential benefits and stages of Environmental management system with diagram. | CO6 | U | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Apply different approaches in clean production. |
| CO2 | Understand and choose the different principles of sustainable development. |
| CO3 | Implement green building concepts and conduct material balance studies. |
| CO4 | Comment on the evolution of corporate environmental management strategies. |
| CO5 | Describe cleaner production measures. |
| CO6 | Conduct energy and waste audit. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 16 | 16 | - | - | - | - | 32 |
| CO2 | - | 32 | - | - | - | - | 32 |
| CO3 | - | 16 | - | - | - | - | 16 |
| CO4 | 4 | 12 | - | - | - | - | 16 |
| CO5 | - | 16 | - | - | - | - | 16 |
| CO6 | - | 20 | - | - | - | - | 20 |
|  | | | | | | | **132** |



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| **Course Code** | **18CE3048** | **Duration** | **3hrs** |
| **Course Name** | **NANOTECHNOLOGY IN ENVIRONMENTAL ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Define nanoparticles and list down the methods of synthesis of nanoparticles. | CO1 | U | 5 |
|  | b. | Examine any two methods of synthesis of nanoparticles in detail with sketch. | CO2 | An | 15 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | List down the applications of nanoparticles in wastewater treatment. | CO6 | R | 5 |
|  | b. | Evaluate the methods of the synthesis of magnetic nanoparticles with sketch. | CO2 | Ev | 15 |
|  |  |  |  |  |  |
| 3. | a. | List down the properties and characterization studies of nanoparticles. | CO3 | R | 4 |
|  | b. | Outline the working principle of Scanning Electron Microscope and how the SEM images can be analysed? | CO3 | U | 16 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | How the elemental analysis of the nanoparticles can be done and explain it in detail. | CO3 | An | 10 |
|  | b. | How are the functional groups of the nanoparticles interpreted? List down the spectrum range for various functional groups. | CO3 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Compare different types of filtrationsapplied in water purification. | CO6 | An | 8 |
|  | b. | What are the different types of materials used for membrane fabrication? How the membranes can be fabricated using insoluble polymers. | CO2 | U | 12 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Examine how the fabricated polymer membranes can be characterized and discuss in detail the properties of them. | CO2 | An | 15 |
|  | b. | List down the different types of membrane fouling. | CO3 | R | 5 |
|  |  |  |  |  |  |
| 7. | a. | With a sketch, explain how the Iron oxide Nanoparticles can be synthesized. | CO4 | An | 10 |
|  | b. | Explain the process and highlight efficiency of photocatalytic oxidation and Fenton process. | CO6 | Un | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Outline the method of synthesis of single walled and multi-walled carbon nanotubes. | CO4 | Ap | 12 |
|  | b. | Explain how the micro pollutants can be removed from wastewater. | CO5 | Ap | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain how aggregation, reaction, adsorption and deposition affect the behavior of nanoparticles in the aqueous environment. | CO5 | U | 14 |
|  | b. | Examine the eco-toxicity of nanoparticles on human health and environment. | CO5 | An | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the principles of nanotechnology. |
| CO2 | Synthesis different types of nano particles for various applications. |
| CO3 | Conduct characterization studies of nanomaterial. |
| CO4 | Develop nano-sensors. |
| CO5 | Analyse the impact of nanomaterial on environment. |
| CO6 | Design efficient and effective treatment method. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 |  |  |  |  |  | 5 |
| CO2 |  | 12 |  | 15 |  |  | 27 |
| CO3 | 9 | 16 |  | 35 | 15 |  | 75 |
| CO4 |  |  | 12 | 10 |  |  | 22 |
| CO5 |  | 14 | 8 | 6 |  |  | 28 |
| CO6 | 5 | 10 |  | 8 |  |  | 23 |
|  | | | | | | | **180** |



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| **Course Code** | **18CE3049** | **Duration** | **3hrs** |
| **Course Name** | **ELECTROCHEMICAL WATER PROCESSING AND WATER TREATMENT** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain in detail about the working principle of electrochemical cell with example. Write down the categories. | CO1 | U | 10 |
|  | b. | a. Brief explain the cell potential.  b. Differentiate primary and secondary cells. | CO1 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Discuss in detail the different electrodes and the electrode reactions. | CO1 | U | 10 |
|  | b. | How the Faraday’s law of electrolysis is applied in Electrochemical treatment of Wastewater. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | i. Outline the working principle of electrocoagulation.  ii. Examine the reactions occurring in anode and cathode in electrocoagulation process. | CO6 | U | 10 |
|  | b. | i. Distinguish between electrode passivation and activation.  ii. Compare electrocoagulation with chemical coagulation. | CO6 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Compare the different designs of electrocoagulation reactors. | CO3 | Ap | 10 |
|  | b. | Analyse how the operational parameters affect the efficiency of electrocoagulation process. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Detail the performance characteristics of the electro-dialysis process. | CO4 | Ap | 10 |
|  | b. | List down the applications of anion and cation exchange membranes in water and wastewater treatment. | CO4 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain how desalination happens in electrodialysis unit. | CO4 | An | 12 |
|  | b. | Enumerate the advantages and limitations of electrodialysis. | CO4 | U | 8 |
|  |  |  |  |  |  |
| 7. | a. | Explain how the chromium ion can be recovered using electrochemical methods. | CO5 | An | 14 |
|  | b. | List down different electrochemical methods of recovering heavy metals. | CO5 | U | 6 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the process of flue gas desulphurization. | CO5 | U | 10 |
|  | b. | Discuss in detail how iron can be removed from acid baths using electrochemical method. | CO5 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain in detail the significance of Bio-ciding technology in electrochemical water processing. | CO3 | U | 10 |
|  | b. | Summarize the process of electrochemical bromination with a sketch. | CO3 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basic concepts of electrochemistry. |
| CO2 | Anlayse the characteristics of the effluent and sludge produced. |
| CO3 | Design electrochemical reactor. |
| CO4 | Understand the mechanism of electro dialysis for desalination. |
| CO5 | Apply electrochemical methods for heavy metal removal. |
| CO6 | Develop new electrodes for electrocoagulation and capacitive deionization. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 30 |  | 10 |  |  | 40 |
| CO2 |  |  |  | 10 |  |  | 10 |
| CO3 |  | 20 | 10 |  |  |  | 30 |
| CO4 |  | 8 | 10 | 22 |  |  | 40 |
| CO5 |  | 26 |  | 14 |  |  | 40 |
| CO6 |  | 10 |  | 10 |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **18CE3057** | **Duration** | **3hrs** |
| **Course Name** | **FOREST, URBAN AND AGRICULTURAL WATERSHED MANAGEMENT** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain in the watershed development and mention characteristics of watersheds. | CO1 | U | 10 |
|  | b. | Explain the integrated and multi-disciplinary approaches of watershed management. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Express the influence of forest on hydrologic processes. | CO1 | U | 10 |
|  | b. | Identify the major causes for deterioration seen in watersheds. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the global agricultural trends in watershed management. | CO1 | U | 10 |
|  | b. | Discuss the impacts on soil and water in agricultural watershed management. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the soil and water conservation in water development. | CO3 | U | 10 |
|  | b. | Explain the procedures in monitoring and evaluation watershed development. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Discuss the impacts of urbanization on hydrology. | CO3 | U | 10 |
|  | b. | Generalize the applications for water and green building. | CO6 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Discuss about water delineation and its application in watershed development. | CO6 | U | 10 |
|  | b. | Discuss the objective and need for watershed development. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Relate the common reason for deforestation and accelerated erosion. | CO2 | A | 10 |
|  | b. | Define   * Peak flow * Low flow | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Define   * Erosion * Sediment * Drainage | CO1 | R | 10 |
|  | b. | Explain the nutrient budget. | CO4 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Discuss a case study on cultivated watersheds followed by changes adapted there on. | CO5 | U | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the hydrologic principles in forest, urban and agricultural management. |
| CO2 | Apply the techniques for soil erosion control, flood management and storm management. |
| CO3 | Develop an integrated watershed management plan. |
| CO4 | Determine nutrient budget for a watershed. |
| CO5 | Develop storm water management strategy for a watershed. |
| CO6 | Apply water conservation techniques in green buildings. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 20 | 30 | - | - | - | - | 50 |
| CO2 | - | 10 | 10 | - | - | - | 20 |
| CO3 | - | 60 | - | - | - | - | 60 |
| CO4 | - | 10 | - | - | - | - | 10 |
| CO5 | - | 20 | - | - | - | - | 20 |
| CO6 | - | 20 | - | - | - | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **18CE3061** | **Duration** | **3hrs** |
| **Course Name** | **REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Differentiate any tool for remote sensing platforms. | CO1 | U | 10 |
|  | b. | Explain interaction of EMR with atmosphere and earth surface. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Define   * Image interpretation * Digital image processing | CO2 | R | 10 |
|  | b. | Describe image classification using neat and clean diagram. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Discuss the components of GIS. | CO1 | U | 10 |
|  | b. | Memorize data structures for raster and vector. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Analysis the procedure for the thematic mapping. | CO3 | An | 10 |
|  | b. | Differentiate the vector and raster map overlay. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Articulate GIS approaches for water resources system. | CO4 | A | 10 |
|  | b. | Explain the common steps for flood inundation mapping and modelling. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Discuss various data types and format in remote sensing. | CO3 | U | 10 |
|  | b. | Define   * LANDSAT * SPOT * ERS * IKONOS * EMR | CO3 | R | 10 |
|  |  |  |  |  |  |
| 7. | a. | Differentiate between multi temporal and multi sensoral. | CO1 | U | 10 |
|  | b. | Define   * Satellite data analysis * Data merging | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Discuss map projection and coordinate system in GIS. | CO5 | U | 10 |
|  | b. | Discuss sources of error in GIS. | CO2 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Explain software for GIS and remote sensing data to analysis and modelling. | CO6 | U | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the principles and components of Remote Sensing and GIS. |
| CO2 | Analyze and interpret satellite images using digital image processing. |
| CO3 | Create thematic maps for various applications. |
| CO4 | Implement overlay analysis for various environmental and water resources application. |
| CO5 | Create spatial and temporal variation maps. |
| CO6 | Apply GIS and RS tool in environmental and water resources projects. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 40 | - | - | - | - | 50 |
| CO2 | 10 | 20 | - | - | - | - | 30 |
| CO3 | 20 | 10 | - | 10 | - | - | 40 |
| CO4 | - | 20 | 10 | - | - | - | 30 |
| CO5 | - | 10 | - | - | - | - | 10 |
| CO6 | - | 20 | - | - | - | - | 20 |
|  | | | | | | | **180** |

**Graphical user interface, application

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| **Course Code** | **19CE2020** | **Duration** | **3hrs** |
| **Course Name** | **CONSTRUCTION SAFETY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | | **Course Outcome** | **Bloom’s Level** | **Marks** | |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | | |
| 1. | Give few examples of common hazards related to loading and unloading materials. | | | | CO1 | U | 1 | |
| 2. | Indicate an innovative construction technology that can be used for lifting heavy equipment. | | | | CO1 | R | 1 | |
| 3. | List any two roles and responsibilities of HSE. | | | | CO2 | R | 1 | |
| 4. | Identify the full form of the term JHA. | | | | CO2 | R | 1 | |
| 5. | Differentiate formwork and scaffolding based on any one of their function. | | | | CO3 | U | 1 | |
| 6. | Define Stripping. | | | | CO3 | R | 1 | |
| 7. | Identify the three different acts that are related with EPF. | | | | CO4 | U | 1 | |
| 8. | State the goal of labour law. | | | | CO4 | R | 1 | |
| 9. | Compare backhoe and dozer equipment in any one aspect. | | | | CO5 | U | 1 | |
| 10. | Generalize about demolition permit. | | | | CO6 | U | 1 | |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | | |
| 11. | Select the appropriate safety measures to be followed while a labour is climbing the ladder of 10m height during the project execution. | | | | CO1 | An | 3 | |
| 12. | Identify the reasons to refer the safety training regulations and give examples of the general hazards at construction site. | | | | CO2 | U | 3 | |
| 13. | Cite the functions of Scaffolding and mention its types. | | | | CO3 | U | 3 | |
| 14. | Discuss the benefits of Occupancy Certificate. | | | | CO4 | U | 3 | |
| 15. | Focus on the safety precautions to be followed while a heavy stone is been lifted with mobile crane. | | | | CO5 | An | 3 | |
| 16. | Discover the situation when a demolition permit is required. | | | | CO6 | U | 3 | |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | | |
| 17. |  | Choose the safety precautions needed to be taken care while executing a project at construction site. | | | CO1 | A | 12 | |
| 18. | a. | Classify the different stages of construction phases and the application of equipment in each stage. | | | CO2 | A | 8 | |
|  | b. | Construct few points on how safety induction programs and culture take place in the training period. | | | CO2 | A | 4 | |
| 19. |  | Describe the requirement of a good and temporary structure that act as a mould for concrete structures & also recommend the safety precautions needed to be followed while working with this temporary structure. | | | CO3 | U | 12 | |
| 20. |  | An authorized safety engineer is inspecting a process that generates flames and sparks. Prepare a risk assessment report associated with it and recommend the safety precautions to be taken. | | | CO4 | A | 12 | |
| 21. |  | Prepare a safety precautions report while working with earthmover machines. | | | CO5 | A | 12 | |
| 22. | a. | Discover the act that fixes minimum rates in certain employments and explain its objectives. | | | CO4 | U | 6 | |
|  | b. | Analyse the hazards involved when handling power tools and recommend the safety precautions for the same. | | | CO3 | An | 6 | |
| 23. | a. | Illustrate the hierarchy of Hazard control and explain shortly. | | | CO2 | An | 6 | |
|  | b. | Generalize the safety facilities available at construction site and cite the categories that must be prepared in case of any emergency rescue operation. | | | CO1 | U | 6 | |
| **COMPULSORY QUESTION** | | | | | | | | |
| 24. |  | | An Industrial building is planned to renovate its whole building. Categorize the general safety maintenance rules that has to be followed while carrying out repair and renovation tasks. | CO6 | | An | | 12 |

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|  | **COURSE OUTCOMES** | | | | | | | |
| CO1 | Ensure the security of the workers and protect the firm against lawsuits and damages. | | | | | | | |
| CO2 | Develop the essential aspects of Health and Safety in construction. | | | | | | | |
| CO3 | Adopt the management tools for Structural safety, Environment and Occupational health. | | | | | | | |
| CO4 | Interprets the local technical standards and regulations on labor risks prevention, environmental management applicable to construction works. | | | | | | | |
| CO5 | Implement the safety and health issues in construction works and the typical hazards of the construction activity. | | | | | | | |
| CO6 | Select the most effective personal and collective safety equipment, based on the risks in construction activities. | | | | | | | |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | | | |
| CO / P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** | |
| CO1 | | 1 | 7 | 12 | 3 | - | - | 23 | |
| CO2 | | 2 | 3 | 12 | 6 | - | - | 23 | |
| CO3 | | 1 | 16 | - | 6 | - | - | 23 | |
| CO4 | | 1 | 10 | 12 | - | - | - | 23 | |
| CO5 | | - | 1 | 12 | 3 | - | - | 16 | |
| CO6 | | - | 4 | - | 12 | - | - | 16 | |
|  | | | | | | | | **124** | |

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| **Course Code** | **20CE1001** | **Duration** | **3hrs** |
| **Course Name** | **BUILDING SCIENCE AND ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | List out the types of view. | | CO1 | R | | 1 |
| 2. | List the number of standard meridians in globe. | | CO1 | R | | 1 |
| 3. | Mention the correct core body temperature and skin temperature. | | CO2 | R | | 1 |
| 4. | State the importance of thermal comfort. | | CO2 | R | | 1 |
| 5. | List the factors that affect the energy consumption. | | CO3 | R | | 1 |
| 6. | Define the energy efficiency in the building. | | CO3 | R | | 1 |
| 7. | Infer the term used to measure the sound wave. | | CO4 | R | | 1 |
| 8. | Name the three types of expression of decibel scale. | | CO4 | R | | 1 |
| 9. | List the demerits of day lighting. | | CO5 | R | | 1 |
| 10. | List the three main components of sound. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | State the use of loco-centric view. | | CO1 | | U | 3 |
| 12. | Differentiate the active and passive thermal comfort. | | CO2 | | U | 3 |
| 13. | Enumerate the benefits of energy efficiency building. | | CO3 | | U | 3 |
| 14. | Enumerate the behavior of sound in enclosed space. | | CO4 | | U | 3 |
| 15. | Define the components of daylight. | | CO5 | | U | 3 |
| 16. | List out the thermal comfort parameters. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Explain the macro and micro climate. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 18. |  | Explain the heat exchange in human body with the equations. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | Summarize the calculation of energy use in the buildings. | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 20. |  | Review the room acoustic parameters. | CO4 | | U | 12 |
| 21. |  | Explain the building design used in controlling the daylight. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 22. |  | Delineate the energy indicators in the building. | CO6 | | U | 12 |
|  |  |  |  | |  |  |
| 23. |  | Examine the classroom acoustic design. | CO4 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Explain the factors affecting the acoustic design of the building. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the climate responsive design of buildings. |
| CO2 | Illustrate the thermal comfort and energy efficiency requirements. |
| CO3 | Illustrate acoustics, in the design of buildings. |
| CO4 | Demonstrate the principles of noise control. |
| CO5 | Design for visual quality and day lighting. |
| CO6 | Appraise the design principles in real time environment. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 15 |  |  |  |  | 17 |
| CO2 | 2 | 15 |  |  |  |  | 17 |
| CO3 | 2 | 15 |  |  |  |  | 17 |
| CO4 | 2 | 27 |  |  |  |  | 29 |
| CO5 | 1 | 15 |  |  |  |  | 16 |
| CO6 | 1 | 27 |  |  |  |  | 28 |
|  | | | | | | | **124** |

