A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Illustrate the effects of air pollution on humans, vegetation, and buildings. | CO1 | An | 10 |
|  | b. | Classify air pollutants according to their sources and chemical characteristics. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Illustrate the influence of lapse rate on plume behavior using neat labeled sketches. | CO2 | A | 20 |
|  |  |  |  |  |  |
| 3. | a. | 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. Assume if any data is required. | CO2 | A | 10 |
|  | b. | Differentiate between subsidence, radiation, and advection inversions with neat diagrams. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Illustrate stable, unstable, and neutral atmospheric stability conditions. | CO3 | A | 10 |
|  | b. | Evaluate the Indian Ambient Air Quality Standards (NAAQS) in comparison with World Health Organization (WHO) guidelines. | CO3 | E | 10 |
|  |  |  |  |  |  |
| 5. | a. | Write a short note on any two particulate matter control technologies with neat labeled diagrams. | CO4 | A | 10 |
|  | b. | Illustrate a stack sampling setup showing all essential components with a labeled diagram. | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Differentiate between packed columns and plate columns based on operation and efficiency. | CO5 | An | 10 |
|  | b. | Explain the working principles of absorption and adsorption, and indicate suitable applications for each. | CO5 | U | 10 |
|  |  |  |  |  |  |
| 7. |  | Write short notes on any two:  a) CALINE  b) ISCST3  c) SCREEN3 | CO6 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Explain the Gaussian Plume Model with a neat labeled diagram and mention its assumptions. | CO6 | U | 20 |
| **COMPULSORY QUESTION** | | | | | |
| 9. |  | Summarize the Aerosol Robotic Network (AERONET) and its application in air-quality modeling, using a neat flow diagram. | CO6 | A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **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 |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Enumerate the evolution of nanotechnology and its applications in water and wastewater treatment. | CO1 | U | 10 |
|  | b. | Determine the working principles of nanosensors to detect the contaminants in water. | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Compare different methods for synthesizing nanomaterials such as sol-gel, micro-emulsion, electro-spinning, plasma, and CVD techniques. | CO2 | An | 10 |
|  | b. | Explain the basic steps involved in nanoparticle characterization, including sample preparation, testing sequence, and the principle of FTIR and XRD techniques. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 3. |  | Differentiate between magnetic, carbonaceous, composite, clay-supported nanoparticles, and aerogels towards environmental applications. | CO2 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Elaborate the advantages and limitations of magnetic and carbon-based nanomaterials in water purification. | CO5 | A | 10 |
|  | b. | Summarize the key environmental safety practices to be followed during the use, handling, and disposal of nanomaterials in treatment processes. | CO5 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Interpret the morphology and elemental composition of nanomaterials using SEM, EDAX, and XRD data. | CO3 | A | 10 |
|  | b. | Examine the adsorption behavior of carbon nanotubes and fullerenes for micro-pollutant removal. | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Assess how zeta potential and UV-Vis spectroscopy help determine nanoparticle stability and optical properties. | CO3 | E | 10 |
|  | b. | Infer the role of metal oxide nanomaterials (TiO₂, Fe₂O₃, CuO, ZnO) in photocatalytic oxidation of organic pollutants. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Illustrate a workflow for nanomaterial characterization, integrating FTIR and XRD results for phase identification. | CO3 | A | 10 |
|  | b. | Summarize the efficiency of advanced oxidation processes such as photocatalytic and Fenton systems using nanomaterials. | CO6 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Compare microfiltration, ultrafiltration, nanofiltration, and reverse osmosis in terms of pore size, transport mechanism, and pollutant removal. | CO6 | An | 10 |
|  | b. | Explain nanoparticle-embedded membrane reactor for wastewater treatment and justify your material selection. | CO6 | A | 10 |
| **COMPULSORY QUESTION** | | | | | |
| 9. |  | Analyze the ecotoxicity of nanomaterials and their potential impacts on human health and ecosystems. | CO5 | An | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the principles of nanotechnology. |
| CO2 | Synthesize different types of nanoparticles for various applications. |
| CO3 | Conduct characterization studies of nanomaterials. |
| CO4 | Develop nano-sensors. |
| CO5 | Analyze the impact of nanomaterials on the environment. |
| CO6 | Design efficient and effective treatment methods. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| **CO1** | 0 | 10 | 0 | 0 | 0 | 0 | 10 |
| **CO2** | 0 | 0 | 0 | 30 | 0 | 0 | 30 |
| **CO3** | 0 | 10 | 20 | 0 | 10 | 0 | 40 |
| **CO4** | 0 | 0 | 20 | 10 | 0 | 0 | 30 |
| **CO5** | 0 | 10 | 0 | 20 | 10 | 0 | 40 |
| **CO6** | 0 | 0 | 10 | 10 | 10 | 0 | 30 |
|  | | | | | | | **180** |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18CE3084** | **Duration** | **3hrs** |
| **Course Title** | **EXPERIMENTAL TECHNIQUES AND INSTRUMENTATION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | List the different type of measurement systems with a detailed description | CO3 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Discuss in detail about the functions of LVDT and its application in element testing | CO4 | U | 20 |
|  |  |  |  |  |  |
| 3. |  | What is ground penetrating radar? Explain its principle and applications | CO4 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Write the key factors to be considered while conducting experiment with suitable examples | CO3 | A | 20 |
|  |  |  |  |  |  |
| 5. |  | Write short notes on shake table test with neat sketches | CO4 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Discuss the causes and types of experimental errors | CO1 | U | 20 |
|  |  |  |  |  |  |
| 7. |  | Explain different types of crack measuring devices and its working procedure | CO5 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | List different measurement systems and its application in Structural health monitoring | CO6 | R | 20 |