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| **Course Code** | **20CE1002** | **Duration** | **3hrs** |
| **Course Name** | **ENGINEERING MECHANICS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define Centroid. | | CO5 | R | | 1 |
| 2. | Define the term Moment. | | CO5 | R | | 1 |
| 3. | Define the term Force. | | CO1 | R | | 1 |
| 4. | What is a collinear system of forces? | | CO1 | R | | 1 |
| 5. | Define the term Beam. | | CO2 | R | | 1 |
| 6. | State the three conditions of static equilibrium. | | CO1 | U | | 1 |
| 7. | Define time of flight. | | CO3 | R | | 1 |
| 8. | State Newton’s second law of motion. | | CO3 | R | | 1 |
| 9. | Define co-efficient of friction. | | CO2 | R | | 1 |
| 10. | Define Energy. | | CO1 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Define Varignon’s theorem. | | CO3 | | R | 3 |
| 12. | List the three important End supports of a beam. | | CO4 | | U | 3 |
| 13. | List the types of Equilibrium. | | CO1 | | R | 3 |
| 14. | Distinguish centroid and centre of gravity | | CO5 | | U | 3 |
| 15. | Give the Work-Energy equation and express it terms. | | CO2 | | R | 3 |
| 16. | A bullet of mass 1kg is fired from a gun with a velocity of 500m/s. The length of the barrel of the gun is 2m. Calculate the force exerted by the gun. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | The following forces act at a point:  a. 200N inclined at 300 towards North of East  b. 250N towards North c. 300 N towards North of west at 45o 350 N inclined at 40o towards south of west.  Find the resultant of the force system. | CO6 | | A | 12 |
|  |  |  |  | |  |  |
| 18. |  | A uniform ladder 3m long weighs 250N. It is placed against a wall making an angle of 60o with the floor. The coefficient of friction between the wall and the ladder is 0.25 and that between floor and ladder is 0.35. The ladder in addition to its own weight has to support a man of 700 N at its top. Find the minimum force required to prevent slipping of the ladder at floor level. | CO6 | | A | 12 |
|  |  |  |  | |  |  |
| 19. |  | Find the centroid of the plane lamina as shown in the figure. | CO5 | | A | 12 |
|  |  |  |  | |  |  |
| 20. |  | Mr. Sudhan is driving his car at 100km/hr. When he observes that a traffic light 50m ahead turns red, the traffic light is timed to remain red for 15 seconds. If he wishes to pass the light without stopping just as it turns green, determine:  a. the required uniform deceleration of the car  b. the speed of the car as it passes the traffic light. | CO6 | | A | 12 |
|  |  |  |  | |  |  |
| 21. |  | Find the reactions at A and B of the beam shown.  A  B  1 m  2 m  1 m  10 KN  5 KN/m  10 KN/m  20 KN  300  2 m  3 m | CO5 | | A | 12 |
|  |  |  |  | |  |  |
| 22. |  | Analyze the pin jointed truss as shown below by method of joints. | CO4 | | A | 12 |
|  |  |  |  | |  |  |
| 23. |  | Two cars A and B start from rest at the same time from two stations spaced ‘L’ apart along the same straight road. Car ‘A’ travels first with an acceleration of 0.6 m/s2 reaching a maximum velocity of 30 m/s and travels uniformly with this velocity. Car ‘B’ travels first with an acceleration of 0.75 m/s2 reaching a maximum velocity of 24 m/s. Both the cars cross each other at ‘C’ which is exactly mid way between the two stations. Determine ‘L’ and the time taken by each car to cross ‘C’ | CO5 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Find the Moment of Inertia of a I section of flange 100mm x 30mm and web 20mm x 80mm about its centroidal axes. | CO5 | | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Illustrate the concepts of mechanics |
| CO2 | Identify the principles of dynamics |
| CO3 | Examine the concepts of kinetics |
| CO4 | Analyse the stresses in the members |
| CO5 | Apply the equilibrium concepts in analysis of members |
| CO6 | Apply the basic principles to solve problems in mechanics |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 6 | 1 | - | - | - | - | 7 |
| CO2 | 5 | - | - | - | - | - | 5 |
| CO3 | 5 | - | - | - | - | - | 5 |
| CO4 | - | 3 | 12 | - | - | - | 15 |
| CO5 | 2 | 3 | 48 | - | - | - | 53 |
| CO6 | - | 3 | 36 | - | - | - | 39 |
|  | | | | | | | **124** |

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| **Course Code** | **20CE1004** | **Duration** | **3hrs** |
| **Course Name** | **SUSTAINABLE BUILDING MATERIALS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | |
| 1. | List out the steps in stone production. | CO1 | R | 1 |
| 2. | Define the properties of concrete. | CO1 | U | 1 |
| 3. | Give some of the reusable building materials. | CO2 | R | 1 |
| 4. | Demonstrate the rubber usage in construction. | CO2 | U | 1 |
| 5. | State the concrete curing process. | CO3 | U | 1 |
| 6. | Recall the blocks that are stabilized with a chemical binder. | CO3 | R | 1 |
| 7. | Name some of the use of nanostructures | CO4 | R | 1 |
| 8. | List the usage of shipping containers in construction practices. | CO5 | R | 1 |
| 9. | Give any two smart parameters in smart building. | CO6 | U | 1 |
| 10. | Define active structure. | CO6 | U | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | | |
| 11. | Define the term Workability of concrete. | CO1 | U | 3 |
| 12. | Describe the objective of sustainable construction. | CO3 | U | 3 |
| 13. | Define the composition of good soil. | CO2 | U | 3 |
| 14. | Identify the use of Ferro cement in construction. | CO4 | U | 3 |
| 15. | Interpret the building demolition waste usage again in industries. | CO5 | U | 3 |
| 16. | Summarize the context of absorbing brick in reducing pollution. | CO6 | U | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23)** | | | | | |
| 17. |  | Explain the building structures with neat sketch. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. | a. | Delineate the properties of cement and its types. | CO1 | A | 6 |
| b. | Distinguish the renewable material and recycled material with examples. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 19. | a. | Describe the usage of paper in construction with its merits and demerits. | CO2 | A | 4 |
| b. | Examine the properties need to be considered in selecting the paints, finishes and adhesives has for the residential construction. | CO2 | U | 8 |
|  |  |  |  |  |  |
| 20. | a. | Categorize the types of sustainable mud blocks available in construction with the advantages and disadvantages. | CO3 | An | 4 |
| b. | Elaborate the Funicular shell and its components. | CO3 | A | 8 |
|  |  |  |  |  |  |
| 21. | a. | Examine the reason Geopolymer concrete is used as sustainable material instead of OPC in construction. And state the constituents of geopolymer concrete. | CO4 | A | 6 |
| b. | Discuss the 3D printing technology and its usage. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 22. | a. | Explain the Silica-fumes properties and its practice in construction field. | CO5 | A | 8 |
| b. | Select the suitable way to use the demolition waste in various fields of construction. | CO5 | An | 4 |
|  |  |  |  |  |  |
| 23. | a. | Enumerate the consumption of salvaged materials in construction industry. | CO5 | A | 6 |
| b. | Inspect the provision of concrete in controlling the bacteria and smart building construction. | CO6 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss in detail about the piezoelectic material with suitable example. | CO6 | A | 6 |
| b. | Distinguish the types of fiber optics available for construction. | CO6 | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the sustainable building materials. |
| CO2 | Distinguish between conventional and modern construction materials. |
| CO3 | Define the concepts of embodied carbon or carbon footprint. |
| CO4 | Identify the different sustainable construction techniques. |
| CO5 | Analyze the usage of waste materials for construction. |
| CO6 | Analyze the use of smart materials. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 16 | 6 | - | - | - | 23 |
| CO2 | 1 | 8 | 6 | - | - | - | 15 |
| CO3 | 1 | 4 | 6 | 6 | - | - | 17 |
| CO4 | 1 | 9 | 6 | - | - | - | 16 |
| CO5 | 1 | 3 | 12 | 6 | - | - | 22 |
| CO6 | - | 16 | 6 | - | - | - | 32 |
|  | | | | | | | **124** |

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| **Course Code** | **20CE2001** | **Duration** | **3hrs** |
| **Course Name** | **SURVEYING AND GEOMATICS ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define leveling. | | CO3 | R | | 1 |
| 2. | Compare curvature and refraction correction. | | CO1 | U | | 1 |
| 3. | Define latitude. | | CO2 | R | | 1 |
| 4. | Recall the term Reduced bearing. | | CO2 | R | | 1 |
| 5. | List the methods of tachometric surveying. | | CO3 | R | | 1 |
| 6. | Recall the value of multiplying constant (K) and additive constant (C) When the theodolite is fitted with anallatic lens. | | CO1 | R | | 1 |
| 7. | Define curve. | | CO4 | R | | 1 |
| 8. | Calculate the degree of the circular curve if the radius of curve is 393m. | | CO4 | A | | 1 |
| 9. | Explain working principle of total station. | | CO1 | U | | 1 |
| 10. | Recall the term EDM in survey. | | CO5 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Differentiate plane and geodetic surveying. | | CO6 | | U | 3 |
| 12. | List out the temporary adjustment of a theodolite and explain them with neat sketch. | | CO3 | | U | 3 |
| 13. | Compare latitude and departure. | | CO2 | | U | 3 |
| 14. | Discuss the essential points of difference between a tacheometer and theodolite. | | CO1 | | U | 3 |
| 15. | Illustrate the purpose of setting out a building. | | CO4 | | U | 3 |
| 16. | Name some drones used for land surveying. | | CO5 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | The following consecutive readings were taken with a dumpy level along a chain line at a common interval of 15m. The first reading was at a chainage of 165 m where the RL is 98.085 m. the instrument was shifted after the fourth and ninth readings.  3.150, 2.245, 1.125, 0.860, 3.125, 2.760, 1.835, 1.470, 1.965, 1.225, 2.390 and 3.035 m.  Calculate the RLs of all the points by using, Height of Instrument method and Rise and fall method. | CO3 | | A | 12 |
|  |  |  |  | |  |  |
| 18. |  | Define Trigonometric Leveling. And Explain How do you use trigonometric levelling to find the height of object when the base of the object is accessible and inaccessible? Each cases with neat sketch. | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | The following observations were taken with a tachometer fitted with an anallatic lens, the staff being held vertically. The constant of the tachometer is 100 and 0.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Int.  Station | Height of instrument | Staff station | Vertical angle | Staff readings  (m) | Remark | | P | 1.255 | BM | -4°20’ | 1.325, 1.825,2.325 | RL of BM = 255.750m | | P | 1.255 | A | +6°30’ | 0.850, 1.600, 2.350 | | P | 1.450 | A | -7°24’ | 1.715, 2.315,2.915 |   Calculate the RL of B and the distance between A and B. | CO2 | | A | 12 |
|  |  |  |  | |  |  |
| 20. |  | Two tangents AB and BC intersect at a point B at a chainage of 150.5 m. Calculate all the necessary data for setting out a circular curve of radius 100 m and deflection angle 30o by the long chord method. | CO4 | | A | 12 |
|  |  |  |  | |  |  |
| 21. | a. | Illustrate the precautions to be taken while using total station. | CO5 | | U | 3 |
|  | b. | Discuss the important operations of total station with example. | CO1 | | U | 9 |
|  |  |  |  | |  |  |
| 22. |  | A theodolite was set over a BM of RL 240.00 m and a vertical angle observed to the top of a television tower was 25o36’. The height of instrument over BM was 1.250 m. to find the distance between BM and the television tower another instrument station was chosen, In line with the BM and the television tower at a distance of 40m. Vertical angle observed to the top of tower from that instrument was 19o56’ and the staff reading over the BM was 1.250 m. Find the elevation of the top of the television tower. | CO2 | | A | 12 |
|  |  |  |  | |  |  |
| 23. |  | Discuss the different classification of Surveying. | CO6 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Explain the benefits of drone surveying. | CO5 | | U | 6 |
|  | b. | Explain the application of drone surveying. | CO6 | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recall the principles of surveying equipment’s. |
| CO2 | Select methods to measure angles and distances. |
| CO3 | Schedule field surveying operations. |
| CO4 | Examine the implementation of surveying procedures for setting out curves. |
| CO5 | Appraise the usage of equipment’s and methods in triangulation survey. |
| CO6 | Formulate the surveying methods and executions. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 14 |  |  |  |  | 15 |
| CO2 | 2 | 3 | 24 |  |  |  | 29 |
| CO3 | 2 | 3 | 24 |  |  |  | 29 |
| CO4 | 1 | 3 | 13 |  |  |  | 17 |
| CO5 | 1 | 12 |  |  |  |  | 13 |
| CO6 |  | 21 |  |  |  |  | 21 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CE2002** | **Duration** | **3hrs** |
| **Course Name** | **MECHANICS OF SOLIDS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define young’s modulus. | | CO1 | R | 1 |
| 2. | List the various types of strains. | | CO1 | R | 1 |
| 3. | Recall the advantages of continuous beam over simply supported beam. | | CO2 | U | 1 |
| 4. | Name the indeterminate beams. | | CO2 | R | 1 |
| 5. | Define slope. | | CO3 | R | 1 |
| 6. | Recall the value of maximum deflection of cantilever beam with end point load. | | CO3 | U | 1 |
| 7. | Compare thin and thick cylinder. | | CO4 | U | 1 |
| 8. | Recall the pressure value at outside of thick cylinder. | | CO4 | R | 1 |
| 9. | Write the torsional equation and explain each term. | | CO5 | U | 1 |
| 10. | Define power transmission by the shaft. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | List the principal stress theories. | | CO1 | R | 3 |
| 12. | A Cantilever beam 3 m carries a UDL of 10kN/m for its entire span. Sketch the B.M.D. | | CO3 | A | 3 |
| 13. | Write the relation between Deflection, Slope, Moment, Shear force and Rate of loading. | | CO2 | U | 3 |
| 14. | A thin cylindrical pipe of diameter 1.5m and thickness is 1.5cm subjected to an internal pressure of 1.2N/mm2. Determine Circumferential stress developed in the point. | | CO4 | A | 3 |
| 15. | Determine the torque required of the shaft to transmit 320 kW at 160 rpm. | | CO5 | A | 3 |
| 16. | Differentiate strut and column. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. |  | A steel bar is 900 mm long; its two ends are 40 mm and 30 mm in diameter and the length of each rod is 200 mm. the middle portion of the bar is 15 mm in diameter and 500 mm long. If the bar is subjected to an axial load of 15 kN, find its total elongation.  Take E = 200 x 109 N/m2. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. |  | A fixed beam of length 6 m carries a point load of 30 kN at a distance of 3m from the left support. Determine the fixed end moments and Draw the Shear force and B.M diagrams | CO3 | A | 12 |
|  |  |  |  |  |  |
| 19. |  | A simply supported beam shown below. Determine the slope at  mid span and deflection at load acting point. EI is constant. Use Macaulay’s method. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | A compound cylinder has inner radius 200 mm, radius at common surface 250 mm and outer radius is 300 mm. Initial pressure at common surface is 6N/mm2. Determine the final hoop stresses after a fluid is admitted at a pressure of 80N/mm2. Sketch the variation of hoop and radial stresses. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | The working condition to be satisfied by a shaft transmitting power are (i) the shaft must not twist more than 1degree in a length of 15 times diameter (ii) the shear stress must not exceed 80MN/m2. Determine the actual working stress and diameter of the shaft to transmit 736 kW at 200 rpm. Take shear modulus as 80 GN/m2. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | Draw the S.F and B.M. diagrams for cantilever loaded as shown in fig. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | A shaft is required to transmit 245 kW power at 240 rpm. The maximum torque may be 1.5 times the mean torque. The shear stress in the shaft should not exceed 40 N/mm2 and the twist one degree per meter length. Determine the diameter required if   1. The shaft is solid. 2. The shaft is hollow with external diameter twice the internal diameter.   Take modulus of rigidity = 80kN/mm2. | CO5 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | A simply supported beam of length 4m is subjected to a uniformly distributed load of 30 kN/m over the whole span and deflects 15 mm at the center. Determine the crippling load when this beam is used as a column the following conditions:   1. one end is fixed and other end hinged 2. both the ends pin jointed 3. Both the ends fixed | CO6 | A | 10 |
|  | b. | List the assumptions of Eulers theory for long column analysis. | CO6 | R | 2 |

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|  | **COURSE OUTCOMES** |
| CO1 | Illustrate the concepts and principles of Engineering Mechanics. |
| CO2 | Explain the behaviour of structural elements. |
| CO3 | Analyze the structural members for various forces. |
| CO4 | Estimate the response of the elements. |
| CO5 | Develop suitable response intricacies. |
| CO6 | Adapt suitable analysis procedure. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 |  | 12 |  |  |  | 17 |
| CO2 | 1 | 4 | 12 |  |  |  | 17 |
| CO3 | 1 | 1 | 27 |  |  |  | 29 |
| CO4 | 1 | 1 | 15 |  |  |  | 17 |
| CO5 | 1 | 1 | 27 |  |  |  | 29 |
| CO6 | 2 | 3 | 10 |  |  |  | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CE2003** | **Duration** | **3hrs** |
| **Course Name** | **FLUID MECHANICS AND MACHINERY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Classify fluid based on viscosity. | | CO1 | R | | 1 |
| 2. | State the assumptions applied for Bernoulli’s equation. | | CO1 | R | | 1 |
| 3. | Define a most economical section and state its significance. | | CO2 | U | | 1 |
| 4. | Paraphrase laminar flow. | | CO2 | R | | 1 |
| 5. | State the expression for the loss of head due to sudden enlargement and sudden contraction of a pipe. | | CO3 | U | | 1 |
| 6. | Enumerate specific energy. | | CO3 | R | | 1 |
| 7. | Mention the relationship between minimum specific energy and critical depth. | | CO4 | R | | 1 |
| 8. | Enumerate the equation for a gradually varied flow. | | CO4 | R | | 1 |
| 9. | Mention some applications of hydraulic jump | | CO5 | U | | 1 |
| 10. | List the purposes of priming a pump. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Determine the kinematic viscosity of a liquid whose specific gravity is 0.95 and dynamic viscosity 1.2 x 10-3 N-s/m2. | | CO1 | | An | 3 |
| 12. | The diameters of a pipe at two sections 1-1 and 2-2 are 200mm and 300mm respectively. If the velocity of water flowing through the pipe at section 1-1 is 4 m/s. Estimate) Discharge through the pipe and ii) Velocity of water at section 2-2 | | CO2 | | An | 3 |
| 13. | State the formula to determine the loss of head due to friction in pipes using (i) Darcy’s formula and (ii) Chezy’s formula. | | CO3 | | U | 3 |
| 14. | Elaborate on the construction of specific energy curve diagram. | | CO4 | | U | 3 |
| 15. | Enumerate minimum specific energy and state the formula to calculate it. | | CO5 | | An | 3 |
| 16. | Draw the Velocity Triangle diagram for a centrifugal pump and explain it. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | The space between two square flat parallel plates is filled with  oil. Each side of the plate is 60cm. The thickness of the oil film  is 12.5mm. The upper plate which moves at 2.5 m/s requires a  force of 98.1 N to maintain the speed. Determine  i) The dynamic viscosity of the oil in poise  ii). The kinematic viscosity of the oil in stokes if the specific gravity of the oil is 0.95. | CO1 | | A | 6 |
|  | b. | Two horizontal plates are placed 1 cm apart, and the space between them is filled with oil of viscosity 14 poises. Calculate the shear stress in oil, if upper plate is moved with a velocity of 2 m/s. | CO1 | | A | 6 |
|  |  |  |  | |  |  |
| 18. | a. | An inverted U-tube manometer is connected to two horizontal pipes A and B through which water is flowing. The vertical distance between the axes of these pipes is 30 cm. when an oil of specific gravity 0.8 is used as a gauge fluid, the vertical heights of water columns in the two limbs of the inverted manometer (when measured from the respective center lines of the pipe) are found to be the same and equal to 35 cm. determine the difference of pressure between the pipes. | CO2 | | A | 6 |
|  | b. | Water is flowing through a tapered inclined  Pipeas shown in the diagram. Calculate the  flow rate,if the pressure intensities at the  two ends are 40 N/m2 and 30 N/m2,  respectively. Diameter of the pipe at the two  ends are 20 cm and 10 cm, respectively.  Ignore any head loss in pipe. | CO2 | | An | 6 |
|  |  |  |  | |  |  |
| 19. |  | An orifice meter with orifice diameter 10 cm is inserted in a pipe of 20 cm diameter. The pressure gauges fitted upstream and downstream of the orifice meter gives readings of 19.62 N/cm2 respectively. Co-efficient of discharge for the orifice meter is given as 0.6. Estimate the discharge of water through pipe. | CO3 | | A | 12 |
|  |  |  |  | |  |  |
| 20. | a. | A rectangular channel is to be dug in the rocky portion of a soil. Calculate its most economical cross-section, if it is to convey 12 m3/s water with an average velocity of 3m/s. Take Chezy’s constant C = 50 | CO4 | | A | 6 |
|  | b. | A rectangular channel carries water at the rate of 400 l/s when bed slope is 1 in 2000. Determine the most economical dimensions of the channel if C=50. | CO4 | | A | 6 |
|  |  |  |  | |  |  |
| 21. |  | A sluice gate discharges water into a horizontal rectangular channel with a velocity of 6 m/s and the depth of flow is 0.4 m. The width of the channel is 8 m. Determine whether a hydraulic jump will occur, and if so, determine the height of the jump and loss of energy per unit weight of water. Also determine the power lost in the hydraulic jump. | CO5 | | A | 12 |
|  |  |  |  | |  |  |
| 22. | a. | Estimate the head lost due to friction in a pipe of diameter 300 mm and length 50 m., through which water is flowing at a velocity of 3 m/s using Darcy weisbach formula. Take Kinematic viscosity of water as 0.01 stokes | CO3 | | An | 4 |
|  | b. | The difference in water surface levels in two tanks is 8m, which are connected by three pipes in series of lengths 300m, 170m and 210m and of diameters 300 mm, 200 mm and 400 mm respectively. Determine the rate of flow of water if co-efficient of friction are .005, .0052 and .0048 respectively, considering (i) minor losses also (ii) neglecting minor losses. | CO3 | | An | 8 |
|  |  |  |  | |  |  |
| 23. |  | An inward flow reaction turbine is supplied with 0.233 m3/s of water under a head of 11m. The wheel vanes are radial at inlet and the inlet diameter is twice the outlet diameter. The velocity of flow is constant and equal to 1.83 m/s. The wheel makes 370 r.p.m. Determine.  a. Guide vane angle.  b. Inlet and outlet diameters of the wheel.  c. The width of the wheel at inlet and exit. Assume that the discharge is radial and there are no losses in wheel  Take speed ratio = 0.7  Neglect the thickness of vanes | CO6 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | A single jet pelton wheel runs at 300 r.p.m under a head of 510m. The jet diameter is 200 mm. its deflection inside the bucket is 165° and its relative velocity is reduced by 15% due to friction. Determine.  i) Water power.  ii) Resultant force on the bucket.  iii). Over all efficiency.  Take coefficient of velocity = 0.98 and  Speed ratio = 0.46 | CO6 | | A | 7 |
|  | b. | Enumerate the effect of acceleration in the indicator diagram of a single acting reciprocating pump | CO6 | | U | 5 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recall the behaviour of fluids under static condition, measure pressure changes and estimate total pressure on plane surfaces. |
| CO2 | Demonstrate flow measurement methods. |
| CO3 | Identify the flow pattern and estimate total energy. |
| CO4 | Measure flow in open channels. |
| CO5 | Demonstrate various types of flows in open channels. |
| CO6 | Investigate the selection and operation turbines and pumps. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 |  | 12 | 3 |  |  | 17 |
| CO2 | 1 | 1 | 6 | 9 |  |  | 17 |
| CO3 | 1 | 4 | 12 | 12 |  |  | 29 |
| CO4 | 2 | 3 | 12 |  |  |  | 17 |
| CO5 |  | 1 | 12 | 3 |  |  | 16 |
| CO6 |  | 9 | 19 |  |  |  | 28 |
|  | | | | | | | **124** |

Graphical user interface, application

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| **Course Code** | **20CE2004** | **Duration** | **3hrs** |
| **Course Name** | **SOIL MECHANICS AND FOUNDATION ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | |
| 1. | List the types of soil. | CO2 | R | 1 |
| 2. | Sketch the soil phase diagram. | CO2 | A | 1 |
| 3. | Discuss quick condition. | CO3 | U | 1 |
| 4. | Formulate the equation for permeability. | CO1 | C | 1 |
| 5. | Differentiate consolidation and compaction in basic parameter. | CO1 | An | 1 |
| 6. | Defend compaction over consolidation. | CO3 | E | 1 |
| 7. | Define soil exploration. | CO4 | R | 1 |
| 8. | Classify the methods of penetration test. | CO4 | U | 1 |
| 9. | Use of Newmark’s influence chart. | CO4 | A | 1 |
| 10. | Differentiate Mohr coulomb’s strength theory and Modified Mohr coulomb’s theory. | CO4 | An | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | | |
| 11. | Appraise the techniques used for sampling. | CO4 | E | 3 |
| 12. | Formulate Terzaghi’s one dimensional consolidation theory. | CO3 | C | 3 |
| 13. | Explain the physical characterization of soil. | CO1 | U | 3 |
| 14. | Explain field tests based on drainage conditions. | CO3 | U | 3 |
| 15. | Interpret the factors affecting permeability. | CO3 | A | 3 |
| 16. | Compare deep and shallow foundation. | CO5 | An | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23)** | | | | | |
| 17. | a. | Justify the wet and dry sieve analysis used for soil classification. | CO2 | E | 4 |
| b. | Construct the IS classification as per the code. | CO2 | C | 4 |
| c. | Discuss the soil nomenclature. | CO2 | U | 4 |
|  |  |  |  |  |  |
| 18. | a. | Define Darcy's law and its validity. | CO1 | R | 4 |
| b. | Demonstrate the factors affecting permeability. | CO3 | A | 4 |
| c. | Compare permeability and seepage pressure. | CO3 | An | 4 |
|  |  |  |  |  |  |
| 19. | a. | Justify the consolidation and compaction. | CO3 | E | 4 |
| b. | Assemble the mechanism of consolidation through spring analogy. | CO3 | C | 4 |
| c. | List and explain the methods of compaction. | CO3 | R | 4 |
|  |  |  |  |  |  |
| 20. | a. | Discuss Boussinesq theory. | CO3 | U | 4 |
| b. | Sketch the Newmark’s influence chart. | CO3 | A | 4 |
| c. | Differentiate Mohr's strength theory and Mohr coulomb’s strength theory. | CO3 | An | 4 |
|  |  |  |  |  |  |
| 21. | a. | Appraise the semi-direct methods of exploration. | CO4 | E | 4 |
| b. | Formulate the depth and spacing of boring. | CO4 | C | 4 |
| c. | Define bore-log report and data interpretation. | CO4 | R | 4 |
|  |  |  |  |  |  |
| 22. | a. | Discuss in detail the sampling methods. | CO4 | U | 4 |
| b. | Demonstrate SPT. | CO4 | A | 4 |
| c. | Static test used for penetration. | CO4 | An | 4 |
|  |  |  |  |  |  |
| 23. | a. | Appraise the Atterberg’s indices. | CO2 | E | 4 |
| b. | Deign the phase diagram and geological cycle. | CO2 | C | 4 |
| c. | List the soil types and explain its formation. | CO2 | R | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain deep foundation. | CO5 | U | 4 |
| b. | Interpret shallow foundation. | CO5 | A | 4 |
| c. | Compare shallow and deep foundation. | CO5 | An | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | List the basic equations of elasticity. |
| CO2 | Distinguish between the applications of different types of finite elements. |
| CO3 | Develop the finite element discrimination for seepage, consolidation soil structure interaction problems. |
| CO4 | Identify the suitable foundation construction. |
| CO5 | Design the foundation system for shallow depth. |
| CO6 | Analyse the earth retaining structures for different soil medium. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | 3 | - | 1 | - | 1 | 9 |
| CO2 | 5 | 4 | 1 | - | 8 | 8 | 26 |
| CO3 | 4 | 8 | 11 | 7 | 5 | 7 | 42 |
| CO4 | 5 | 5 | 5 | 5 | 7 | 4 | 31 |
| CO5 | - | 5 | 4 | 7 | - | - | 16 |
| CO6 | - | - | - | - | - | - | - |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CE2005** | **Duration** | **3hrs** |
| **Course Name** | **WATER SUPPLY AND SANITARY ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome / Bloom’s level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1. | The conductivity of pure water is approximately \_\_\_\_\_\_. | CO5 / R | 1 |
| 2. | The maximum hourly consumption is generally taken as \_\_\_\_\_\_. | CO3 / R | 1 |
| 3. | Recall Type I settling. | CO1 / U | 1 |
| 4. | Which pollutants can be removed or reduced by aeration? | CO1 / A | 1 |
| 5. | The joint used for joining the plain ends of cast iron pipes is \_\_\_\_\_ | CO2 / A | 1 |
| 6. | A water channel supported above the ground over trestles is generally called | CO2 / R | 1 |
| 7. | The sewer that unloads the sewage at the point of treatment is called \_\_\_ | CO4 / R | 1 |
| 8. | Define overflow rate. | CO1 / R | 1 |
| 9. | Give the functions of the ferrule in water service connection | CO6 / A | 1 |
| 10. | Which is the first step in the sludge treatment process? | CO1 / R | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | If the annual average hourly demand of the city is 2000 m3/h, what is the maximum hourly consumption (assume daily peak factor as 1.8 and hourly peak factor as 1.5)? | CO3/ An | 3 |
| 12. | Why baffles are provided in the sedimentation tank in sewage treatment? | CO1 / A | 3 |
| 13. | Describe the purpose of providing a reflux valve and air valve. | CO2 / U | 3 |
| 14. | Give some qualities of the good sewer pipes | CO4 / A | 3 |
| 15. | Sketch the different components of the house water connection | CO6 / A | 3 |
| 16. | Write the purpose of sludge digestion. | CO1 / U | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is Compulsory)** | | | | |
| 17. | a. | Define BOD/COD ratio and state its significance. | CO5 /An | 4 |
| b. | List the factors in governing the selection of a particular source of water. | CO3 / R | 4 |
| c. | Recommend permissible BIS standard for fluoride and nitrate, in drinking water. state its health affects if exceeds its limit | CO5/ E | 4 |
|  |  |  |  |  |
| 18. | a. | Define “sewerage system”. List out the components of it. | CO4 / R | 4 |
| b. | What are the different sewerage systems? Compare the systems. | CO4/ R | 4 |
| c. | Distinguish between grit chamber and plain sedimentation tank. | CO1/ U | 4 |
|  |  |  |  |  |
| 19. | a. | State the requirements of an ideal joint. | CO2 / R | 4 |
| b. | Describe in detail the design criteria of hydraulics flow of pipe. | CO2/ An | 4 |
| c. | List the different conduits used for water supply. | CO2 / R | 4 |
|  |  |  |  |  |
| 20. | a. | Enumerate the various steps involved in the layout and construction of sewers. | CO4 / R | 4 |
| b. | List the advantages of circular sewer over other sewer sections. | CO4 /An | 4 |
| c. | Sketch a drop manhole and indicate where it is used. | CO4 / A | 4 |
|  |  |  |  |  |
| 21. | a. | Sketch and explain one pipe and two pipe plumbing systems with components. | CO6/A | 8 |
| b. | What is an intercepting trap and write its significance? | CO6 /U | 4 |
|  |  |  |  |  |
| 22. | a. | Differentiate between slow and rapid sand filter with respect to (a) Rate of filtration (b) suitability (c) method of cleaning (d) efficiency | CO1 /U | 4 |
| b. | Discuss the methods of removing permanent hardness. | CO1 /U | 4 |
| c. | Describe the various methods of application of coagulants. | CO1/A | 4 |
|  |  |  |  |  |
| 23. | a. | Elaborate the tests conducted in sewer pipes after laying. | CO4/ A | 5 |
| b. | How velocity is being controlled in grit chamber? | CO1/An | 5 |
| c. | List the factors affecting sludge digestion. | CO1/ R | 2 |
|  |  | **COMPULSORY** | | |
| 24. | a. | State the purpose of sludge thickening. | CO1 / U | 4 |
| b. | Under what circumstances land disposal of sewage is suitable? | CO1/ E | 4 |
| c. | Determine the BOD of river water at the discharge point of the treated sewage from a town having a BOD of 30mg/L discharged at the rate of 5m3/s into a river having a flow of 30m3/s and no BOD. | CO1/ An | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | Select appropriate treatment to raw water |
| CO2 | Design the pipe-network for water supply and sewage disposal effectively. |
| CO3 | Calculate and Estimate the quantity and quality of water used for domestic as well as construction. |
| CO4 | Design the water distribution and sewer networks |
| CO5 | Make use of available standards. |
| CO6 | Prepare the plan and implement house plumbing work effectively |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | 20 | 8 | 9 | 4 |  | 45 |
| CO2 | 9 | 3 | 1 | 4 |  |  | 17 |
| CO3 | 5 |  |  | 3 |  |  | 8 |
| CO4 | 13 |  | 12 | 4 |  |  | 29 |
| CO5 | 1 |  |  | 4 | 4 |  | 9 |
| CO6 |  | 4 | 12 |  |  |  | 16 |
|  | | | | | | | **124** |

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| **Course Code** | **20CE2006** | **Duration** | **3hrs** |
| **Course Name** | **SOLID WASTE MANAGEMENT** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Recall hospital waste. | | CO1 | R | | 1 |
| 2. | Define integrated solid waste management. | | CO6 | U | | 1 |
| 3. | Explain the grading of risk. | | CO4 | U | | 1 |
| 4. | List any two uses of biogas. | | CO1 | R | | 1 |
| 5. | Define the segregation of waste. | | CO6 | R | | 1 |
| 6. | Show the dose-response assessment. | | CO5 | A | | 1 |
| 7. | Discuss vermicomposting. | | CO2 | U | | 1 |
| 8. | Explain the landfill impacts. | | CO1 | U | | 1 |
| 9. | Recall solid waste. | | CO1 | R | | 1 |
| 10. | Define the passive composting | | CO3 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Discuss the steps in the management of biomedical waste by using a neat and clean diagram. | | CO5 | | U | 3 |
| 12. | Classify solid waste by using different sources. | | CO1 | | U | 3 |
| 13. | Illustrate a simplified material-flow diagram indicating the path of generation of solid wastes. | | CO2 | | U | 3 |
| 14. | Discuss the need for transfer operations. | | CO2 | | R | 3 |
| 15. | Describe the composting by using a neat and clean diagram. | | CO3 | | U | 3 |
| 16. | Explain the advantage and limitations of the biogas plant. | | CO3 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Discuss the silent feature of the solid waste management rule 2016 and the need for solid waste management. | CO2 | | U | 12 |
| 18. |  | Explain the types of biogas plants in detail using a neat and clean diagram. | CO6 | | U | 12 |
| 19. | a. | Articulate the labeling for hazardous materials using a neat and clean diagram. | CO5 | | A | 6 |
|  | b. | Discuss the waste sampling and characterization plan. | CO2 | | U | 6 |
| 20. |  | Define the factor causing variation in quantity and composition of solid waste.  1. Geographic locations.  2. Population diversity.  3. Public attitude. | CO1 | | U | 12 |
| 21. | a. | Define the environmental risk assessment framework by using a neat and clean diagram. | CO3 | | U | 6 |
|  | b. | Analyze the color coding for the segregation of biomedical waste. | CO1 | | An | 6 |
| 22. | a. | Discuss the incineration process with advantages and disadvantages. | CO3 | | U | 6 |
|  | b. | Discuss the disposal of industrial and mill tailings. | CO3 | | U | 6 |
| 23. |  | Articulate Swachh Bharat Mission for municipal solid waste by using any case study. | CO5 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Define the term (any two):  1. Secure landfills.  2. Closure of landfills  3. Need for solid waste management.  4. Role of the stack holder for solid waste management. | CO2 | | R | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Analyse the nature and characteristics of municipal solid wastes. |
| CO2 | Sort out the functional elements for solid waste management. |
| CO3 | Apply the techniques and methods used in transformation, conservation and recovery of materials from solid waste. |
| CO4 | Identify and design waste containment systems. |
| CO5 | Gain knowledge in regulatory requirements regarding municipal solid waste management. |
| CO6 | Apply the basic scientific principles for solving practical waste management challenges. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 3 | 16 | - | 6 | - | - | 25 |
| CO2 | 15 | 22 | - | - | - | - | 37 |
| CO3 | 1 | 24 | - | - | - | - | 25 |
| CO4 | - | 1 | - | - | - | - | 1 |
| CO5 | - | 3 | 19 | - | - | - | 22 |
| CO6 | 1 | 13 | - | - | - | - | 14 |
|  | | | | | | | **124** |