| **COMPULSORY QUESTION** | | | | | |
| 9. |  | Prepare a case study report for conducting the experiment to evaluate load deflection behavior of Steel beam | CO1 | A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18CE3085** | **Duration** | **3hrs** |
| **Course Title** | **FIRE RESISTANT DESIGN OF STRUCTURES** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | Discuss the effect of cover and size of structural elements with regard to fire resistance. | CO3 | | U | 20 |
|  | **(OR)** |  | |  |  |
| 2. | Briefly explain the procedure of fire tests conducted for structural elements as per ISO standards. | CO1 | | R | 20 |
|  |  |  | |  |  |
| 3. | Explain the behaviour of different construction materials subjected to extreme fire conditions. | CO3 | | U | 20 |
|  | **(OR)** |  | |  |  |
| 4. | List different types of fiber and composites used for repair and rehabilitation of fire affected RCC structures | CO5 | | E | 20 |
|  |  |  | |  |  |
| 5. | Discuss the effect of fire on mechanical properties of concrete and rebar | CO3 | | A | 20 |
|  | **(OR)** |  | |  |  |
| 6. | Calculate the moment of resistance of the beam subjected to fire for the duration of 90minutes using isotherm method. Span= 8m, Width=300mm, Depth= 600mm, Density of Concrete= 24kN/m3, Characteristic compressive strength of Concrete= 25MPa, Yield strength of steel= 415MPa, Bar diameter= 16mm, Number of bars= 8 (2 rows), Bottom cover= 25mm | CO6 | | An | 20 |
|  |  |  | |  |  |
| 7. | Explain the details of post fire investigation to be followed in reinforced concrete structures | CO5 | | E | 20 |
|  | **(OR)** |  | |  |  |
| 8. | Analyse the spalling behaviour of normal and high strength concrete | CO5 | | E | 20 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | How the RCC structural system can be protected by active and passive system to improve the fire resistance. | CO5 | | A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Classify different types of fire |
| CO2 | Identify the modes of failures |
| CO3 | Explain the material characteristics exposed to fire |
| CO4 | Analyse the distribution of temperature in concrete |
| CO5 | Evaluate the strength of fire affected member |
| CO6 | Design the structural elements for fire loading |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define the term 'Carbon Footprint'. | | CO1 | R | 1 |
| 2. | State the primary greenhouse gas associated with global warming. | | CO1 | R | 1 |
| 3. | List any one economic benefit of designing an energy-efficient building. | | CO2 | R | 1 |
| 4. | State the purpose of a Building Energy Management System (BEMS). | | CO2 | R | 1 |
| 5. | Name any one internationally recognized green building rating system. | | CO3 | R | 1 |
| 6. | Define 'embodied energy' in the context of construction materials. | | CO3 | R | 1 |
| 7. | State the standard unit for measuring greenhouse gas emissions. | | CO4 | R | 1 |
| 8. | Define LCA. | | CO4 | R | 1 |
| 9. | State the goal of a Life Cycle Inventory (LCI) analysis. | | CO5 | R | 1 |
| 10. | Name any one example of a low-carbon construction material. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Give examples for the relationship between climate change and human activities. | | CO1 | U | 3 |
| 12. | State any two economic advantages of energy efficiency. | | CO2 | U | 3 |
| 13. | Appraise the purpose and function of a green building rating system (like LEED) | | CO3 | An | 3 |
| 14. | Cite the fundamental steps to measure the carbon footprint of a construction activity. | | CO4 | U | 3 |
| 15. | Write the purpose of energy analysis in construction projects. | | CO5 | A | 3 |
| 16. | Describe the significance of using low-carbon materials in green 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. | Explain how the construction sector contributes to global warming through energy consumption and greenhouse gas emissions. | CO1 | U | 6 |
|  | b. | Apply the concept of life cycle assessment to identify major carbon-emitting stages in a building’s life cycle. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. | a. | Describe the different types of benefits (environmental, economic, and social) achieved through energy-efficient practices in buildings. | CO2 | A | 6 |
|  | b. | Illustrate how a building energy management system (BEMS) can be applied to reduce power wastage in a commercial complex. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 19. |  | Explain the methods used for measuring greenhouse gas emissions in the construction. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. | a. | Describe the four key phases of Life Cycle Assessment and their roles in evaluating a product’s environmental impact. | CO4 | U | 6 |
|  | b. | Explain the role of stakeholder feedback in carbon footprint measurement. | CO4 | A | 6 |
|  |  |  |  |  |  |
| 21. |  | Determine the various financial indicators that are linked with emission control. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Explain the need for sustainability assessment in construction projects. | CO3 | U | 6 |
|  | b. | Describe the purpose of an environmental impact assessment. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 23. | a. | Summarize the importance of using low-carbon materials in construction. | CO2 | A | 8 |
|  | b. | Explain how green transport system supports sustainable construction. | CO2 | U | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Justify the selection of any three low-carbon materials for a new residential building, and its contributions to overall sustainability. | CO6 | A | 6 |
|  | b. | Infer the choice of construction materials that directly impact a building's sustainability. | CO6 | An | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | Identify the carbon emission from the buildings |
| **CO2** | Illustrate the energy efficiency principles |
| **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 |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | State Newton’s law of viscosity. | | CO1 | R | 1 |
| 2. | State the mathematical equation for the surface tension on a liquid droplet. | | CO1 | R | 1 |
| 3. | Name the equation of motion derived from Newton’s second law when the force due to compressibility is negligible. | | CO2 | R | 1 |
| 4. | Describe the coefficient of discharge (Cd). | | CO2 | R | 1 |
| 5. | State Manning’s formula. | | CO3 | R | 1 |
| 6. | Define shooting flow. | | CO3 | R | 1 |
| 7. | Explain Net Head of a turbine. | | CO4 | U | 1 |
| 8. | Define cavitation. | | CO4 | R | 1 |
| 9. | State the expression for capillary rise. | | CO5 | R | 1 |
| 10. | Describe absolute pressure. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Determine the derivation for the discharge over a rectangular notch or weir provided in a channel carrying water, as shown in the figure. | | CO1 | A | 3 |
| 12. | Explain specific energy curve with a neat diagram. | | CO2 | U | 3 |
| 13. | List any two conditions for most economical triangle section. | | CO3 | R | 3 |
| 14. | State the mathematical expression for critical velocity (hv).. | | CO4 | U | 3 |
| 15. | Write the equations of mechanical efficiency and volumetric efficiency for a turbine. | | CO5 | A | 3 |
| 16. | Illustrate the main characteristic curves of centrifugal pumps with a graph. | | 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. | Classify the types of fluids with a neat graph between velocity gradient and shear stress. | CO1 | U | 4 |
|  | b. | Determine the viscosity of the fluid between two plates if the distance from the fixed plate is 0.025 mm as shown in figure below, the moving plate travels at 60 m/s, and a force of 2 N per unit area (2 N/m²) is required to maintain this speed. | CO1 | A | 6 |
|  | c. | Illustrate a piezometer and mention the equation for pressure. If at a point A, the height of the liquid (say, water) in the piezometer tube is h, then find the pressure at point A. | CO1 | U | 2 |
|  |  |  |  |  |  |
| 18. | a. | List the advantages of the triangular notch or weir compared to the rectangular notch or weir. | CO2 | R | 3 |
|  | b. | Calculate the head lost due to friction in a pipe of diameter 300 mm and length 50m, through which water is flowing at a velocity of 3m/s using i) Darcy formula, ii) Chezy’s formula for which C= 60. Take kinematic viscosity | CO2 | A | 6 |
|  | c. | Describe the minor energy losses are and list the common cases of occurrence. | CO2 | U | 3 |
|  |  |  |  |  |  |
| 19. | a. | Classify the flow in channels and mention the respective equations. | CO3 | A | 4 |
|  | b. | Apply the Chezy’s formula and derive discharge of uniform flow of water in an open channel as shown in figure below. | CO3 | A | 8 |
|  |  |  |  |  |  |
| 20. | a. | Determine the force exerted by a jet on a stationary vertical plate and its corresponding equation for an inclined plate with a neat sketch. | CO4 | A | 8 |
|  | b. | Classify the types of hydraulic turbines-based on type of energy, direction of flow, head at the inlet and specific speed of the turbine. | CO4 | U | 4 |
|  |  |  |  |  |  |
| 21. | a. | Explain the main parts of the Pelton wheel with a neat diagrams. | CO4 | U | 8 |
|  | b. | Write the design specifications for Pelton wheel. | CO4 | A | 4 |
|  |  |  |  |  |  |
| 22. | a. | Classify the types of draft tubes with neat diagrams. | CO5 | U | 6 |
|  | b. | Determine the specific speed of the machine, power generated and type of turbine if the turbine operates under a head of 25m at 200 r.p.m, and having a discharge of 9 m3/s. Take efficiency as 90%. Assume if any data is required. | CO5 | A | 6 |
|  |  |  |  |  |  |
| 23. | a. | Illustrate the main parts of the centrifugal pump in detail. | CO6 | A | 8 |
|  | b. | Define the following terms:   1. Suction Head (hs) 2. Delivery Head (hd) 3. Static Head (Hs) 4. Manometric Head (Hm) | CO6 | R | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Determine the minimum starting speed of the pump if it works against a head of 30m. The diameters of an impeller of centrifugal pump at inlet and outlet are 30cm and 60cm respectively. Assume if any data is required. | CO6 | A | 6 |
|  | b. | Explain the operation of multistage centrifugal pumps (series arrangement) for achieving high heads. | CO6 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **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** | Select method to design pipe flows including losses |
| **CO5** | Formulate and solve boundary layer problems |
| **CO6** | Relate the physical parameters using dimensional analysis |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20CE2008** | **Duration** | **3hrs** |
| **Course Title** | **TRAFFIC ENGINEERING AND MANAGEMENT** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | State the scope of traffic engineering. | | CO1 | R | 1 |
| 2. | Recall the types of vulnerable road users. | | CO1 | U | 1 |
| 3. | List any four uses of traffic volume studies. | | CO2 | R | 1 |
| 4. | Mention the recommended base length for spot speed survey as per IRC guidelines. | | CO2 | U | 1 |
| 5. | Define PCU. | | CO3 | R | 1 |
| 6. | Enlist the advantages of one-way streets in effective traffic management for a city. | | CO3 | U | 1 |
| 7. | Mention the different shapes of Rotary Island to be considered in a rotary design. | | CO4 | R | 1 |
| 8. | Under what circumstances rotary intersection and signalized intersection are recommended. | | CO4 | U | 1 |
| 9. | Draw any two warning signs. | | CO5 | R | 1 |
| 10. | Define Travel Demand Management. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Write short notes on PIEV Theory. | | CO1 | A | 3 |
| 12. | Identify the key features to be considered for Parking survey in congested cities like Mumbai. | | CO2 | U | 3 |
| 13. | Determine the parking turnover for an area having 10 numbers of parking spaces with 100 numbers of vehicles to be parked in a day. | | CO3 | An | 3 |
| 14. | Calculate the Lost time per cycle, if the red amber time is 12 seconds for a two phase traffic signal in an at-grade intersection. | | CO4 | U | 3 |
| 15. | Draw Three informatory signs to be installed in roads. | | CO5 | An | 3 |
| 16. | Highlight the significance of Car Pooling in metropolitan cities like Bangalore. | | 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 briefly the various factors which affect the road user characteristics and their effects in traffic performance. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. | a. | Explain in brief the origin and destination survey methods which are commonly used in traffic planning of metro cities. | CO2 | A | 6 |