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| **Course Code** | **20CE2007** | **Duration** | **3hrs** |
| **Course Name** | **TRANSPORTATION ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | |
| 1. | Write the factors required for an ideal alignment. | CO1 | U | 1 |
| 2. | Write the classification of road system under Bombay road plan. | CO1 | R | 1 |
| 3. | List the items included in inventory survey. | CO3 | R | 1 |
| 4. | Define spot speed. | CO3 | U | 1 |
| 5. | Differentiate between Slip and Skid. | CO4 | U | 1 |
| 6. | Differentiate flexible and rigid pavements. | CO4 | R | 1 |
| 7. | List various data to be collected for railway track alignment. | CO2 | R | 1 |
| 8. | Define the term Gauge. | CO2 | R | 1 |
| 9. | Write the function of ballast in railway track. | CO5 | U | 1 |
| 10. | What is creep? | CO2 | U | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | | |
| 11. | Explain Tresaguat Road construction. | CO1 | U | 3 |
| 12. | Explain the different wheel (axle) configuration for vehicle classification. | CO3 | U | 3 |
| 13. | Describe the types of joints used in the concrete pavements. | CO6 | U | 3 |
| 14. | Explain the types of transition curves. | CO4 | U | 3 |
| 15. | Explain various types of crossings. | CO2 | U | 3 |
| 16. | Describe semaphore signal. | CO2 | U | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23)** | | | | | | |
| 17. | a. | Explain various obligatory points which effects the highway alignment. | | CO1 | U | 6 |
| b. | Discuss the salient features of Nagpur Road Plan. | | CO1 | U | 6 |
|  |  |  | |  | U |  |
| 18. | a. | Discuss the importance of parking survey and explain the terms parking demand, parking volume and parking duration. | | CO3 | U | 6 |
| b. | Discuss the application of origin-destination survey. | | CO3 | U | 6 |
|  |  |  | |  | U |  |
| 19. | a. | Enumerate various methods of flexible pavement design discussing merits and limitations of each method. | | CO4 | U | 6 |
| b. | Determine the stresses at corner, interior and egdes of a  cement concrete pavement using the following data:  Wheel load p=5100kg. Modules of elasticity of cement concrete  E= 3×105kg/cm2 .Poisson’s ratio (µ) =0.15.  Radius of contact area =15 cm. modules of sub grade  reaction K= 10 kg/cm3.  Assume thickness of pavement as 20cm. | | CO4 | A | 6 |
|  |  |  | |  |  |  |
| 20. | a. | A vehicle is travelling at 50 kmph, coefficient of friction between the tyre and pavement is 0.30 and the highway gradient is + 1 percent. Calculate the lag distance, braking distance, and non passing sight distance. Assume suitable data | | CO4 | A | 6 |
| b. | A new National Highway passing through a plain terrain has a horizontal curve of radius equal to the ruling minimum radius. In its vertical profile, the curve has a positive gradient of 1.0% and negative gradient of 1.5%. Design all the geometric features of this curve, assuming suitable data. | | CO4 | A | 6 |
|  |  |  | |  |  |  |
| 21. | a. | Explain the various requirements of an ideal rail. | | CO5 | U | 6 |
| b. | Explain the various components of Railway Track with help of a neat sketch. | | CO5 | U | 6 |
|  |  |  | |  |  |  |
| 22. | a. | Design the super elevation and extra widening required on a two lane horizontal curve of radius 220 m for a speed of 100 kmph. Take wheel base length as 7.0m and co-efficient of friction as 0.15. Check if restrictions on speed to be provided. | | CO4 | An | 8 |
| b. | Explain two methods for conducting traffic volume survey. | | CO3 | U | 4 |
|  |  |  | |  | U |  |
| 23. | a. | Explain how the quality of the bitumen can be checked in the laboratory. Explain any two test procedure. | | CO6 | U | 6 |
| b. | Design the flexible pavement for a NH having the following data:  CBR of subgrade soil = 3%, CBR of soil aggregate mix = 25%,  CBR of soil kankar aggregate mix = 12%, CBR of WBM  coarse = 85%.  The minimum thickness of bituminous macadam surfacing  may be taken as 5cm. The last traffic count is 1500 commercial Vehicles/day. | | CO4 | An | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Explain the requirements for passenger amenities in railway station. | CO2 | | U | 6 |
| b. | Explain the tunneling method for railway construction. | CO2 | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the concepts of development of highways and railway engineering. |
| CO2 | Explain components of highway and railway engineering. |
| CO3 | Carryout engineering surveys involved in planning of highway and railway engineering. |
| CO4 | Design the geometric elements of highway and railway engineering. |
| CO5 | Recognize the functions of structural elements of highway and railway engineering. |
| CO6 | Identify the materials used for highway and railway construction. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 13 | 3 | - | - | - | - | 16 |
| CO2 | 2 | 16 | - | - | - | - | 18 |
| CO3 | 1 | 16 | - | - | - | - | 17 |
| CO4 | 1 | 10 | 18 | 14 |  |  | 49 |
| CO5 | - | 13 | - | - | - | - | 13 |
| CO6 | - | 9 | - | - | - | - | 9 |
|  | | | | | | | **124** |

Chart

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| **Course Code** | **20CE2009** | **Duration** | **3hrs** |
| **Course Name** | **SMART CITY PLANNING AND MANAGEMENT** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Name any two cities that are identified as top 10 smart cities in the world. | | CO1 | R | | 1 |
| 2. | Define urbanization. | | CO1 | R | | 1 |
| 3. | Define the smart components employed in the city. | | CO2 | R | | 1 |
| 4. | Define Garden city. | | CO2 | R | | 1 |
| 5. | Define the policies connecting Transportation and Land use. | | CO3 | R | | 1 |
| 6. | Name the Acts, Policies existing for the energy conservation practices. | | CO3 | R | | 1 |
| 7. | Infer the key challenges in implementing the SEM | | CO4 | R | | 1 |
| 8. | Describe the threats and issues of existing energy lighting system. | | CO4 | R | | 1 |
| 9. | Discuss the key components of sustainability. | | CO5 | R | | 1 |
| 10. | Illustrate the use of Land use map. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List out the Indian Guidelines followed for urban planning in India. | | CO1 | | U | 3 |
| 12. | State the use of Big data. | | CO2 | | U | 3 |
| 13. | Illustrate the concept of urban mobility. | | CO3 | | U | 3 |
| 14. | State the use of smart grid. | | CO4 | | U | 3 |
| 15. | Classify the rainfall distributions in the earth. | | CO5 | | U | 3 |
| 16. | Describe the AMRUT mission. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Discover the types of smart urban components that can be adopted for the Indian condition. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 18. |  | Delineate the benefits of sustainable urban planning with examples. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | Illustrate the measures taken in the Indian cities in concern with SEM. | CO3 | | A | 12 |
|  |  |  |  | |  |  |
| 20. |  | Delineate the strategy adopted in Street Light controller, objective, methodology and its benefits. | CO4 | | A | 12 |
|  |  |  |  | |  |  |
| 21. | a. | Explain the population projection methods. | CO5 | | U | 6 |
|  | b. | Examine the water demand of urban population and the factors affecting the per capita demand. | U | 6 |
|  |  |  |  | |  |  |
| 22. |  | Delineate the strategy adopted in Toronto city planning and its benefits. | CO6 | | U | 12 |
|  |  |  |  | |  |  |
| 23. |  | Examine the concept of HVAC system with a neat sketch.  Examine the smart monitoring and surveillances system techniques in cities. | CO4 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Explain the smart city mission in India and its Guidelines. | CO6 | | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the concepts of smart city. |
| CO2 | Understand the components of Smart City. |
| CO3 | Apply the concepts of urban mobility. |
| CO4 | Apply the smart energy and smart building concepts. |
| CO5 | Apply the smart water management concepts. |
| CO6 | Analyse the smart cities across the countries. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 15 |  |  |  |  | 17 |
| CO2 | 2 | 15 |  |  |  |  | 17 |
| CO3 | 2 | 3 | 12 |  |  |  | 17 |
| CO4 | 2 | 15 | 12 |  |  |  | 29 |
| CO5 | 1 | 15 |  |  |  |  | 16 |
| CO6 | 1 | 15 | 12 |  |  |  | 28 |
|  | | | | | | | **124** |

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| --- | --- | --- | --- |
| **Course Code** | **20CE2010** | **Duration** | **3hrs** |
| **Course Name** | **ENGINEERING SUSTAINABILITY: ANALYSIS AND DESIGN** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Show the framework of triple bottom line. | | CO1 | U | | 1 |
| 2. | List out the 3P’s of triple bottom line. | | CO1 | R | | 1 |
| 3. | Recall the example for traditional economy. | | CO2 | R | | 1 |
| 4. | Label the formula for benefit cost ratio. | | CO2 | R | | 1 |
| 5. | Identify the lowest country for ecological footprint. | | CO3 | U | | 1 |
| 6. | Name the primary tool used to support decision making for sustainability development. | | CO3 | R | | 1 |
| 7. | Identify the percentange of construction professions on social media. | | CO4 | U | | 1 |
| 8. | List out the second countries of human development index. | | CO4 | R | | 1 |
| 9. | Express the formula for wear resistance. | | CO5 | U | | 1 |
| 10. | Identify the components of fly ash. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Compare economic and environmental sustainability. | | CO1 | | An | 3 |
| 12. | Explain activity-based costing. | | CO2 | | U | 3 |
| 13. | Differentiate blue, green and green water. | | CO3 | | An | 3 |
| 14. | Discuss the new technology in civil engineering. | | CO4 | | U | 3 |
| 15. | Explain the tertiary treatment of water. | | CO5 | | An | 3 |
| 16. | Illustrate the adaptable design. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | List out the five stages of product life cycle. | CO1 | | An | 5 |
|  | b. | Discuss the application of life cycle cost analysis. | CO1 | | U | 5 |
|  | c. | Recall the term paradigm shift. | CO1 | | U | 2 |
|  |  |  |  | |  |  |
| 18. | a. | An engineer has two alternatives for an elevator installed in a new building. The details of the alternative for the elevators are as follows   |  |  |  |  | | --- | --- | --- | --- | |  | Engineer’s estimates | | | |  | Initial cost (Rs) | Annual operation and maintenance cost (Rs) | Service life (Yrs.) | | Alternative 1 | 5,50,000 | 27,500 | 12 | | Alternative 2 | 6,20,000 | 30,000 | 12 | | CO2 | | An | 6 |
|  | b. | A Computer cost $1000. It’s salvage value after 5 years is  $500. Annual maintenance is $50. If the interest rate is 8%. Calculate the equivalent uniform, annual cost? | CO2 | | An | 6 |
|  |  |  |  | |  |  |
| 19. | a. | Focus the framework of environmental building assessment. | CO3 | | An | 6 |
|  | b. | Conclude the units for the production of life cycle assessment. | CO3 | | An | 6 |
|  |  |  |  | |  |  |
| 20. | a. | Categorize out the fields in civil engineering. | CO4 | | An | 5 |
|  | b. | Describe social impact assessment of civil engineering projects. | CO4 | | An | 7 |
|  |  |  |  | |  |  |
| 21. | a. | Explain the primary treatment plant. | CO5 | | A | 6 |
|  | b. | Explain the types of filler materials and its physical properties. | CO5 | | A | 6 |
|  |  |  |  | |  |  |
| 22. |  | Explain the advantages and disadvantages of triple bottom line with examples. | CO1 | | A | 12 |
|  |  |  |  | |  |  |
| 23. | a. | Conclude the applications of Traditional cost. | CO2 | | An | 6 |
|  | b. | Compare the advantages and disadvantages of life cycle techniques. | CO2 | | An | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Describe the multimodal and intelligent transportation system. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the concepts of sustainability. |
| CO2 | Understand the concepts of economic sustainability. |
| CO3 | Analyze the concepts of environmental sustainability. |
| CO4 | Analyze the social aspects of sustainability. |
| CO5 | Apply the concepts of sustainability to environmental and geotechnical engineering. |
| CO6 | Apply the concepts of sustainability to construction and transportation engineering. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 8 | 12 | 8 | - | - | 29 |
| CO2 | 2 | 3 | - | 24 | - | - | 29 |
| CO3 | 1 | 1 | - | 15 | - | - | 17 |
| CO4 | 1 | 4 | - | 12 | - | - | 17 |
| CO5 | - | 1 | 12 | 3 | - | - | 16 |
| CO6 | - | 16 | - | - | - | - | 16 |
|  | | | | | | | **124** |

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| **Course Code** | **20CE2011** | **Duration** | **3hrs** |
| **Course Name** | **ANALYSIS OF STRUCTURES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | |
| 1. | Define virtual work. | CO1 | R | 1 |
| 2. | Recall the maximum deflection of the cantilever beam with uniformly distributed load. | CO2 | R | 1 |
| 3. | Tell the number of slope deflection equation for two span continuous beam. | CO2 | R | 1 |
| 4. | Define rotational stiffness. | CO1 | R | 1 |
| 5. | The moment required to rotate the near end of a prismatic beam through a unit angle without translation, the far end being fixed supported, is given by | CO1 | U | 1 |
| 6. | List the examples of displacement method. | CO1 | R | 1 |
| 7. | Recall the test value assumed in ILD. | CO2 | R | 1 |
| 8. | Recall the location of maximum shear force in a simple beam with any kind of loading. | CO5 | R | 1 |
| 9. | Under what conditions will the bending moment in an arch be zero throughout. | CO5 | R | 1 |
| 10. | Recall the minimum tension in the cable when loaded uniformly throughout the span. | CO2 | R | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | | |
| 11. | Compare statically determinate and indeterminate structures. | CO1 | U | 3 |
| 12. | Explain the use of slope deflection method. | CO1 | U | 3 |
| 13. | Find the fixed end moments for the beam shown in fig. | CO3 | R | 3 |
| 14. | Explain the uses of influence line diagrams. | CO1 | U | 3 |
| 15. | Explain with the aid of a sketch, the normal thrust and radial shear in an arch rib. | CO6 | U | 3 |
| 16. | Develop the stiffness matrix for a given beam shown in fig. EI is constant. | CO5 | A | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. |  | Determine the vertical displacement at the free end E in the frame shown in figure using virtual work method. Take EI = 20,000 kN-m2. | CO4 | E | 12 |
|  |  |  |  |  |  |
| 18. |  | Analyze the continuous beam loaded as shown in fig.by slope deflection method. Take E = 2 x 105 N/mm2 and I = 16 x 107 mm4. Sketch the bending moment diagram. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 19. |  | Analyze the portal frame loaded as shown in fig. by moment distribution method and sketch bending moment diagrams. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 20. |  | Draw the influence line diagram for shear force and bending moment for a section at 5m form the left hand support of a simply supported beam 20m long. Determine the maximum shear force and bending moment at the section due to an uniformly distributed rolling load of length 8m and intensity 10kN/m run. | CO3 | E | 12 |
|  |  |  |  |  |  |
| 21. |  | A three hinged parabolic arch hinged at the supports and at the crown has a span of 24 m and rise 4 m. It carries a concentrated load of 50 kN at 18 m from the left support and a uniformly distributed load of 30 kN/m over the left half portion. Determine the moment, thrust and radial shear at a section 6 m from the left support. | CO5 | E | 12 |
|  |  |  |  |  |  |
| 22. |  | A three hinged parabolic arch has a span of 60m and a central rise of 12m. A concentrated load of 8kN acts at 15m from the left hinge. Find the reactions at the supports. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 23. |  | A suspension cable is supported at 2 points 25m apart. The left support is 2.5 m above the right support. The cable is loaded with a uniformly distributed load of 10 kN/m throughout the span. The maximum dip in the cable from the left support is 4m. Find the maximum and minimum tensions in the cable. | CO3 | An | 12 |
|  |  | **COMPULSORY QUESTION** | | | |
| 24. |  | Analyze the continuous beam shown in fig. and draw the bending moment diagram using Stiffness martix method. Assume EI is constant | CO6 | An | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Illustrate the concepts and principles. |
| CO2 | Explain the behaviour of structural elements. |
| CO3 | Analyze the structural members for various forces. |
| CO4 | Analyze the response of the Structural elements. |
| CO5 | Develop suitable response intricacies. |
| CO6 | Adapt suitable analysis procedure. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 3 | 10 | - | - | - | - | 13 |
| CO2 | 4 | - | - | - | - | - | 4 |
| CO3 | 3 | - | - | 12 | 12 | - | 27 |
| CO4 | - | - | - | 36 | 12 | - | 48 |
| CO5 | 2 | - | 3 | - | 12 | - | 17 |
| CO6 | - | 3 | - | 12 | - | - | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| --- | --- | --- | --- |
| **Course Code** | **20CE2012** | **Duration** | **3hrs** |
| **Course Name** | **MECHANICS AND DESIGN OF CONCRETE STRUCTURES** | **Max. Marks** | **100** |