|  | b. | List and explain the different methods of carrying out traffic volume studies. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 19. |  | Enumerate the various desirable parking space standards for different land use as per IRC guidelines | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Illustrate with a neat sketch the concept of channelization. Explain how it improves intersection efficiency and safety. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | Compare the Safe System Approach with traditional traffic safety models. How can Indian cities adopt this approach to reduce road fatalities? | CO5 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | The average normal flow of traffic on cross roads P and Q during design period are 400 and 200 PCU / hour respectively; the saturation flow values on these roads are estimated as 1200 and 1000 PCU / hour respectively. The all red time required for pedestrian crossing is 13 seconds. Design two phase signal with pedestrian crossing by Webster method | CO3 | An | 12 |
|  |  |  |  |  |  |
| 23. |  | Envisage few regulatory measures in traffic management influencing speed zoning and reduction of traffic congestion in cities | CO6 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Summarize the various tools of traffic management system and its importance in real life applications. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the fundamentals of traffic engineering |
| CO2 | Carry out different traffic studies |
| CO3 | Design channels, intersections, signals, roundabouts and parking arrangements |
| CO4 | Express the application of traffic flow theory |
| CO5 | Enhance safety and environment in all design aspects |
| CO6 | Develop Traffic management Systems |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define the term sustainable development. | | CO1 | R | 1 |
| 2. | Name any two guiding principles of sustainability. | | CO1 | R | 1 |
| 3. | Define life cycle cost analysis. | | CO2 | R | 1 |
| 4. | Write the formula for benefit-cost ratio. | | CO2 | A | 1 |
| 5. | State any two environmental product declaration (EPD) parameters. | | CO3 | R | 1 |
| 6. | Define life cycle impacts assessment (LCIA). | | CO3 | R | 1 |
| 7. | Define social sustainability. | | CO4 | R | 1 |
| 8. | State any two components of social impact assessment. | | CO4 | R | 1 |
| 9. | List any two low-impact development practices in environmental engineering. | | CO5 | R | 1 |
| 10. | State two sustainable practices used in transportation engineering. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain the concept of the triple bottom line in sustainability. | | CO1 | U | 3 |
| 12. | Identify the significance of rate of return in economic sustainability. | | CO2 | U | 3 |
| 13. | Explain the role of ecological footprint in environmental sustainability. | | CO3 | U | 3 |
| 14. | Interpret the importance of human development index in assessing social well-being. | | CO4 | U | 3 |
| 15. | Explain the principles of coastal resilience and living shorelines in sustainable design. | | CO5 | U | 3 |
| 16. | Analyze how intelligent transportation systems (ITS) contribute to environmental, economic, and social dimensions of sustainability in modern cities. | | CO6 | 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. | Explain the paradigm shift towards sustainability in modern civil engineering. | CO1 | U | 6 |
|  | b. | Apply the concept of the triple bottom line to balance environmental, economic, and social goals in a construction project. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. | a. | Classify the methods of life cycle cost analysis (LCCA) with examples. | CO2 | An | 6 |
|  | b. | Describe the advantages and limitations of using benefit-cost ratio and annual worth methods in project evaluation. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 19. | a. | Illustrate the structure and categories of LCIA and their relevance to green infrastructure. | CO3 | A | 8 |
|  | b. | Differentiate between product category rule (PCR) and environmental product declaration (EPD). | CO3 | An | 4 |
|  |  |  |  |  |  |
| 20. | a. | Generalize the importance of social impact assessment in large civil infrastructure projects. | CO4 | U | 6 |
|  | b. | Explain how social media influences sustainable practices in civil engineering. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 21. | a. | Explain sustainable approaches in geotechnical engineering such as stabilized earth walls and alternate filler materials. | CO5 | U | 6 |
|  | b. | Apply the concept of planetary boundaries by explaining any seven key boundaries. | CO5 | A | 6 |
|  |  |  |  |  |  |
| 22. | a. | Illustrate the use of fly ash and bamboo in sustainable building projects to enhance the structural performance and environmental efficiency. | CO6 | A | 6 |
|  | b. | Summarize the effectiveness of design for adaptability and deconstruction in reducing construction waste. | CO6 | E | 6 |
|  |  |  |  |  |  |
| 23. | a. | Paraphrase the material and waste management strategies for sustainable infrastructure. | CO6 | U | 6 |
|  | b. | Examine the interrelationship between worker safety, community participation, and transport sustainability outcomes in smart city projects. | CO6 | A | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Illustrate a case study on social impact assessment of a dam project and its effects on displaced communities. | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | Identify the concepts of sustainability |
| **CO2** | Understand the Concepts of Economic Sustainability |
| **CO3** | Analyse the Concepts of Environmental Sustainability |
| **CO4** | Analyse 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. |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

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

IS 456, SP 16 codes are permitted, Assume the missing design data suitably

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | State the partial safety factor for concrete. | | CO1 | U | 1 |
| 2. | Describe the load factors used for the limit state of collapse and limit state of serviceability. | | CO1 | R | 1 |
| 3. | The length and breadth of a slab are 7 m and 3 m respectively. Classify the slab. | | CO2 | A | 1 |
| 4. | Define Creep. | | CO2 | R | 1 |
| 5. | State the limiting value of the L/D ratio for a simply supported beam. | | CO3 | R | 1 |
| 6. | Define a singly reinforced section. | | CO3 | R | 1 |
| 7. | Estimate the self-weight of a footing if the load on the column is 1500 kN. | | CO4 | An | 1 |
| 8. | Explain the failure mode of a short column. | | CO4 | U | 1 |
| 9. | Classify the types of shallow footing. | | CO5 | U | 1 |