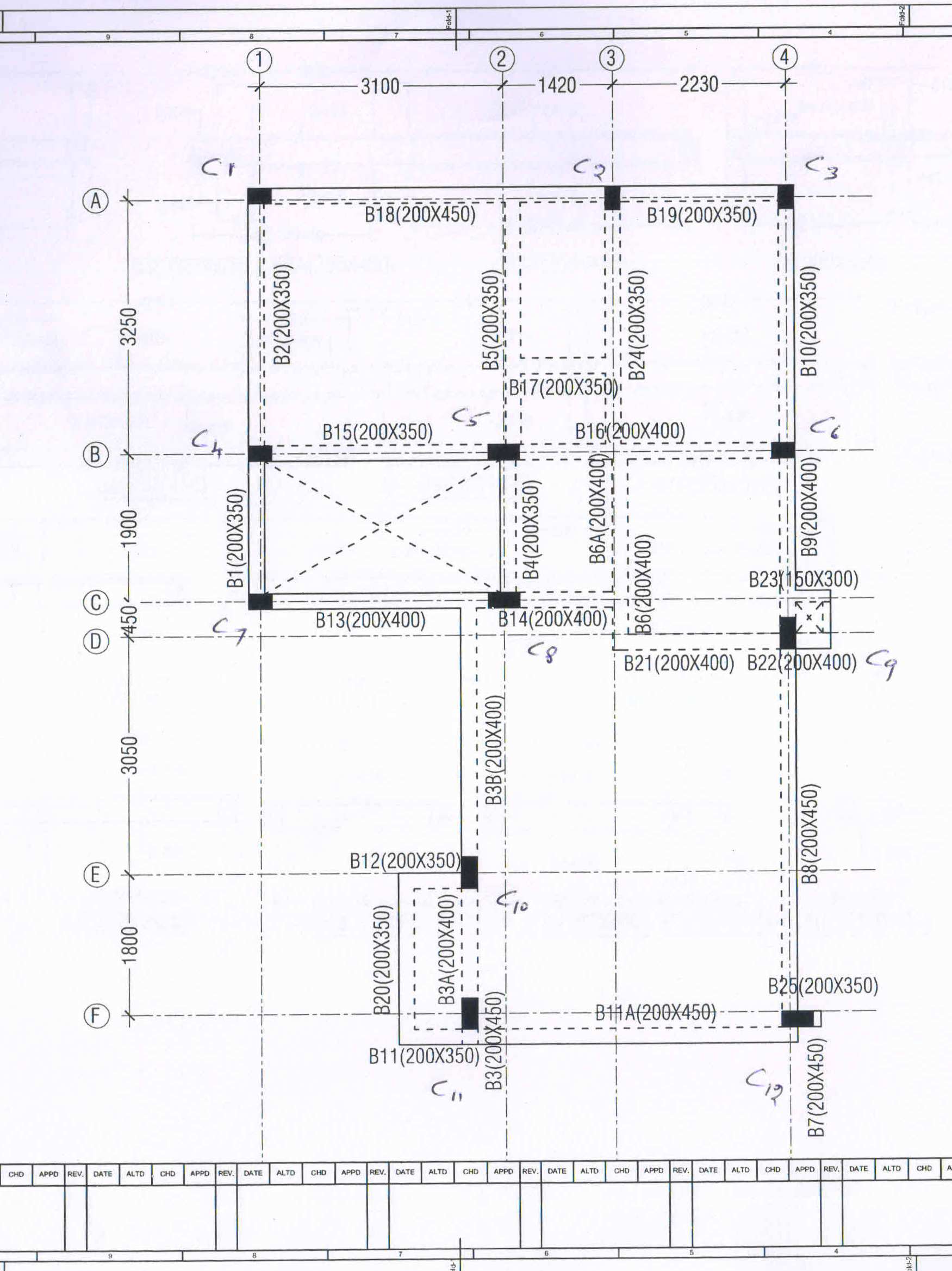
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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Recall the partial safety factor for steel. | | CO1 | R | 1 |
| 2. | Explain the failure mode of over reinforced beams. | | CO2 | U | 1 |
| 3. | Determine the value of Ʈc for M20 concrete when the percentage of tension reinforcement is 1.0. | | CO3 | A | 1 |
| 4. | Explain the function of cranked rods in beams. | | CO2 | U | 1 |
| 5. | For a slab, MB> MU. Classify the beam. | | CO2 | U | 1 |
| 6. | For a slab, *ly/lx*is1.8. Determine the percentage of load shared by the shorter direction. | | CO4 | A | 1 |
| 7. | Establish the critical section for one way shear for an isolated footing. | | CO2 | A | 1 |
| 8. | Describe minimum eccentricity. | | CO4 | U | 1 |
| 9. | Prepare the diagram of a lateral tie of a column. | | CO6 | C | 1 |
| 10. | Estimate the lap length for a column rod of 16 mm dia. | | CO6 | C | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | The mean strength of concrete cubes is 29 N/mm2. The standard deviation is 1.2 N/mm2. Estimate the characteristic strength. | | CO1 | A | 3 |
| 12. | Describe the limit state of serviceability. | | CO3 | U | 3 |
| 13. | Explain about the provision of torsional reinforcement in slabs. | | CO4 | An | 3 |
| 14. | Discover the need for combined footing. | | CO4 | A | 3 |
| 15. | List the methods available for the analysis of frames. | | CO2 | R | 3 |
| 16. | Develop a diagram to indicate the design details of a simply supported beam. | | CO5 | C | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. | a. | Discover the stress block under limit state method of design. | CO3 | A | 4 |
|  | b. | Draw the stress-strain curve for mild steel and explain the salient points. | CO2 | U | 4 |
|  | c. | Write the assumptions made in the limit state method of design. | CO1 | A | 4 |
| 18. | a. | Estimate the moment of resistance of a rectangular beam of size 230 x 300mm reinforced with 4 nos. of 12 mm φ Fe 500 steel. Adopt M20 concrete. | CO3 | E | 10 |
|  | b. | Estimate the value of Xumax/*d* for Fe 550 steel. | CO3 | E | 2 |
|  |  |  |  |  |  |
| 19. |  | Design a cantilever beam to carry a UDL of 15 kN/m over a span of 1.5m by limit state method. Adopt M20 concrete and Fe 415 steel. Draw a neat sketch and indicate the design details. Apply the check for shear also. | CO5 | C | 12 |
|  |  |  |  |  |  |
| 20. |  | Determine the reinforcement for the column with the following data:  Size 450 x 600 mm, Pu = 2000 kN, Mux = 160 kNm, Muyx = 120 kNm. Use M20 concrete and Fe 500 steel. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | Design the footing for a column of size 300 x 300 mm to carry a load of 1200 kN. The safe bearing capacity of the soil is 150 kN/m2. Draw a neat sketch and indicate the design details. | CO5 | C | 12 |
|  |  |  |  |  |  |
| 22. |  | Design the interior slab of size 4m x 3m to carry a live load of 2000 N/m2. The load due to F.F. is 1500 N/m2. Draw a neat sketch and indicate the design details. | CO5 | C | 12 |
|  |  |  |  |  |  |
| 23. |  | The plan of the building is given below.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | 4 | 4 | 4 |  | | 1.2 m |  |  |  |  | | 4 m  5 m  A |  |  |  | A | |  |  |  | | 5 m | B1 | B2 | B3 | A |   4 4 4  Section AA is given below:   |  |  |  |  | | --- | --- | --- | --- | |  | 4 | 4 | 4 | | 3 |  |  |  | | 3 |  |  |  | | 3 | A B1 | B B2 | C B3 | |  | 1.5 |  |  |   Estimate the loads on beams B1 & B3. The live load is 3000 N/m2, load due to floor finish is 1500 N/m2. Weight of brick masonry is 19 kN/m3. | CO5 | E | 12 |
|  |  |  |  |  |  |
| **COMPULSORY QUESTION** | | | | | |
| 24. | Refer to the diagram attached for answering the following questions. Assume suitable dimensions. | |  |  |  |
| a. | Prepare the cross section of the beam B13. | CO6 | C | 4 |
|  | b. | Prepare the foundation drawing for column C2. | CO6 | C | 4 |
|  | c. | Prepare the plan and section of the footing for column C2. | CO6 | C | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the design philosophies for RCC elements. |
| CO2 | Demonstrate the behaviour of elements for load calculations. |
| CO3 | Illustrate the LSM for estimating stress resultants. |
| CO4 | Design the section and reinforcement for the structural elements. |
| CO5 | Develop suitable detailing diagrams. |
| CO6 | Prepare the design for buildings. |

1. Demonstrate the behaviour of elements for load calculations.
2. Illustrate the LSM for estimating stress resultants.
3. Design the section and reinforcement for the structural elements.
4. Develop suitable detailing diagrams.

Prepare the design for buildings.

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 |  | 7 |  |  |  | 8 |
| CO2 | 3 | 7 | 1 |  |  |  | 11 |
| CO3 |  | 3 | 5 |  | 12 |  | 20 |
| CO4 |  | 1 | 16 | 3 |  |  | 20 |
| CO5 |  |  |  |  | 12 | 39 | 51 |
| CO6 |  |  |  |  |  | 14 | 14 |
|  | | | | | | | **124** |



**Graphical user interface, application

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| **Course Code** | **20CE2013** | **Duration** | **3hrs** |
| **Course Name** | **DESIGN OF STEEL STRUCTURES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Recall the possible failure modes of steel column. | | CO1 | R | | 1 |
| 2. | Define the term slender section. | | CO1 | R | | 1 |
| 3. | Illustrate the view of ISA 100X100X 6 section. | | CO2 | U | | 1 |
| 4. | Name the predominant type of failure occur in web of steel section. | | CO1 | R | | 1 |
| 5. | Infer the material safety factor of steel under yielding. | | CO1 | U | | 1 |
| 6. | Identify the buckling class of steel hollow sections. | | CO1 | R | | 1 |
| 7. | Write the load factor to be considered for combining dead and liveloads under limit state of collapse. | | CO2 | A | | 1 |
| 8. | Recall the full form of ISA section. | | CO1 | R | | 1 |
| 9. | Identify the suitable roofing material used for steel truss building. | | CO1 | R | | 1 |
| 10. | Indicate the term used for denoting the spacing between bolt. | | CO1 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List the geometrical properties of ISMC300 section as per the code. | | CO1 | | R | 3 |
| 12. | Differentiate hot rolled and welded section. | | CO1 | | U | 3 |
| 13. | Calculate the yield and ultimate strength of bolt of grade 5.8 | | CO3 | | A | 3 |
| 14. | Explain the parts of steel built-up section with neat sketches. | | CO4 | | U | 3 |
| 15. | Construct the sample truss with neat sketches and indicate the components. | | CO1 | | A | 3 |
| 16. | Explain the failure of bolts under loading. | | CO4 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Determine the failure load of tension member of steel section ISA 120X120X6mm for the following data  Yield strength of steel – 250 MPa | CO2 | | A | 12 |
| 18. |  | Analyze the load carrying capacity of the compression member for the following data.  Length of column – 3.5m, Yield strength of steel – 250 MPa  Double angle section of ISA 75X75X6mm connected  Opposite side of the gusset plate | CO2 | | An | 12 |
| 19. |  | Analyze the moment carrying capacity of laterally restrained simply supported beam for the following data, Dead load – 10kN/m and Live load – 7.5kN/m, Span – 5m, fy - 250MPa | CO4 | | An | 12 |
| 20. |  | Determine the axial load carrying capacity of built-up column section for the following data. Fy - 250MPa, Height - 3m, Both ends pinned.  Width of flange –250mm, Thickness of flange – 6mm, Depth of web – 500mm, Thickness of web – 8mm | CO3 | | A | 12 |
| 21. |  | Assess the bearing pressure and design the column base for the following data.  Axial load on column – 700kN, Grade of concrete – M25, Column section ISHB 300 | CO6 | | E | 12 |
| 22. |  | i) Determine the strength of bolt under bearing  Grade 4.4, Yield strength of bolt – 400MPa, Diameter of bolt – 16mm  Edge distance – 30mm, Pitch – 50mm  ii) Determine the strength of weld system  Thickness of weld – 3mm, length of weld – 400mm | CO6 | | A | 12 |
| 23. |  | Explain the failure pattern of laterally restrained/unrestrained column sections with neat sketches. | CO5 | | An | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Explain the detailed procedure for calculating the loads on the truss system with neat sketches. | CO5 | | An | 12 |

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|  | **COURSE OUTCOMES** | | | | | | | |
| CO1 | Identify the behaviour of members. | | | | | | | |
| CO2 | Estimate the forces in members. | | | | | | | |
| CO3 | Design the member for forces. | | | | | | | |
| CO4 | Choose the suitable steel section. | | | | | | | |
| CO5 | Explain the design intricacies. | | | | | | | |
| CO6 | Formulate the design for steel structures. | | | | | | | |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | | |
| CO/ P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | | 9 | 5 | 3 | - | - | - | 17 |
| CO2 | | - | 1 | 13 | 12 | - | - | 26 |
| CO3 | | - | - | 15 | - | - | - | 15 |
| CO4 | | - | 6 | - | 12 | - | - | 18 |
| CO5 | | - | - | - | 24 | - | - | 24 |
| CO6 | | - | - | 12 | - | 12 | - | 24 |
|  | | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CE2014** | **Duration** | **3hrs** |
| **Course Name** | **WATER RESOURCES SYSTEMS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define precipitation. | | CO1 | R | | 1 |
| 2. | Describe average precipitation. | | CO1 | U | | 1 |
| 3. | Define base flow. | | CO3 | R | | 1 |
| 4. | Define flood routing. | | CO4 | R | | 1 |
| 5. | Recall the use of cross regulators. | | CO4 | R | | 1 |
| 6. | Define base period. | | CO5 | R | | 1 |
| 7. | State the meaning for specific retention. | | CO2 | R | | 1 |
| 8. | Describe dead storage. | | CO4 | U | | 1 |
| 9. | Define hydrograph. | | CO3 | R | | 1 |
| 10. | Recall the use of cross-drainage works. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Distinguish the equations for Meyer’s formula and Rohwer’s formula. | | CO2 | | U | 3 |
| 12. | Explain the capacity of the storage reservoir (analytical method). | | CO4 | | U | 3 |
| 13. | Discuss porosity and effective porosity. | | CO2 | | U | 3 |
| 14. | State the relationship between duty and delta. | | CO1 | | R | 3 |
| 15. | Discuss Canal irrigation and its advantages. | | CO5 | | U | 3 |
| 16. | List the types of canals based on sizes. | | CO5 | | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Describe the hydrological cycle and its components. | CO1 | | R | 12 |
|  |  |  |  | |  |  |
| 18. | a. | Discuss the factors affecting the runoff. | CO2 | | U | 6 |
|  | b. | Classify the methods of base flow separations. | CO3 | | U | 6 |
|  |  |  |  | |  |  |
| 19. | a. | Illustrate mass curve. | CO3 | | A | 6 |
|  | b. | Identify the purposes of the reservoir. | CO4 | | U | 6 |
|  |  |  |  | |  |  |
| 20. | a. | Explain the storage coefficients and specific storage for confined and unconfined aquifers. | CO4 | | A | 6 |
|  | b. | Describe types of aquifers and the piezometric surfaces. | CO6 | | U | 6 |
|  |  |  |  | |  |  |
| 21. | a. | Discuss the factors and methods to improve the duty. | CO5 | | U | 6 |
|  | b. | Explain surface irrigation and its types. | CO5 | | U | 6 |
|  |  |  |  | |  |  |
| 22. | a. | Explain culverts and their types. | CO4 | | A | 6 |
|  | b. | Discuss canal fall, its location, and types. | CO4 | | U | 6 |
|  |  |  |  | |  |  |
| 23. | a. | Classify types of reservoirs. | CO4 | | U | 6 |
|  | b. | Explain S-curve. | CO3 | | U | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Explain river training works, objectives, and its purpose. | CO6 | | A | 6 |
|  | b. | Describe the factors in selecting suitable types of cross-drain works and highlight the purpose of cross regulators. | CO6 | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the concepts to manage water resources and apply for hydrological modeling. |
| CO2 | Decide and plan basic water resources projects. |
| CO3 | Analyze the flow in streams. |
| CO4 | Appreciate the importance of reservoirs and hydraulic structures. |
| CO5 | Identify the irrigation methods. |
| CO6 | Plan structures for research recharging groundwater. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 16 | 1 | - | - | - | - | 17 |
| CO2 | 1 | 6 | 6 | - | - | - | 13 |
| CO3 | 2 | 18 | - | - | - | - | 20 |
| CO4 | 2 | 22 | 12 | - | - | - | 36 |
| CO5 | 4 | 15 | - | - | - | - | 19 |
| CO6 | 1 | 12 | 6 | - | - | - | 19 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| --- | --- | --- | --- |
| **Course Code** | **20CE2016** | **Duration** | **3hrs** |
| **Course Name** | **CONSTRUCTION TECHNOLOGY AND AUTOMATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | Classify the Structural loads acting on a building. | | | CO1 | U | | 1 |
| 2. | List the chemicals used for Anti Termite treatment. | | | CO1 | R | | 1 |
| 3. | Define scaffolding. | | | CO2 | R | | 1 |
| 4. | Differentiate any one point between shoring and underpinning. | | | CO2 | U | | 1 |
| 5. | Recall the diameter range of Tunnel boring machine. | | | CO3 | R | | 1 |
| 6. | Differentiate Fire protection, Fire prevention and Fire suppression. | | | CO3 | U | | 1 |
| 7. | Identify the type of crane that is used in the construction of oil rigs. | | | CO4 | U | | 1 |
| 8. | List any four objectives of material handling equipment. | | | CO4 | R | | 1 |
| 9. | Recall the different types of equipment maintenance. | | | CO5 | R | | 1 |
| 10. | Differentiate any one point between LiDAR scanner and Total station surveying techniques. | | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Select the appropriate type of building based upon the application of religious gathering and brief about it shortly. | | | CO1 | | An | 3 |
| 12. | Indicate the functions of scaffolding and mention its types. | | | CO2 | | U | 3 |
| 13. | Select the method of fire suppression system used at data processing centers and explain shortly. | | | CO3 | | An | 3 |
| 14. | Identify the usage of positioning equipment. | | | CO4 | | U | 3 |
| 15. | According to OSHA, write the causes of death and injury at construction site. | | | CO5 | | An | 3 |
| 16. | Discover the facilities available in the Robotic Roadways and Excavation System (RRES) from ULC Technologies. | | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. |  | Summarize the principles and significance of Planning with an example | | CO1 | | A | 12 |
| 18. |  | Write the condition and installation procedure of a temporary structure that is used to provide support when removing a defective portion in a building. | | CO2 | | A | 12 |
| 19. |  | Discover the different types of heavy machinery equipment used for excavation and explain the types of operating cost of an equipment when the machine starts to operate. | | CO3 | | A | 12 |
| 20. |  | Discover the factors to be considered when selecting the right equipment for a storage handling equipment and state the objectives of its system. | | CO4 | | A | 12 |
| 21. |  | An industrialist has owned a 3D printing equipment industry. Prioritize the factors that he should consider while selecting the equipment and also focus on the factors to be considered for effective equipment management. | | CO5 | | An | 12 |
| 22. |  | Discuss the different types of system that are intended to extinguish the flames. | | CO3 | | U | 12 |
| 23. | a. | Describe the requirement of a good temporary structure that acts as a mould for concrete structures. | | CO2 | | U | 4 |
|  | b. | The allowable soil bearing capacity is low and has differential settlements at a particular site. Illustrate the suitable foundation types in detail with its supporting drawings. | | CO1 | | An | 8 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. |  | | Categorize the applications of LIDAR in the field of construction and compare its advantages in the field of land surveying over Total station. | CO6 | | An | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Adopt the construction practices adopted in the field. |
| CO2 | Demonstrate basic knowledge about construction equipment. |
| CO3 | Identify the equipment types for different construction projects. |
| CO4 | Evaluate the material handling equipment and the equipment productivity. |
| CO5 | Demonstrate construction project management skills. |
| CO6 | Adapt automation in construction site. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 1 | 12 | 11 | - | - | 25 |
| CO2 | 1 | 8 | 12 | - | - | - | 21 |
| CO3 | 1 | 13 | 12 | 3 | - | - | 29 |
| CO4 | 1 | 4 | 12 | - | - | - | 17 |
| CO5 | 1 | - | - | 15 | - | - | 16 |
| CO6 | - | 4 | - | 12 | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CE2031** | **Duration** | **3hrs** |
| **Course Name** | **CONCRETE TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Group the types of cement. | | CO1 | U | | 1 |
| 2. | Reproduce the concept of soundness of cement. | | CO1 | R | | 1 |
| 3. | List the types of aggregate based on origin. | | CO2 | R | | 1 |
| 4. | Label the types of aggregate based on density. | | CO2 | R | | 1 |
| 5. | Group the properties of fresh concrete. | | CO3 | U | | 1 |
| 6. | Recall the concept of bleeding. | | CO3 | R | | 1 |
| 7. | Identify the principle involvedin designing the mix proportion of concrete. | | CO4 | U | | 1 |
| 8. | Label the properties of the ingredients of concrete required for mix design. | | CO4 | R | | 1 |
| 9. | Group the light weight aggregates used in LWC. | | CO5 | U | | 1 |
| 10. | Interpret Rebound hammer test. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Focus on the grades of cement used for construction. | | CO1 | | An | 3 |
| 12. | Classify the aggregates based on size and shape. | | CO2 | | U | 3 |
| 13. | Categorize the tests conducted on hardened concrete. | | CO3 | | An | 3 |
| 14. | Discuss about design mix. | | CO4 | | U | 3 |
| 15. | Illustrate in detail about ferro cement. | | CO5 | | An | 3 |
| 16. | Explain in detail about rebar analyzer test. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Explain the 10 types of cement used for construction. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 18. |  | Focus on the criteria of analyzing the application of load, how flakiness and elongation index on aggregates are tested. | CO2 | | An | 12 |
|  |  |  |  | |  |  |
| 19. |  | Compare tests conducted on hardened concrete required for durability aspect. | CO3 | | An | 12 |
|  |  |  |  | |  |  |
| 20. |  | Construct the mix design proportion for M20 grade for the following stipulations as per IS 456: 2000 and IS 10262 : 2009.   1. Type of cement = OPC 53 grade 2. Maximum nominal size of aggregate = 20mm 3. Slump = 75mm 4. Exposure condition = severe (RCC) 5. Method of concrete placing = pump 6. Degree of supervision = good   Type of aggregate = crushed angular aggregate. | CO4 | | A | 12 |
|  |  |  |  | |  |  |
| 21. |  | Compare the special concretes HPC and HSC. | CO5 | | An | 12 |
|  |  |  |  | |  |  |
| 22. |  | Explain detail about the tests conducted on cement. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 23. |  | Illustrate in detail about the special concrete Polymer concrete, shotcrete and RMC. | CO5 | | An | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Classify and explain the types of tests used in SDT of structures. | CO6 | | An | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Categorize the construction materials, their components and manufacturing process. |
| CO2 | Identify the quality control properties of concrete making materials. |
| CO3 | Design the mix design of concrete based on various parameters. |
| CO4 | Predict the properties of concrete in fresh and hardened concrete. |
| CO5 | Adopt the different types of concrete in details. |
| CO6 | Demonstrate non- destructive techniques on concrete structures. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 25 | - | 3 | - | - | 29 |
| CO2 | 2 | 3 | - | 12 | - | - | 17 |
| CO3 | 1 | 1 | - | 15 | - | - | 17 |
| CO4 | 1 | 4 | 12 | - | - | - | 17 |
| CO5 | - | 1 | - | 27 | - | - | 28 |
| CO6 | - | 4 | - | 12 | - | - | 16 |
|  | | | | | | | **124** |

**IS 456 : 2000 and IS 10262 : 2009 are permitted**

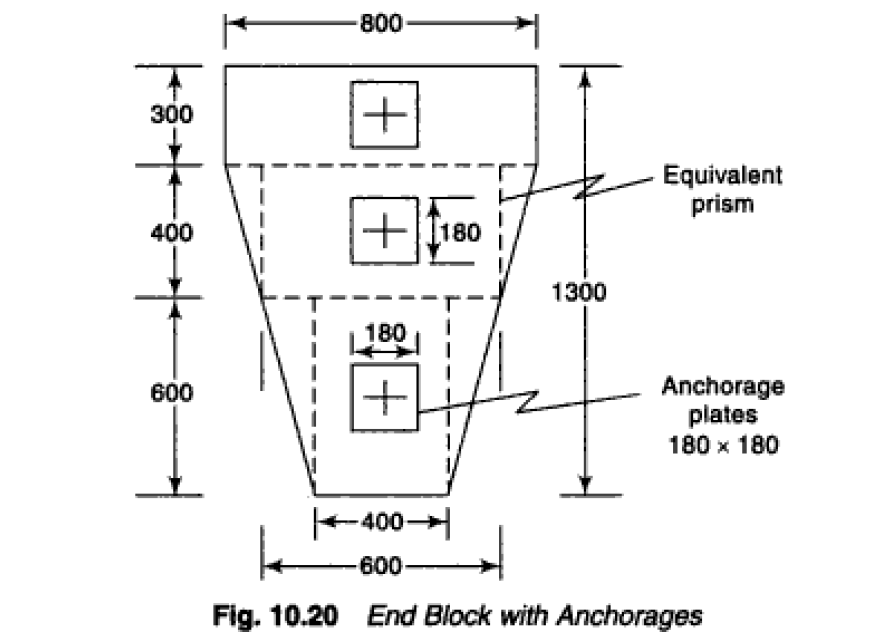
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| **Course Code** | **20CE2032** | **Duration** | **3hrs** |
| **Course Name** | **PRESTRESSED CONCRETE** | **Max. Marks** | **100** |

**IS 1343-2012 is permitted for the Examination**

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART - A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Specify the type of cable mostly being used in Prestressed concrete. | | CO1 | R | | 1 |
| 2. | Can you recall the range of concrete grade being adopted in Prestressed concrete as per IS 1343-2012? | | CO2 | R | | 1 |
| 3. | What would be the minimum percentage of transverse reinforcement to be provided to a prestressed concrete beam apart from prestressing steel? | | CO4 | AP | | 1 |
| 4. | Can you recognize the minimum length of end block need to be provided in a Prestressed Concrete Beam as per IS Code? | | CO2 | U | | 1 |
| 5. | State the design considerations to be given for the design of continuous prestressed concrete structures. | | CO4 | U | | 1 |
| 6. | How would you define a ‘Thrust line’? | | CO3 | R | | 1 |
| 7. | Can you specify the considerations by which the shear reinforcement for a prestressed concrete beam can be designed? | | CO4 | U | | 1 |
| 8. | How would you decide on the ultimate shear resistance of a section cracked inflexure as per IS Code? | | CO2 | AP | | 1 |
| 9. | Specify the requirements of tendons. | | CO5 | AP | | 1 |
| 10. | Bring out the main point of failure on a precast concrete structure. | | CO6 | E | | 1 |
| **PART - B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | How would you assess the Limit state of collapse of the structure or part of the structure? | | CO2 | | U | 3 |
| 12. | How would you distinguish between Primary Tension failure and Primary Compression failure? | | CO5 | | E | 3 |
| 13. | Can you state the methods by which end blocks may be designed for anchorage? | | CO2 | | R | 3 |
| 14. | When would you avoid shear reinforcement in a prestressed concrete beam? | | CO2 | | AP | 3 |
| 15. | How would you designate the zone called Kern of a prestressed concrete beam? | | CO4 | | AP | 3 |
| 16. | Can you identify the type of moment which will not arise in a prestressed concrete continuous beam provided with concordant cable? | | CO3 | | AN | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | How would you classify the structure into different types as per IS1343-2012? | CO2 | | U | 3 |
|  | b. | Derive the equations for the design of Prestressed concrete slabs/beams. | CO2 | | U | 9 |
|  |  |  |  | |  |  |
| 18. |  | Design a post tensioned beam of 15m for a live load of 20kN per metre run. Adopt concrete grade of M40 and 7mm diameter steel wires of characteristic strength 1600MPa. Design the beam as type 1 structure. Assume that the strength of concrete at transfer is 35MPa and the wires can be initially stretched to 1200MPa. | CO4 | | AP | 12 |
|  |  |  |  | |  |  |
| 19. |  | Determine the Limit State Moment of Resistance of the midspan section of a slab using codal method as well as theoretical method for the following data:   1. Effective span = 12m 2. Live load of 20 kN/m 3. M45 grade of concrete and 7mm diameter high tensile wires of ultimate strength 1520 MPa, The cube strength of concrete is 35.6N/mm2 4. Breadth b = 1000mm 5. Depth D = 450mm 6. Eccentricity of prestressing wire = 140mm below the centroidal axis 7. Area of prestressing steel = 6 Freyssinet cables of 7mm diameter wires 8. Initial Prestressing force = 3500000N   Check whether this section has adequate safety factor with respect to limit state of collapse | CO3 | | AN | 12 |
|  |  |  |  | |  |  |
| 20. |  | A prestressed concrete beam 300mm wide and 400mm deep is prestressed with wires (area 350mm2) located at a constant eccentricity of 50mm and carrying an initial stress of 1000N/mm2. The span of the beam is 10m. Calculate the percentage loss of stress in wires if (a) the beam is pre-tensioned, and (b) the beam is post-tensioned using the following data:  Ec = 35kN/mm2, Es = 210kN/mm2  Relaxation of steel stress= 5 percent of the initial stress  Shrinkage of concrete = 300 x 10-6 for pre-tensioning and 200 x 10-6 for post tensioning  Creep coefficient = 1.6  Slip at anchorage = 1mm  Frictional coefficient for wave effect = 0.0015 per m | CO3 | | AN | 12 |
|  |  |  |  | |  |  |
| 21. |  | Check the given section of the prestressed concrete girder for shear and suggest suitable shear reinforcement.  Breadth of the top flange = 500mm  Thickness of top flange = 100mm  Thickness of web = 120mm  Breadth of bottom flange = 350mm  Thickness of bottom flange = 180mm  Clear depth of web = 500mm  Eccentricity of prestressing wire = 278.3mm below the centroidal axis  Prestressing steel = 3 Freyssinet cables of 7mm diameter wires  Initial Prestressing force = 1446588N  Live load on the beam = 15kN/m  Span of the beam = 15m  fck = 40N/mm2& Ultimate stress in steel is 1580N/mm2 | CO4 | | AP | 12 |
|  |  |  |  | |  |  |
| 22. |  | The solid end block of a post tensioned prestressed beam of 25m span, with three cables, each of 7-15mm strands, tensioned to 1200kN is shown in Fig. 1. The anchorage plates are square with a side length with a side of 180mm. Design the end block for bursting forces and sketch the details of reinforcement according to the provisions of the IS 1343-2012 | CO4 | | AP | 12 |
|  |  |  |  | |  |  |
| 23. |  | Can you briefly furnish a case study on the failure of a Post Tensioned Precast Structural Elements? | CO6 | | E | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | A continuous prestressed concrete beam of uniform section has cable profile as shown in Fig.2. The magnitude of the prestressing force is 1200kN   1. Locate the line of pressure ( C-line) in the concrete due to prestress alone not considering the dead load of the beam 2. What is the secondary moment at section B 3. Determine the maximum stress at the mid span section of BC due to dead load and prestressing force, if cross section is a rectangle of breadth 300mm and depth 600mm | CO3 | | AN | 12 |



**Fig. 1**

**75mm**

**240mm**

**150mm**

**3000mm**

**10m**

**5m**

**15m**

**Fig. 2**

**Θ1**

**Θ2**

**c.l.c**

**c.l.s**

**P**

**A**

**B**

**C**

**D**

**E**

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Identify appropriate prestressing techniques. |
| CO2 | Explain the concepts of prestressing. |
| CO3 | Analyse the prestressed concrete structures. |
| CO4 | Design the prestressed concrete structural elements. |
| CO5 | Appraise on the quality parameters of PSC structures. |
| CO6 | Investigate the rationale for failure of a PSC structure. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 |  |  |  |  |  | 1 |
| CO2 | 4 | 16 | 4 |  |  |  | 24 |
| CO3 | 1 |  |  | 39 |  |  | 40 |
| CO4 |  | 2 | 40 |  |  |  | 42 |
| CO5 |  |  | 1 |  | 3 |  | 4 |
| CO6 |  |  |  |  | 13 |  | 13 |
|  | | | | | | | **124** |

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| **Course Code** | **20CE2034** | **Duration** | **3hrs** |
| **Course Name** | **REPAIR AND REHABILITATION OF STRUCTURES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | Classify the types of maintenance used to inspect the structures. | | | CO1 | U | | 1 |
| 2. | List out the causes of distress. | | | CO1 | R | | 1 |
| 3. | Recall the concept of corrosion. | | | CO2 | R | | 1 |
| 4. | Label the types of failures in masonry structures. | | | CO2 | R | | 1 |
| 5. | Identify the equipment used in rebound hammer test. | | | CO3 | U | | 1 |
| 6. | Quote the principle used in chloride penetration test. | | | CO3 | R | | 1 |
| 7. | Give examples for the epoxy injection technique. | | | CO4 | U | | 1 |
| 8. | List the methods used in special repair technique. | | | CO4 | R | | 1 |
| 9. | Generalize the criteria when fire earthquake is caused. | | | CO5 | U | | 1 |
| 10. | Group the sequence of operation in demolition technique. | | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Compare the types of maintenance with illustrations. | | | CO1 | | An | 3 |
| 12. | Classify the types of failures in concrete structures. | | | CO2 | | U | 3 |
| 13. | Categorize the types of tests used in SDT of structures. | | | CO3 | | An | 3 |
| 14. | Group and explain the principle involved in rehabilitation techniques. | | | CO4 | | U | 3 |
| 15. | Focus on the methods used to repair the corrosion distress in RCC structures. | | | CO5 | | An | 3 |
| 16. | Explain the engineered methods used in demolition technique. | | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. |  | Discuss the types of failures in RCC structures and explain in detail. | | CO1 | | U | 12 |
|  |  |  | |  | |  |  |
| 18. |  | Illustrate with example about the quality assurance in the building on the aspect of strength and durability. | | CO2 | | An | 12 |
|  |  |  | |  | |  |  |
| 19. |  | Classify and explain the types of tests used in NDT of structures. | | CO3 | | An | 12 |
|  |  |  | |  | |  |  |
| 20. |  | Predict the special methods used for repairing and enhancing the properties of structural members and elaborate it in detail. | | CO4 | | A | 12 |
|  |  |  | |  | |  |  |
| 21. |  | As a civil engineer you need to enhance the structural characteristics of slab and footing. Select the appropriate retrofitting methods with a neat sketch. | | CO5 | | An | 12 |
|  |  |  | |  | |  |  |
| 22. |  | Discuss the types of distress and explain its impact on the structures. | | CO1 | | U | 12 |
|  |  |  | |  | |  |  |
| 23. |  | Explain in detail the corrosion, its prevention and remedial measures. | | CO2 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. |  | | Focus on the engineered methods used in demolition techniques with a case study. | CO6 | | An | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand distress and damages to concrete steel and masonry structures. |
| CO2 | Inspect the structures for its maintenance. |
| CO3 | Interpret damage of structures using various tests. |
| CO4 | Apply of repair techniques to damage structures and various. |
| CO5 | Evaluate the strength of structural elements. |
| CO6 | Retrofit and strengthen RCC and Steel structures. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 25 | - | 3 | - | - | 29 |
| CO2 | 2 | 3 | 12 | 12 | - | - | 29 |
| CO3 | 1 | 1 | - | 15 | - | - | 17 |
| CO4 | 1 | 4 | 12 | - | - | - | 17 |
| CO5 | - | 1 | - | 15 | - | - | 16 |
| CO6 | - | 4 | - | 12 | - | - | 16 |
|  | | | | | | | **124** |

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| **Course Code** | **20CE2036** | **Duration** | **3hrs** |
| **Course Name** | **MUNICIPAL WASTE MANAGEMENT** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome / Pattern** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1 | “Use of sealable containers rather than plastic warp” is an example of \_\_\_\_\_\_\_\_. | CO1 / R | 1 |
| 2 | Which of the following physiological groups of microorganisms are not involved in biomethanation? | CO1 / R | 1 |
| 3 | While designing waste collection system for deciding the collection route which factor should not be considered? | CO3 / U | 1 |
| 4 | The disposal of the screen is done by \_\_\_\_\_\_\_\_\_\_\_\_\_. | CO6 / R | 1 |
| 5 | The aerobic method of mechanical composting practiced in India is called \_\_\_\_\_\_\_\_\_\_\_\_\_. | CO4 / U | 1 |
| 6 | The maximum C\N ration in a municipal solid waste compost is \_\_\_\_\_\_\_\_\_\_\_\_\_. | CO5 / R | 1 |
| 7 | Sludge bulking can be controlled by \_\_\_\_\_\_\_\_\_\_\_\_\_. | CO5 / R | 1 |
| 8 | \_\_\_\_\_\_\_\_\_\_\_\_ Refuse include any animal & vegetable refuse. | CO3 / U | 1 |
| 9 | As per PCB how much solid waste is generated per capita per day in large cities? | CO4 / U | 1 |
| 10 | Which one of the following is not a method of drying? | CO6 / R | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11 | Define solid waste management. | CO1 / R | 3 |
| 12 | List out of the MSWM principles (or) enunciate the vital principle of municipal solid waste management. | CO1 / U | 3 |
| 13 | What is the purpose of onsite processing? | CO2 / A | 3 |
| 14 | How to select transfer station locations? | CO3 / U | 3 |
| 15 | What are the four main ways to treat organic biodegradable waste? | CO4 / R | 3 |
| 16 | List out the various method of disposal of solid waste. | CO5 / R | 3 |

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| **PART – C (6 X 12 = 72 MARKS)** | | | |
| **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is Compulsory)** | | | |
| 17 | a. Explain the various types of solid waste in detail. | CO1 / U | 7 |
| b. Explain the physical and chemical characteristics of MSW. | CO1 / U | 5 |
| 18 | a. Write the effect of solid waste disposal to human health and environment. | CO1 / A | 7 |
| b. Explain the solid waste management system. | CO1 / An | 5 |
| 19 | a. Explain the hauled and stationary containers. | CO2 / A | 7 |
| b. Write the benefits of the waste processing technique. | CO2 / An | 5 |
| 20 | a. Write the types of waste collection equipment. | CO3 / An | 7 |
| b. Briefly discuss waste collection routine. | CO3 A | 5 |
| 21 | a. Write the purpose of source reduction. | CO4 / A | 6 |
| b. Discuss in detail the processing equipment for recycling. | CO4 / A | 6 |
| 22 | a. Discuss sanitary landfill. | CO5 / U | 6 |
| b. Explain landfill gas and leachate. | CO5 / U | 6 |
| 23 | a. Describe the various method of sorting the solid waste. | CO6 / U | 6 |
| b. Discuss Heuristic Routing Rules. | CO6 / R | 6 |
|  | **Compulsory:** | | |
| 24 | a. Write short notes on Shredding and Pulverizing. | CO2 / A | 6 |
| b. What are the requirements of a landfill layout? | CO3 / U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Analyze the nature and characteristics of municipal solid wastes |
| CO2 | Sort out the functional elements for solid waste management |
| CO3 | Apply the techniques and methods used in transformation, conservation and recovery of materials from solid waste |
| CO4 | Identify and design waste containment systems |
| CO5 | Gain knowledge in regulatory requirements regarding municipal solid waste management |
| CO6 | Apply the basic scientific principles for solving practical waste management challenges |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 | 15 | 7 | 5 | - | - | 32 |
| CO2 | - | - | 16 | 5 |  |  | 21 |
| CO3 | - | 11 | 5 | 7 | - | - | 23 |
| CO4 | - | 5 | 12 | - |  |  | 17 |
| CO5 | 5 | 12 | - | - | - | - | 17 |
| CO6 | 8 | 6 | - | - | - | - | 14 |
|  | | | | | | | **124** |