| 10. | Draw the typical reinforcement details of an R.C. one-way slab. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain the working stress method of design. | | CO1 | U | 3 |
| 12. | Describe the limit state of collapse. | | CO2 | U | 3 |
| 13. | Develop a diagram to indicate the design details of a simply supported beam. | | CO3 | An | 3 |
| 14. | Explain the characteristics of long columns. | | CO4 | U | 3 |
| 15. | Discuss the need for combined footing. | | CO5 | U | 3 |
| 16. | Describe the approximate methods available for analysis of multistory 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. | a. | Explain the stress block used in the limit state method of design. | CO1 | U | 4 |
|  | b. | Draw the stress-strain curve for mild steel and explain its salient features. | CO1 | A | 4 |
|  | c. | State and explain the assumptions made in the limit state method of design. | CO1 | U | 4 |
|  |  |  |  |  |  |
| 18. |  | Design the one way simply supported slab it is rest on 220 mm thick masonry wall for the following data  Size of slab – 3.5x10.5m  Grade of concrete – M20  Grade of steel – Fe415  Live load - 2.5kN/m2  Floor finish – 1 kN/m2 | CO2 | An | 12 |
|  |  |  |  |  |  |
| 19. | a. | Design a beam(doubly reinforced) for the following data.  Beam of size 230x500mm  Span of the beam is 7.5m  M40 concrete and Fe 500 grade  Moment – 250kNm | CO3 | An | 10 |
|  | b. | Estimate the value of Xumax/*d* for Fe 450 steel. | CO3 | A | 2 |
|  |  |  |  |  |  |
| 20. |  | 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 | An | 12 |
|  |  |  |  |  |  |
| 21. |  | Design a reinforced concrete footing for a rectangular column of section 300 mm by 500 mm supporting an axial factored load of 1500 kN. The safe bearing capacity of the soil at site is 185 kN/m2. Adapt M-20 grade concrete and Fe-415 grade steel. | CO5 | An | 12 |
|  |  |  |  |  |  |
| 22. |  | Explain the preliminary analysis of multistoreyed RCC buildings with neat sketches. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 23. |  | Determine the reinforcement to be provided for a column subjected to biaxial bending for the following data.  Axial load – 4500kN  Grade of concrete – M30  Grade of steel - Fe500  Size of column – 230x450mm  Bending in X direction – 120kNm  Bending in Y direction – 200kNm | CO4 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain the steps involved in inspecting and evaluating the structural condition of an existing RCC building. | CO6 | U | 6 |
|  | b. | Discuss the importance of reading reinforcement details and preparing as-built drawings of an existing RCC building. | CO6 | U | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **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 |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20CE2013** | **Duration** | **3hrs** |
| **Course Title** | **DESIGN OF STEEL STRUCTURES** | **Max. Marks** | **100** |
|  | **IS 800 and Steel Table is permitted** |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Name the property of steel that defines the stress at which it begins to deform plastically. | | CO1 | U | 1 |
| 2. | Recognize the mechanical property that defines steel’s ability to undergo plastic deformation without fracture. | | CO1 | R | 1 |
| 3. | Name the type of load that includes the self-weight of structural elements. | | CO2 | R | 1 |
| 4. | State the weld type that joins two surfaces at 90 degrees with a triangular cross-section. | | CO2 | R | 1 |
| 5. | Define built-up section. | | CO3 | U | 1 |
| 6. | List a type of failure in columns. | | CO3 | R | 1 |
| 7. | List an advantage of welded connection. | | CO4 | U | 1 |
| 8. | Name the full form of HSFG bolts. | | CO4 | R | 1 |
| 9. | State the full form of LTB failure. | | CO5 | U | 1 |
| 10. | Cite the value of Young’s modulus (E) for steel. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Illustrate erection loads. | | CO1 | U | 3 |
| 12. | Explain load combinations. | | CO2 | U | 3 |
| 13. | Differentiate between the various classifications of cross-sections as per IS 800. | | CO3 | U | 3 |
| 14. | Differentiate various types of elements as per IS 800. | | CO4 | U | 3 |
| 15. | Illustrate the concept of sway frames. | | CO5 | U | 3 |
| 16. | Explain sway frames. | | 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. |  | Design a splice for joining tension member sections 160 x 10 mm and 250 x 14 mm. The member is subjected to a factored tensile load of 300 kN. Assume Fe410 grade of steel. Provide 20 mm diameter bolts of grade 4.6 for making the connections. | CO2 | An | 12 |
|  |  |  |  |  |  |
| 18. |  | Design a built up column 9 m long to carry a factored axial compressive load of 1100 kN. The column is restrained in position but not in direction at both the ends. Design the column with connecting system as battens with bolted connections. Use two channel sections back to back. Use steel of grade Fe 410. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 19. |  | Design a built up column 10 m long to carry factored axial load of 1080 kN. The column is restrained in position but not in direction at both the ends. Provide single lacing system with bolted connections. Assume steel of grade Fe 410 and bolts of grade 4.6. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 20. |  | Design a laterally unsupported beam for the following data.  Effective span: 4 m  Maximum bending moment: 550 kNm  Maximum shear force: 200 kN  Steel of grade: Fe 410. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 21. |  | Design the principal rafter of a fink type roof trust for the following data. Design also its connection using 20 mm diameter bolts.  Design compressive load: 165kN  Design tensile load: 60 kN  Length of rafter panel: 2.235 m  Grade of steel Fe 410  Grade of bolts 4.6 | CO5 | An | 12 |
|  |  |  |  |  |  |
| 22. |  | Design a laterally supported beam of effective span 6 m for the following data.  Grade of steel: Fe 410  Maximum bending moment: M = 150 kNm  Maximum shear force: V = 210 kN | CO4 | An | 12 |
|  |  |  |  |  |  |
| 23. | a. | Design a high-strength bolted connection for an ISA 100 mm × 100 mm × 10 mm transmitting a factored tensile load of 100 kN, connected to a 12 mm thick gusset plate, for the following cases: (a) when slip is not permitted, and (b) when slip is permitted. Assume the steel is of grade Fe 410 | CO1 | An | 6 |