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| **Course Code** | **20CE2037** | **Duration** | **3hrs** |
| **Course Name** | **NOISE POLLUTION AND ITS CONTROL** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome / Bloom’s level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1. | **The noise value of sound wave depends upon \_\_\_\_** | CO1/ U | 1 |
| 2. | Define ‘Hearing Threshold Level’. | CO1/ R | 1 |
| 3. | Recall silence zone for noise pollution. | CO2/ R | 1 |
| 4. | Which of the receptor organ for hearing is destructed by noise pollution? | CO2/ R | 1 |
| 5. | Name the main source of vehicular noise. | CO3/ U | 1 |
| 6. | How does a car in good condition can cause less pollution? | CO3/ A | 1 |
| 7. | Mention the best way to reduce aircraft noise. | CO4/ An | 1 |
| 8. | Identify the best way to control noise pollution among the four fundamental ways. | CO4/ U | 1 |
| 9. | The type of absorbents that can absorb the sound of any frequency is \_\_\_\_\_\_\_. | CO5/U | 1 |
| 10. | To protect sleep and rest, the noise should not exceed \_\_\_\_\_decibels. | CO6/R | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | | |
| 11. | Brief about Frequency analyzers. | | CO1/R | 3 |
| 12. | List the impacts of noise stress on human health. | | CO2/ R | 3 |
| 13. | Describe the laws regarding noise pollution. | | CO6/ R | 3 |
| 14. | List out the factors influencing the intensity of traffic noise? | | CO3/ U | 3 |
| 15. | What imparts noise at construction site and gives its health effects. | | CO3/ An | 3 |
| 16. | Write a brief note on active noise control technology. | | CO4/R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is Compulsory)** | | | | |
| 17. | a. | Describe the characteristics of sound waves. | CO1/R | 8 |
| b. | Discuss briefly the measurement of noise. | CO1/ R | 4 |
|  |  |  |  |  |
| 18. | a. | Describe the major sources of noise pollution. | CO2/ R | 7 |
| b. | Define low frequency noise. Explain the health hazards with examples. | CO2/ U | 5 |
|  |  |  |  |  |
| 19. | a. | Discuss the role of legislation in noise pollution. | CO6/An | 6 |
| b. | Explain strategic noise map in detail. | CO6/A | 6 |
|  |  |  |  |  |
| 20. | a. | Explain how aircraft noise is measured? | CO3/An | 6 |
| b. | List out the measures to reduce traffic noise pollution. | CO3/A | 6 |
|  |  |  |  |  |
| 21. | a. | Illustrate the methods of controlling noise pollution at construction sites. | CO4/A | 7 |
| b. | Describe the main sources of noise pollution at mines. | CO4/A | 5 |
|  |  |  |  |  |
| 22. | a. | Explain the effects of noise on human beings. | CO3/R | 6 |
| b. | Mention few sound absorbing materials and explain them with their application. | CO5/A | 6 |
|  |  |  |  |  |
| 23. | a. | Explain the control strategies of noise pollution. | CO4 /U | 6 |
| b. | How do you control the noise at the source? | CO4 /U | 6 |
|  |  | **COMPULSORY** | | |
| 24. |  | Summarize a case study on noise pollution of any two industries in terms of sources and potential solutions adopted | CO2/ An | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the nature and characteristics of noise pollution |
| CO2 | Analyze the noise pollution problems |
| CO3 | Detect the various effects of noise pollution |
| CO4 | Apply suitable preventive measures and identify the technologies and methods to control of noise |
| CO5 | Choose suitable noise adsorbent materials |
| CO6 | Gain knowledge about the various noise pollution regulations. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 16 | 1 |  |  |  |  | 17 |
| CO2 | 12 | 5 |  | 12 |  |  | 29 |
| CO3 | 6 | 4 | 7 | 9 |  |  | 26 |
| CO4 | 3 | 13 | 12 | 1 |  |  | 29 |
| CO5 |  | 1 | 6 |  |  |  | 7 |
| CO6 | 4 |  | 6 | 6 |  |  | 16 |
|  | | | | | | | **124** |

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| **Course Code** | **20CE2051** | **Duration** | **3hrs** |
| **Course Name** | **GLOBAL CLIMATE CHANGE AND ITS IMPACT** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Describe storm. | | CO1 | R | | 1 |
| 2. | Define climate-compatible development (CCD). | | CO3 | R | | 1 |
| 3. | List any two advantages of renewable resources. | | CO4 | R | | 1 |
| 4. | List any two ways to achieve food security. | | CO4 | R | | 1 |
| 5. | Explain the lapse rate. | | CO1 | U | | 1 |
| 6. | List any two possible impacts of climate change on forests. | | CO3 | R | | 1 |
| 7. | Define climate change. | | CO1 | R | | 1 |
| 8. | Define cloud. | | CO1 | R | | 1 |
| 9. | Define green economy. | | CO3 | R | | 1 |
| 10. | Define water harvesting. | | CO4 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Illustrate Saffir- Simpson hurricane scale. | | CO3 | | U | 3 |
| 12. | Categorize food security dimensions. | | CO4 | | An | 3 |
| 13. | Discuss the impact of fossil fuels. | | CO3 | | U | 3 |
| 14. | Given the following temperature and elevation data, determine the stability of the atmosphere.  Elevation (m) Temperature (oC)  2.00 14.35  324.00 11.13 | | CO1 | | A | 3 |
| 15. | Describe greenhouse effects. List any two greenhouse gases. | | CO3 | | R | 3 |
| 16. | Explain basic types of climate models. | | CO5 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Illustrate the types of clouds by using a neat and clean diagram. | CO4 | | R | 6 |
|  | b. | Evaluate any case study (national/international) on climate change. | CO6 | | E | 6 |
| 18. |  | Report the potential climate adaptation strategies for maintaining water related ecosystem services (WES) during drought and their direct and indirect impacts on other WES. | CO3 | | A | 12 |
| 19. | a. | Determine the climate variability and change effects on sanitation systems. | CO3 | | A | 6 |
|  | b. | Organize Koppen – Geiger climate classification system (empirical). | CO4 | | An | 6 |
| 20. |  | Explain acid rain, the impact of acid rain on living and non-living things, and its mitigation measures. | CO3 | | U | 12 |
| 21. |  | Articulate evidence to suggest what the climate was like in the past. | CO5 | | A | 6 |
|  |  | Illustrate the atmospheric stability by using a neat and clean diagram. | CO1 | | U | 6 |
| 22. | a. | Describe the effects of climate change on agriculture. | CO4 | | R | 6 |
|  | b. | Explain the important international agreements and protocols on climate change. | CO6 | | U | 6 |
| 23. |  | Illustrate the global wind system and types of wind by using a neat and clean diagram. | CO2 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Describe  a. IPCC.  b. Role of IPCC.  c. Structure of IPCC.  d. Activities of IPCC. | CO6 | | R | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the climate and its change. |
| CO2 | List the factors affecting global climate change. |
| CO3 | Analyze the impacts of global climate change. |
| CO4 | Explain the importance of climate change in various fields. |
| CO5 | Develop Climate Change Models. |
| CO6 | Study the impacts of climate change across the Globe. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 3 | 7 | 3 | - | - | - | 13 |
| CO2 | - | 12 | - | - | - | - | 12 |
| CO3 | 6 | 18 | 18 | - | - | - | 42 |
| CO4 | 15 | - | - | 9 | - | - | 24 |
| CO5 | - | 3 | 6 | - | - | - | 9 |
| CO6 | 12 | 6 | - | - | 6 | - | 24 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CE2052** | **Duration** | **3hrs** |
| **Course Name** | **GREEN BUILDINGS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | What does the abbreviation IGBC stands for? | | CO1 | U | | 1 |
| 2. | Quote the principles used in green buildings. | | CO1 | R | | 1 |
| 3. | Define soil erosion control. | | CO2 | R | | 1 |
| 4. | Reproduce the concept of water conservation. | | CO2 | R | | 1 |
| 5. | Express the criteria used in net zero buildings. | | CO3 | U | | 1 |
| 6. | Define energy efficient envelopes. | | CO3 | R | | 1 |
| 7. | Label some green energy used in green buildings. | | CO4 | U | | 1 |
| 8. | Reproduce the concept of Reuse of waste. | | CO4 | R | | 1 |
| 9. | What does the abbreviation HVAC stands for? | | CO5 | U | | 1 |
| 10. | What does the abbreviation IGCC stands for? | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Contrast the benefits of sustainable development in green buildings. | | CO1 | | An | 3 |
| 12. | Generalize the criteria for the cause of soil erosion. | | CO2 | | U | 3 |
| 13. | Focus on the types of green lighting technologies in detail. | | CO3 | | An | 3 |
| 14. | Distinguish between construction and industrial waste. | | CO4 | | U | 3 |
| 15. | Illustrate in detail the Indoor Air Pollutant. | | CO5 | | An | 3 |
| 16. | Group the strategies used in life-cycle costing of green buildings. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Explain in detail the strategies used in overview of rating systems. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 18. |  | Compare the ideas and methods of Waste water treatment and recycle and reuse systems briefly. | CO2 | | An | 12 |
|  |  |  |  | |  |  |
| 19. |  | Compare traditional and green building construction techniques with a case-study. | CO3 | | An | 12 |
|  |  |  |  | |  |  |
| 20. |  | Contrast the system of waste management. | CO4 | | An | 12 |
|  |  |  |  | |  |  |
| 21. |  | Focus on the process of assessing the IEQ and explain briefly. | CO5 | | An | 12 |
|  |  |  |  | |  |  |
| 22. |  | Discuss the green building rating system and explain any three. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 23. |  | Focus on the concept of Wind and solar energy harvesting in a deep manner. | CO5 | | An | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Illustrate with a case-study about LEED- certified rating in green building. | CO6 | | An | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the factors influencing green building concept. |
| CO2 | Identify and compare different rating system. |
| CO3 | Select proper site and adopt green building techniques. |
| CO4 | Plan energy efficient building envelopes and reduce carbon foot print. |
| CO5 | Select the Building material and reduce, reuse and recycle waste. |
| CO6 | Evaluate the performance of green buildings and enhance indoor air quality. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 25 | - | 3 | - | - | 29 |
| CO2 | 2 | 3 | - | 12 | - | - | 17 |
| CO3 | 1 | 1 | - | 15 | - | - | 17 |
| CO4 | 1 | 4 | 12 | - | - | - | 17 |
| CO5 | - | 1 | - | 27 | - | - | 28 |
| CO6 | - | 4 | - | 12 | - | - | 16 |
|  | | | | | | | **124** |



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| **Course Code** | **20CE3001** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCED STRUCTURAL ANALYSIS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Analyze the continuous beams using Matrix flexibility method. Also draw the Bending moment diagram. P=10kN, q=10kN/m  See the source image | CO1 | Analyze | 16 |
|  |  |  |  |  |  |
| 2. |  | Explain in detail the step by step procedure of the Matrix flexibility for a statically determinate and in-determinate structure using semi-automatic method. | CO1 | Understand | 16 |
|  |  |  |  |  |  |
| 3. |  | Analyse the portal frame ABCD shown in figure by Stiffness matrix method and sketch the bending moment diagram. | CO2 | Analyze | 16 |
|  |  |  |  |  |  |
| 4. |  | Analyze the continuous beams using Matrix Stiffness method. P=10kN, q=10kN/m.  See the source image | CO2 | Analyze | 16 |
|  |  |  |  |  |  |
| 5. |  | Analyse the continuous beam shown in Figure 3 by the moment distribution method. Draw the bending moment diagram and shear foAnalyse the continuous beam shown in figure using direct stiffness method. | CO3 | Analyze | 16 |
|  |  |  |  |  |  |
| 6. |  | Explain the term boundary condition and eloborate its various types applied on a structural frame with diagram. | CO4 | Understand | 16 |
|  |  |  |  |  |  |
| 7. |  | Solve the portal frame of member length L shown in figure using Static condensation technique. Assume EI is constant  u1  P  u2  u3  A  D  B  C | CO5 | Analyze | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. |  | Determine the generalized displacement of pin jointed truss using direct stiffness method and hence determine element forces. AE is constant. A = 200 mm2 ; E = 200 kN/mm2. | CO3 | Analyze | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the degrees of freedom and formulate flexibility and stiffness matrix. |
| CO2 | Analyze the truss using stiffness methods. |
| CO3 | Analyze the beams elements using appropriate methods. |
| CO4 | Analyze the elements using advanced methods. |
| CO5 | Evaluate the structural stability of frames. |
| CO6 | Analyze the elements using software tools. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 16 |  | 16 |  |  | 32 |
| CO2 |  |  |  | 32 |  |  | 32 |
| CO3 |  |  |  | 36 |  |  | 36 |
| CO4 |  | 16 |  |  |  |  | 16 |
| CO5 |  |  |  | 16 |  |  | 16 |
| CO6 |  |  |  |  |  |  |  |
|  | | | | | | | **132** |



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| **Course Code** | **20CE3003** | **Duration** | **3hrs** |
| **Course Name** | **STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | A car of mass 1600kg is constructed using four springs each of stiffness 20,000N/m. If the combined mass of two people in the car is 160 kg, find the frequency of the structure and the period of vibration. | CO2 | An | 6 |
|  | b. | A single one storey RC frame idealized as a massless frame supports a dead load 50kN at the roof level. The frame is 8m wide and 4 m high. Each column and beam is 250 mm wide. Assume E= 30 x 106kN/m2. Determine the natural frequency and period of the system. Assume stiffness of the equivalent SDoF as K= 96EI/h3. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 2. |  | A free vibration test is carried out on an empty elevated water tank. A cable attached to the tank applies a lateral force of 144kNand pulls the tank by 0.05m. Suddenly the cable is cut of and the resulting vibration is measured. At the end of five complete cycles, the time is 2 sec and the amplitude is 0.035 m. Compute 1) Stiffness, 2) Damping ratio, 3) undamped natural frequency, 4) Weight of the tank, 5) damping coefficient. | CO1 | Ap | 16 |
|  |  |  |  |  |  |
| 3. |  | Derive the expression for forcing function and steady state response of aSDoF system for the given loading function  F(t) = F0 0 ≤ t ≤ 0.5  = -F0 0.5 ≤ t ≤1 | CO3 | Ap | 16 |
|  |  |  |  |  |  |
| 4. |  | Determine the natural frequency and mode shape of the system shown in the figure  2k m k m 2k | CO2 | Ap | 16 |
|  |  |  |  |  |  |
| 5. |  | A hospital building is located in Delhi. The soil conditions is hard rock. The R. C. frames are infilled with brick-masonry. The lumped weight due to dead loads is 12 kN/m2 on floors and 8 kN/m2 on the roof. The live load on floors are 5 kN/m2 and 2 kN/m2 on the roof. Determine design seismic load on the structure as per codal provisions. The plan has 4 columns at 4m c/c in ‘X’ direction and 3 columns at 4 m c/c in ‘y’ direction. The building has G +2 floors with 3 m height of each floor. | CO5 | Ap | 16 |
|  |  |  |  |  |  |
| 6. | a. | Discuss on the how the propagation of the energy from the earthquake through the soil media occurs through seismic waves. | CO4 | Ap | 10 |
|  | b. | Explain the Elastic rebound theory. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 7. |  | “Ductile detailing of structures enhances the shear capacity of the structures”. Explain the procedure for designing the RC beam, column and joints as per codal provisions. | CO5 | Ap | 16 |
|  |  |  |  |  |  |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | “Base Isolation system” is a passive control system. Explain the principles on which this system is designed. | CO6 | Ap | 10 |
|  | b. | Explain any two Global retrofitting techniques for structures damaged during earthquake. | CO6 | Ap | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the elements of vibratory system and develop mathematical models. |
| CO2 | Determine the fundamental frequency and mode of vibration of structural elements. |
| CO3 | Estimate the response of structures subjected to dynamic forces. |
| CO4 | Apply theory of dynamics to structures subjected to seismic forces. |
| CO5 | Illustrate the codal provisions for seismic resistant design. |
| CO6 | Recommend suitable alternate techniques and retrofitting methods. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  |  |  | 16 |  |  | 16 |
| CO2 |  |  | 32 |  |  |  | 32 |
| CO3 |  |  | 16 |  |  |  | 16 |
| CO4 |  | 6 | 10 |  |  |  | 16 |
| CO5 |  |  | 32 |  |  |  | 32 |
| CO6 |  |  | 20 |  |  |  | 20 |
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| **Course Code** | **20CE3006** | **Duration** | **3hrs** |
| **Course Name** | **DESIGN OF SUBSTRUCTURES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Discuss the various methods of deep foundations. | CO5 | U | 8 |
|  | b. | Explain the procedure for Standard penetration test method. | CO1 | A | 8 |
|  |  |  |  |  |  |
| 2. |  | Explain the design principles of well foundation. | CO5 | An | 16 |
|  |  |  |  |  |  |
| 3. |  | Design the vertical stem of a cantilever retaining wall of height 6m above ground level. The Soil pressure is 180 kN/m2 and the SBC of soil is 230 kN/m2. The angle of internal friction is 20o. Use M20 concrete and Fe415 steel. Assume suitable data wherever necessary. | CO3, CO6 | A | 16 |
|  |  |  |  |  |  |
| 4. | a. | Enumerate the basic principles of design of machine foundation. | CO4 | R | 10 |
|  | b. | Examine the various types of machine foundation. | CO5 | A | 6 |
|  |  |  |  |  |  |
| 5. | a. | Broadly classify tunnel based on its purpose and type of strata. | CO5 | An | 8 |
|  | b. | Explain the various tunneling methods. | CO4 | U | 8 |
|  |  |  |  |  |  |
| 6. |  | Design of pile cap for the following data, Pile Diameter : 400 mm Spacing of piles 2 hp = 2 x 400 : 800 mm, Column Dimension B x D : 300 x 450 mm, Factored Load : 1072.8 KN, Factored Moment Mxu :51.29 KN.m, Safe Load on Single Pile :500KN, Concrete Mix : M20 Steel Grade : Fe 415. | CO3, CO6 | A | 16 |
| 7. |  | Estimate the moments and draw the B.M diagram for the design of mat foundation for columns spaced at 5 m c/c, with three columns in x and y direction. The pmax and pmin at the ends are 21x104 N/m2 and 11 x 104 N/m2. | CO3 | An | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. |  | Explain briefly the various types of coffer dam with figures. | CO6 | A | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the methods of subsoil exploration. |
| CO2 | Evaluate the shear strength parameters. |
| CO3 | Determine the load carrying capacity of different foundation types. |
| CO4 | Analyze the concepts of settlement analysis. |
| CO5 | Select appropriate foundations type based on available soil conditions. |
| CO6 | Design suitable foundations based on the soil conditions. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  |  | 8 |  |  |  | 8 |
| CO2 |  |  |  |  |  |  |  |
| CO3 |  |  | 12 | 16 |  |  | 28 |
| CO4 | 10 | 8 |  |  |  |  | 18 |
| CO5 |  | 8 | 6 | 24 |  |  | 38 |
| CO6 |  |  | 40 |  |  |  | 40 |
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| **Course Code** | **20CE3007** | **Duration** | **3hrs** |
| **Course Name** | **STRUCTURAL ART PRINCIPLES AND PRACTICE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Discuss on form follows function with suitable examples. | CO1 | Ap | 6 |
|  | b. | Explain shells of revolution and shells of translation with suitable example. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 2. |  | Design a spherical dome for a hall of diameter 15 m and the rise  of the dome is 3 m. The live load maybe taken as 1 kN/m 2. The  dome carries a lantern load of 10 kN at the crown . Use M20  concrete and Fe415 steel. | CO2 | Ap | 16 |
|  |  |  |  |  |  |
| 3. |  | Determine the shearing forces, principal stresses, forces in the  edges and valley for the hypar structure with the following data.  Pz= 2 kN/m 2 , t=5 cm, c0= 1.5 m, a0= 6m, b0= 6 m. | CO4 | Ap | 16 |
|  |  |  |  |  |  |
| 4. |  | Derive and sketch the traces of the Elliptical paraboloid given by the equation z= x2 /4 + y2/4 at intervals of 1. Take the maximum length of ‘x’ as 6 m and that of ‘y’ as 6 m. | CO3 | An | 16 |
|  |  |  |  |  |  |
| 5. |  | Explain the Principle on which Heinz Isler designed the shell structures with suitable examples. | CO5 | Ap | 16 |
|  |  |  |  |  |  |
| 6. |  | Discuss on the Trussed Dome geometry and the technology involved in it. | CO5 | Ap | 16 |
|  |  |  |  |  |  |
| 7. |  | Analyze the reason why buckling analysis is important in the design of shells and Discuss on the various types of bifurcation buckling. | CO4 | An | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. |  | Folded plates increase the stiffness of the structure, Justify this statement with a Case study building by Mr. Sundaram. | CO6 | An | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the type of the shell to be employed for the structure. |
| CO2 | Develop equations and design different type of shells. |
| CO3 | Model shells using software knowledge. |
| CO4 | Analyse the shells to determine the resultant stresses. |
| CO5 | Determine the effective techniques for construction. |
| CO6 | Design innovative structures to suite the modern day construction. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 10 | 6 |  |  |  | 16 |
| CO2 |  |  | 16 |  |  |  | 16 |
| CO3 |  |  |  | 16 |  |  | 16 |
| CO4 |  |  | 16 | 16 |  |  | 32 |
| CO5 |  |  | 32 |  |  |  | 32 |
| CO6 |  |  |  | 20 |  |  | 20 |
|  | | | | | | | **132** |