|  | b. | Design the fillet welds for a 75 mm × 8 mm tie member transmitting a factored load of 145 kN, connected to a 12 mm thick gusset plate. Assume the steel is of grade Fe 410. | CO1 | An | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Design a bolted gusset base for a column ISHB 350 @ 661.2 N/m subjected to an axial compressive factored load of 1700 kN. The base plate rests on an M15 grade concrete pedestal, and the connections are made using 24 mm diameter bolts of grade 4.6. | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | Identify the behaviour of members |
| **CO2** | Estimate the forces in members |
| **CO3** | Design the member for forces |
| **CO4** | Choose suitable codal provisions |
| **CO5** | Explain the design intricacies |
| **CO6** | Formulate the design for steel structures |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Mention any two types of Buildings. | | CO1 | R | 1 |
| 2. | Compare load building structures and framed structures. | | CO1 | U | 1 |
| 3. | Give the requirements of good foundation. | | CO2 | R | 1 |
| 4. | Write different types of flooring. | | CO2 | U | 1 |
| 5. | DPC stands for ---------------- | | CO3 | R | 1 |
| 6. | Recall the Acoustics materials used in construction. | | CO3 | U | 1 |
| 7. | List out the equipments used for excavation. | | CO4 | R | 1 |
| 8. | Classify types of costs. | | CO4 | U | 1 |
| 9. | Enlist the applications of drones inconstruction sites. | | CO5 | R | 1 |
| 10. | Specify the significance of 3D Printing in Construction. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Write short notes on Green Building Concepts. | | CO1 | An | 3 |
| 12. | Differentiate Shallow and Deep foundation. | | CO2 | U | 3 |
| 13. | Indicate the importance of Thermal Insulation in Race Cars. | | CO3 | An | 3 |
| 14. | Define Tunnelling and its types. | | CO4 | U | 3 |
| 15. | Quote the significance of Prefabrication in Construction Industry. | | CO5 | An | 3 |
| 16. | Point out the Merits and Demerits of Automation in Construction. | | 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 role of regulatory bye-laws in shaping building design and construction, and evaluate their impact on safety, functionality, and compliance in the construction industry | CO1 | An | 12 |
|  |  |  |  |  |  |
| 18. | a. | Discuss any two types of joints in concrete and mention their importance. | CO2 | A | 6 |
|  | b. | Summarize the factors to be considered for Scaffolding. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 19. |  | Envisage the importance of fire protection in the design and assessment of fire safety systems | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Narrate the safety precautions that construction workers should follow while operating heavy equipment. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | Formulate the essential safety measures and precautions that operators and workers should adhere when working with cranes to prevent accidents and maintain a safe work environment | CO5 | A | 12 |
|  |  |  |  |  |  |
| 22. | a. | Enumerate the meaning of underpinning and its application in construction. | CO2 | A | 6 |
|  | b. | Explain the purpose of plastering and pointing in building construction. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 23. |  | Examine the essential safety measures and precautions required during drilling operations, particularly in deep and high-risk construction areas | CO4 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Elaborate how robotic technology can improve the production of precast concrete elements and propose solutions to overcome the challenges of adopting this technology in the construction industry. | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | 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 |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV/DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20CE2017** | **Duration** | **3hrs** |
| **Course Title** | **DISASTER PREPAREDNESS AND PLANNING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define the term hazards. | | CO1 | R | 1 |
| 2. | List the type of disaster. | | CO1 | R | 1 |
| 3. | State vulnerability assessment. | | CO2 | R | 1 |
| 4. | State a suitable example of a man-made disaster. | | CO2 | R | 1 |
| 5. | Write the concept of risk in disaster. | | CO3 | U | 1 |
| 6. | List the types of early warning systems. | | CO3 | R | 1 |
| 7. | Define NDRF (National Disaster Response Force). | | CO5 | R | 1 |
| 8. | Name the general effects of a disaster. | | CO4 | R | 1 |
| 9. | Write the role of institutions during disaster | | CO5 | R | 1 |
| 10. | List any two nodal agencies of India for disaster preparedness. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Recall then causes of disaster | | CO6 | U | 3 |
| 12. | Cite the ‘assessment of risk’ caused in disaster | | CO5 | U | 3 |
| 13. | Define the terms  I. Disaster  II. Vulnerability. | | CO1 | R | 3 |
| 14. | Differentiate preparedness and mitigation. | | CO1 | U | 3 |
| 15. | Explain the role of media in effective disaster management. | | CO4 | U | 3 |
| 16. | List the agencies for disaster management. | | CO6 | 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. |  | Report any four current trends observed on man-made disaster as a case study. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Classify the disaster types and its health effects in detail. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Write about structural and non-structural measures for disaster preparedness. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Articulate the hazardous location classification using a suitable diagram. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | Illustrate environmental management system during disaster. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Interpret disaster management plans at various levels. | CO6 | U | 12 |
|  |  |  |  |  |  |
| 23. |  | Explain the role and function of National Disaster Management Authority (NDMA). | CO5 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Summarize key national level decision making bodies for disaster management. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20CE2020** | **Duration** | **3hrs** |
| **Course Title** | **ARTIFICIAL INTELLEGENCE IN PROJECT MANAGEMENT** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Cite the type of AI that is designed to perform specific tasks, such as speech recognition. | | CO1 | U | 1 |