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| **Course Code** | **20CE3012** | **Duration** | **3hrs** |
| **Course Name** | **DESIGN OF HIGH RISE STRUCTURES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Illustrate the different design criteria for structural design of tall buildings. | CO5 | Analyse | 15 |
|  | b. | List the forces acting on tall buildings. | CO4 | Remember | 5 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Describe the development of high rise structure. | CO1 | Understand | 20 |
|  |  |  |  |  |  |
| 3. |  | Explain 4 stages of site investigation. | CO3 | Analyse | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Explain various suitable field tests that are conducted during soil exploration at a site having sandy starter. | CO3 | Analyse | 20 |
|  |  |  |  |  |  |
| 5. |  | Describe the different types of earth moving equipment used in construction of high rise structures. | CO5 | Understand | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain Crane Selection Guidelines: How To Pick The Right Solution For Application of tall buildings. | CO4 | Analyse | 15 |
|  | b. | List out the factors to consider when choosing the right crane for high rise building Projects. | CO1 | Remember | 5 |
|  |  |  |  |  |  |
| 7. |  | Explain the behavior tall building during wind and seismic effects. | CO3 | Analyse | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Explain various flooring system in concrete and steel. | CO2 | Understand | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 9. |  | Illustrate the different approaches to analyze the high rise structures. | CO6 | Analyse | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the loads on tall buildings. |
| CO2 | Illustrate the behavior of various structural forms. |
| CO3 | Adopt suitable techniques for analysis. |
| CO4 | Analyse the forces in the structures. |
| CO5 | Assess the long term effects in tall buildings. |
| CO6 | Assess the model for analysis. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 | 20 |  |  |  |  | 25 |
| CO2 |  | 20 |  |  |  |  | 20 |
| CO3 |  |  |  | 60 |  |  | 60 |
| CO4 | 5 |  |  | 15 |  |  | 20 |
| CO5 |  | 20 |  | 15 |  |  | 35 |
| CO6 |  |  |  | 20 |  |  | 20 |
|  | | | | | | | **180** |

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| **Course Code** | **20CE3015** | **Duration** | **3hrs** |
| **Course Name** | **BRIDGE ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. |  | A reinforced concrete simply supported slab is to be designed for the deck of a road bridge with the data given below:  Width of carriageway - 7.5m  Kerbs - 600mm wide  Clear span - 5.5m  Type of loading - IRC Class AA Tracked vehicle  loading  Materials – M25 grade concrete, Fe 415 grade tor steel  Illustrate how you would design the deck slab. | CO4 | A | 16 |
|  |  |  |  |  |  |
| 2. |  | A post-tensioned Prestressed concrete slab is to be designedfor a road bridge for the following data:  Width of carriageway -7.5 m  Kerbs - 600mm wide  Foot path - 1m on either side  Clear span - 12m  Type of loading - IRC Class AA tracked vehicle  Materials - M50 grade concrete, 7mm HTS wires of Ultimate Stress 1600N/mm2  The cube compressive strength at transfer is 45N/mm2  Determine the maximum bending moment and shear forces on the bridge. | CO4 | A | 16 |
|  |  |  |  |  |  |
| 3. |  | The effective span of a through type trussed girder two lane highway bridge is 40m. The reinforced concrete slab is 250mm thick inclusive of the wearing coat. The footpaths are provided on both the sides of the carriageway. The cross girders are provided at 5m c/c. The spacing between main girders is 11m. Find the forces in the central vertical and diagonal members. Design the vertical member. Adopt Class A or B loading whichever gives the worst effect.  EUDLL for Mainline loading (15m span) = 1606 kN& IF = 0.691  EUDLL for Mainline loading (20m span) = 2027 kN& IF = 0.588 | CO3 | An | 16 |
|  |  |  |  |  |  |
| 4. | a. | How would you classify the different types of foundations used in bridges? | CO1 | U | 4 |
|  | b. | Explain how you would verify the adequacy of the dimensions for the pier. | CO5 | E | 12 |
|  |  |  |  |  |  |
| 5. |  | The effective span of a through type plate girder railway bridge is 30m. The stringers are spaced 2m between centerlines. 0.60 kN per meter stock rails and 0.40 kN per metre checkrails are provided. Sleepers are spaced at 0.45m from center to center and are of size 2.8 m x 250 mm 250 mm. The weight of timber may be assumed as 7.5 kN/m3. The spacing between main girders is 9.8m. Determine the maximum bending moment and shear force on the plate girder, if the bridge is to carry standard main lane loading for broad gauge track.  EUDLL for mainline loading (30m span) = 2800 kN& IF = 0.455 | CO3 | A | 16 |
|  |  |  |  |  |  |
| 6. |  | Explain the behavior of different types of bridges. | CO2 | U | 16 |
|  |  |  |  |  |  |
| 7. | a. | Classify the different types of abutments of bridges. | CO1 | U |  |
|  | b. | Summarize the salient features of different types of bearings used in bridges and the intricacies while using them in the field. | CO5 | E | 12 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. |  | Enumerate a case study on a failure or construction of a major bridge. | CO6 | E | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Classify bridges according to loading and site conditions. |
| CO2 | Explain the behaviour of different types of bridges. |
| CO3 | Analyze different types of bridges. |
| CO4 | Design the different components of bridges. |
| CO5 | Appraise on the quality investigation of bridge structures. |
| CO6 | Investigate the reasons for the failure of bridge structures. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 8 |  |  |  |  | 8 |
| CO2 |  | 16 |  |  |  |  | 16 |
| CO3 |  |  |  | 32 |  |  | 32 |
| CO4 |  |  | 32 |  |  |  | 32 |
| CO5 |  |  |  |  | 24 |  | 24 |
| CO6 |  |  |  |  | 20 |  | 20 |
|  | | | | | | | **132** |



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| **Course Code** | **20CE3019** | **Duration** | **3hrs** |
| **Course Name** | **EXPERIMENTAL TECHNIQUES AND INSTRUMENTATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Explain the different type of measurement systems with a detailed description. | CO1 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Illustrate the working principle of LVDT with neat sketches. | CO2 | U | 20 |
|  |  |  |  |  |  |
| 3. |  | Explain the principles and operations of UTM actuators. | CO3 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain different control system. | CO3 | An | 10 |
|  | b. | Explain loading principles and method of load applications. | CO3 | An | 10 |
|  |  |  |  |  |  |
| 5. |  | Explain the following   1. Vibration meter. 2. Seismograph. 3. Wind tunnels. 4. Venturimeter. | CO3 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Define ground penetrating radar. Explain its principle and applications. | CO4 | An | 20 |
|  |  |  |  |  |  |
| 7. |  | Summarize the causes of cracks in structures and explain the methods to measure. | CO5 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | List out the uses and applications of model. | CO6 | R | 10 |
|  | b. | Explain the types of model investigation. | CO6 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | The strength of the concrete in bridge is to be determined using NDT technique. Recommend suitable method. | CO6 | E | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Implement the principles of measurements for static and dynamic response of structure. |
| CO2 | Plan various experiments and the instruments. |
| CO3 | Adopt the various measuring devices for various parameters. |
| CO4 | Choose the appropriate date recorders and improve data interpretation. |
| CO5 | Evaluate the distress in structure. |
| CO6 | Analyse the structure by non-destructive testing methods and model analysis. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  |  |  | 20 |  |  | 20 |
| CO2 |  | 20 |  |  |  |  | 20 |
| CO3 |  | 40 |  | 20 |  |  | 60 |
| CO4 |  |  |  | 20 |  |  | 20 |
| CO5 |  | 20 |  |  |  |  | 20 |
| CO6 | 10 | 10 |  |  | 20 |  | 40 |
|  | | | | | | | **180** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CE1001** | **Duration** | **3hrs** |
| **Course Name** | **BUILDING SCIENCE AND ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define solstice line. | | CO1 | R | | 1 |
| 2. | Write the formula of Sol-air temperature. | | CO1 | R | | 1 |
| 3. | Cite the correct core body temperature and skin temperature. | | CO2 | R | | 1 |
| 4. | State the importance of thermal comfort. | | CO2 | R | | 1 |
| 5. | List out the factors that affect the energy consumption. | | CO3 | R | | 1 |
| 6. | Define the energy efficiency in the building. | | CO3 | R | | 1 |
| 7. | Infer the term used to measure the sound wave. | | CO4 | R | | 1 |
| 8. | Name the three types of expression of decibel scale. | | CO4 | R | | 1 |
| 9. | List out the demerits of day lighting. | | CO5 | R | | 1 |
| 10. | List out the three main components of sound. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | State the types of view used in studying the sun-earth relationship. | | CO1 | | U | 3 |
| 12. | Discuss the three main factors influencing the thermal comfort. | | CO2 | | U | 3 |
| 13. | Enumerate the energy positive building. | | CO3 | | U | 3 |
| 14. | Enumerate the behavior of sound in enclosed space. | | CO4 | | U | 3 |
| 15. | Define the components of daylight. | | CO5 | | U | 3 |
| 16. | List out the thermal comfort parameters. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Explain the elements of climate. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 18. |  | Explain the heat exchange in human body with the equations. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | Summarize the concept of bottom up approach. | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 20. |  | Review the room acoustics parameters. | CO4 | | U | 12 |
| 21. |  | Discover the building design used in controlling the daylight. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 22. |  | Delineate the energy indicators in the building. | CO6 | | U | 12 |
|  |  |  |  | |  |  |
| 23. |  | Examine the classroom acoustic design. | CO4 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Explain the factors affecting the acoustic design of the building. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the climate responsive design of buildings . |
| CO2 | Illustrate the thermal comfort and energy efficiency requirements. |
| CO3 | Illustrate acoustics, in the design of buildings. |
| CO4 | Demonstrate the principles of noise control. |
| CO5 | Design for visual quality and day lighting. |
| CO6 | Appraise the design principles in real time environment. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 15 |  |  |  |  | 17 |
| CO2 | 2 | 15 |  |  |  |  | 17 |
| CO3 | 2 | 15 |  |  |  |  | 17 |
| CO4 | 2 | 27 |  |  |  |  | 29 |
| CO5 | 1 | 15 |  |  |  |  | 16 |
| CO6 | 1 | 27 |  |  |  |  | 28 |
|  | | | | | | | **124** |

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Description automatically generated with medium confidence**

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| **Course Code** | **20CE1003** | **Duration** | **3hrs** |
| **Course Name** | **GREEN DESIGN AND LIFE CYCLE ASSESSMENT** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Illustrate LCA stages with product life cycle. | | CO1 | A | | 1 |
| 2. | Define Ecological Footprint. | | CO1 | R | | 1 |
| 3. | Describe the concept of Embedded Carbon. | | CO2 | U | | 1 |
| 4. | Recall CAP. | | CO3 | R | | 1 |
| 5. | List the types of ISO standards used during LCA. | | CO3 | R | | 1 |
| 6. | Define Operational energy. | | CO3 | R | | 1 |
| 7. | List the limitation for measured indexed to output process. | | CO6 | R | | 1 |
| 8. | Define Life Cycle Cost Analysis. | | CO6 | R | | 1 |
| 9. | Classify the three group of operations in LCIA. | | CO5 | An | | 1 |
| 10. | Define Impact assessment. | | CO5 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Describe the concept of Global Warming. | | CO1 | | U | 3 |
| 12. | List the common functional capabilities of BEMS. | | CO2 | | R | 3 |
| 13. | Interpret the activity based standard. | | CO3 | | A | 3 |
| 14. | State the involvement of Embodied Energy in green designs. | | CO5 | | R | 3 |
| 15. | Illustrate the type of interaction between LCA stages | | CO6 | | U | 3 |
| 16. | Discuss the benefits of Green Transportation. | | CO4 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Discuss overarching principles for Green House Gas protocols. | CO6 | | U | 6 |
|  | b. | List the economic benefits for organizations obtained by the reduction of GHG emissions. | CO5 | | R | 6 |
|  |  |  |  | |  |  |
| 18. | a. | Explain the GHG Protocol Documentations (Any 7). | CO4 | | U | 6 |
|  | b. | Explain Building Energy Management System. | CO3 | | U | 6 |
|  |  |  |  | |  |  |
| 19. | a. | Describe the process of low carbon refurbishment. | CO2 | | U | 6 |
|  | b. | Determine the different methods for Customer Satisfaction. | CO5 | | A | 6 |
|  |  |  |  | |  |  |
| 20. | a. | Explain any two businesses and financial measurement. | CO6 | | U | 7 |
|  | b. | Describe green codes and its types. | CO4 | | U | 5 |
|  |  |  |  | |  |  |
| 21. | a. | Explain Life Cycle Inventory Analysis stages. | CO3 | | U | 6 |
|  | b. | Discuss Life Cycle Sustainability with its advantages. | CO4 | | U | 6 |
|  |  |  |  | |  |  |
| 22. |  | Discuss Sustainability and its three main pillars. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 23. | a. | Discuss the need and steps involved in Life Cycle Inventory Analysis. | CO2 | | U | 6 |
|  | b. | State the examples for low carbon materials that reduce the emissions of carbon in construction field. | CO1 | | R | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | State EIA and the components involved. | CO5 | | R | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the Carbon emission from the buildings. |
| CO2 | Illustrate the energy efficiency principle. |
| CO3 | Apply the energy analysis models. |
| CO4 | Analyze the sustainability of buildings. |
| CO5 | Apply the social and economic aspects in green buildings. |
| CO6 | Formulate techniques for green design in buildings. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 7 | 3 | 1 | - | - | - | 11 |
| CO2 | 3 | 13 | - | - | - | - | 16 |
| CO3 | 3 | 12 | 3 | - | - | - | 18 |
| CO4 | - | 20 | - | - | - | - | 20 |
| CO5 | 22 | 12 | 6 | 1 | - | - | 41 |
| CO6 | 2 | 16 | - | - | - | - | 18 |
|  | | | | | | | **124** |



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| **Course Code:** | **18CE3035** | **Duration** | **3hrs** |
| **Course Name:** | **ATMOSPHERIC ENVIRONMENTAL POLLUTION AND CONTROL** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Explain the effects of air pollution on human, vegetation, and buildings. | CO1 | U | 10 |
|  | b. | Explain the classification of air pollutants. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 2. | a. | Sketch the effects of lapse rate on plume behavior. | CO2 | A | 10 |
|  | b. | Calculate the plume rise for a 3m diameter stack whose exit gas has a velocity of 20 m/s when the wind velocity is 2 m/s, the pressure is 1atm and the stack and surrounding temperatures are 100 and 15, respectively. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 3. | a. | Articulate subsidence, radiation and advection inversion with neat and clean diagrams. | CO2 | A | 8 |
|  | b. | Illustrate stable, non-stable and neutral atmospheric stability using neat and clean diagrams. | CO3 | U | 8 |
|  |  |  |  |  |  |
| 4. | a. | Discuss Indian standards for ambient air quality. | CO2 | U | 10 |
|  | b. | Articulate stack sampling using neat and clean diagrams. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 5. |  | Discuss the particulate matter control technologies (any four) using neat and clean diagrams. | CO5 | U | 16 |
|  |  |  |  |  |  |
| 6. | a. | Define   1. Packed columns (continuous operation) 2. Plate columns (staged operation) | CO4 | R | 8 |
|  | b. | Define   1. Absorption 2. Adsorption | CO4 | R | 8 |
|  |  |  |  |  |  |
| 7. | a. | Write a short note on – (any two)  1. CALINE  2. ISCST3  3. SCREEN 3 | CO6 | A | 8 |
|  | b. | Explain the Gaussian Plume Model and its assumptions using a neat and clean diagram. | CO5 | U | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. |  | Summarize the Aerosol Robotic Network (AERONET) using a neat and clean diagram. | CO6 | U | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the principles of atmospheric chemistry in air pollution. |
| CO2 | Classify, characterize and quantify different types of air pollutants. |
| CO3 | Analyze the effects of air pollution on environment. |
| CO4 | Chose appropriate technology to control air pollution . |
| CO5 | Apply suitable measures in controlling air pollution. |
| CO6 | Develop model for atmospheric pollution. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 16 | - | - | - | - | 16 |
| CO2 | - | 10 | 24 | - | - | - | 34 |
| CO3 | - | 8 | 6 | - | - | - | 14 |
| CO4 | 16 | - | - | - | - | - | 16 |
| CO5 | - | 24 | - | - | - | - | 24 |
| CO6 | - | 20 | 8 | - | - | - | 28 |
|  | | | | | | | **132** |