| 2. | Recognize the type of AI that possesses human-like intelligence. | | CO1 | R | 1 |
| 3. | Recall the type of AI that is hypothetical and represents a level where machines can understand emotions. | | CO2 | R | 1 |
| 4. | Recall a benefit of AI in any of a civil Engineering project. | | CO2 | R | 1 |
| 5. | Describe artificial intelligence. | | CO3 | U | 1 |
| 6. | State the full form of ANN. | | CO3 | R | 1 |
| 7. | Cite a common marking challenge faced by AI during estimation. | | CO4 | U | 1 |
| 8. | Memorize a challenge while predicting possible cost overrun using AI. | | CO4 | R | 1 |
| 9. | Cite an Impact of AI on future project performance management strategies. | | CO5 | U | 1 |
| 10. | Recall one AI application used for traffic management. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Illustrate about metrics in AI. | | CO1 | An | 3 |
| 12. | Illustrate about Naive Bayes Classifier. | | CO2 | U | 3 |
| 13. | Explain about fuzzy logic. | | CO3 | U | 3 |
| 14. | Explain the importance of data quality in AI-based estimation. | | CO4 | U | 3 |
| 15. | Define probability distribution. | | CO5 | R | 3 |
| 16. | Explain about expert decisions in project management. | | 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. | Explain in detail about knowledge representation, its types and their advantages. | CO1 | U | 6 |
|  | b. | Explain about decision tree and its working method. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Explain about knowledge based expert system (KBES) and steps involved. | CO3 | U | 6 |
|  | b. | Explain the steps involved in Genetic algorithm. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 19. | a. | Explain in detail about forward reasoning, backward reasoning and reasoning with uncertainty. | CO1 | U | 6 |
|  | b. | Summarize about Artificial Neuron Network, its structure and functions. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. |  | Explain the concept of probability distributions in risk management and different types commonly applied. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Infer the importance of Monte Carlo Simulation results in decision-making for risk management in civil engineering projects. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Summarize estimating probability of occurrence using AI. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 23. |  | Explain the steps in implementing ANN for Engineering design with a help of case study. | CO3 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain how AI can be used to improve management efficiency and describe the steps involved in its implementation | CO6 | R | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | Identify the problems in Civil Engineering and solve using AI |
| **CO2** | Formulate problems and make decisions |
| **CO3** | Explain various search algorithms for problem solving |
| **CO4** | Apply Artificial Intelligence in real time problems |
| **CO5** | Participate in the design of systems that act intelligently and learn from experience |
| **CO6** | Assess the applicability, strengths and weaknesses of the basic knowledge representation |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions (IS 456:2000 and IS 10262:2019 is permitted)** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | List the main ingredients of cement. | | CO1 | R | 1 |
| 2. | Name any two types of fine aggregates. | | CO1 | R | 1 |
| 3. | Infer the standard consistency test on cement. | | CO2 | R | 1 |
| 4. | State any TWO tests on raw cement. | | CO2 | R | 1 |
| 5. | List any two tests on freshly prepared concrete. | | CO4 | R | 1 |
| 6. | Define compressive strength of concrete. | | CO4 | R | 1 |
| 7. | Name any two purposes of non-destructive testing. | | CO6 | R | 1 |
| 8. | List the Indian Standard codes used for designing the concrete. | | CO3 | R | 1 |
| 9. | Recall the types of concrete. | | CO4 | R | 1 |
| 10. | State the purpose of the rebound hammer test. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Write short notes on field test on cement samples. | | CO1 | U | 3 |
| 12. | Illustrate the standard consistency test on cement with a suitable example. | | CO5 | A | 3 |
| 13. | Classify the aggregates based on the source and weight. | | CO2 | U | 3 |
| 14. | Infer ready-mix concrete and its types in detail. | | CO5 | U | 3 |
| 15. | Infer the durability property of concrete and its governing factors. | | CO4 | U | 3 |
| 16. | Cite the principle of the ultrasonic pulse velocity 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. | a. | Illustrate the dry cement manufacturing process adopted in India with a suitable flow chart. | CO1 | U | 6 |
|  | b. | Infer Bouge’s compounds and their role in the hydration process of cement with suitable equations. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Explain different types of cement and their uses in the structural and non-structural applications. | CO1 | U | 6 |
|  | b. | Compare crushing, impact, and abrasion tests on aggregates. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 19. | a. | Explain the procedure for conducting compressive strength and split tensile strength tests on concrete. | CO4 | U | 6 |
|  | b. | Describe any three workability tests on fresh concrete in detail. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 20. | a. | Illustrate the role of the concrete mixer and its types in detail with a suitable example. | CO2 | A | 6 |
|  | b. | Summarize the concrete transportation methods and their importance in detail. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 21. | a. | Classify the types of chemical attack on concrete in detail. | CO6 | U | 6 |
|  | b. | Summarize the role of Geopolymer composite | CO3 | U | 6 |
|  |  |  |  |  |  |
| 22. |  | Design a concrete mix for slab construction with the following data:   1. Grade: M30 2. Cement: Ordinary Portland cement of grade 33 3. Specific gravity of cement: 3.11 4. Fine aggregate: M-sand with a specific gravity and maximum particle size of 2.3 and 2.36 mm. 5. Coarse aggregate: crushed stones with a specific gravity and maximum particle size of 2.7 and 20 mm. 6. Slump: 100 mm.   Use IS 10262:2019 for designing the concrete and assume that any data is required. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Prepare a concrete for M20 mix using IS 10269:2019 guidelines, with the following data:   1. Portland Pozzolana Cement, having a specific gravity of 2.9 2. M-sand with a specific gravity and maximum particle size of 2.6 and 4.75 mm 3. Coarse aggregate with a specific gravity and maximum particle size of 2.8 and 10 mm 4. Concrete should have a slump of 62 mm.   Assume that any data is required. | CO4 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain any three non-destructive testing methods with a suitable sketch. | CO6 | U | 6 |
|  | b. | Compare self-compacting concrete and fiber-reinforced concrete with their advantages and disadvantages in detail. | CO5 | U | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | Categorize the construction materials, their components, and the 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 detail. |
| **CO6** | Demonstrate non-destructive techniques on concrete structures. |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define preventive maintenance. | | CO1 | R | 1 |
| 2. | Name any two types of cracks commonly found in reinforced concrete structures. | | CO1 | R | 1 |
| 3. | Define voids and permeability in concrete. | | CO1 | R | 1 |
| 4. | List the fabrication errors in steel structures. | | CO1 | R | 1 |
| 5. | Infer the outcome of the Ultrasonic Pulse Velocity test. | | CO3 | U | 1 |
| 6. | State the term half-cell potential in the context of corrosion measurement. | | CO1 | R | 1 |
| 7. | State the purpose of shoring during repairs. | | CO4 | R | 1 |
| 8. | List any two coatings used for reinforcement to prevent corrosion. | | CO6 | R | 1 |
| 9. | Differentiate between repair and rehabilitation.. | | CO6 | U | 1 |
| 10. | Write about ‘controlled demolition’ in one sentence. | | CO4 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Recall the steps involved in the assessment procedure of a distressed structure. | | CO2 | A | 3 |
| 12. | Cite the preventive and remedial measures for corrosion in steel structures. | | CO3 | U | 3 |
| 13. | Compare ‘Non-Destructive Testing’ with ‘Semi-Destructive Testing’ with a suitable example. | | CO3 | U | 3 |
| 14. | List masonry defects and their preventive and remedial measures. | | CO4 | U | 3 |
| 15. | Write about rapid chloride penetration test on concrete with a suitable sketch. | | CO4 | U | 3 |
| 16. | Infer the penetration resistance test on the concrete structure. | | 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. | Describe the various causes of deterioration in concrete structures. | CO1 | U | 6 |
|  | b. | Compare the civil structures that undergo distress with their causes in detail. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Elaborate the effects of corrosion on the strength and service life of a reinforced concrete structure. | CO2 | U | 6 |
|  | b. | Illustrate the quality assurance parameters for ensuring the durability of concrete. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 19. | a. | Describe the procedure for conducting a core cutting test on a concrete sample. | CO3 | U | 6 |
|  | b. | Differentiate the LOK and CAPO tests with a suitable sketch. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. | a. | Explain different methods for strengthening the footing of an existing structure. | CO3 | U | 6 |
|  | b. | Infer the repair methodology for a structure distressed by overloading. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 21. | a. | Illustrate any four building strengthening techniques. | CO4 | A | 6 |
|  | b. | Describe any four non-destructive testing methods in detail. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 22. | a. | Infer the strategies to prevent distress in a building located in an offshore area. | CO4 | U | 6 |
|  | b. | Explain Cathodic Protection of reinforced concrete structures. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 23. | a. | Compare the corrosion inhibitors used in concrete repair with their merits and demerits. | CO5 | U | 6 |
|  | b. | Illustrate the benefits of retrofitting a building in detail with a suitable example. | CO5 | A | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Describe the sequence of operations for the demolition of a reinforced concrete building. | CO6 | U | 6 |
|  | b. | Write the key learning outcomes regarding safety and planning during the demolition of a building. | CO6 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **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 repair techniques to damage structures and various |
| **CO5** | Evaluate the strength of structural elements |
| **CO6** | Retrofit and strengthen RCC and Steel structures |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20CE2035** | **Duration** | **3hrs** |
| **Course Title** | **BUILDING INFORMATION MODELING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | State the importance of hardware requirements for BIM applications. | | CO1 | R | 1 |
| 2. | Name any one-fabrication benefit of adopting BIM in construction. | | CO1 | R | 1 |
| 3. | Identify any one type of lighting used in Autodesk rendering. | | CO2 | R | 1 |
| 4. | Recall any one purpose of performing a virtual takeoff in BIM. | | CO2 | R | 1 |
| 5. | Identify any one-safety system integrated into BIM modelling. | | CO3 | R | 1 |
| 6. | State any one factor that affects indoor air quality in buildings. | | CO3 | R | 1 |
| 7. | List the purpose of lighting analysis in BIM. | | CO4 | R | 1 |
| 8. | Recall the main purpose of creating electrical circuits in a BIM model. | | CO4 | R | 1 |
| 9. | List any two advantages of using BIM 360 for cloud-based project collaboration. | | CO5 | R | 1 |
| 10. | Identify the purpose of the clash detective window in Navisworks manage. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Name any two BIM tools and state their main applications. | | CO1 | R | 3 |
| 12. | Identify the purpose of exposure control in rendering. | | CO2 | R | 3 |
| 13. | List any three building elements included in BIM models. | | CO3 | R | 3 |
| 14. | List any three key components of an electrical design in BIM. | | CO4 | R | 3 |
| 15. | Give examples how facility management can benefit from BIM integration post-construction. | | CO5 | U | 3 |
| 16. | Write the process of setting clash rules and selecting objects for clash testing in a BIM model. | | 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. | Summarize the overall benefits of BIM in design and construction. | CO1 | U | 6 |
|  | b. | Explain the improvement of project collaboration and reduction of errors through BIM. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Describe the role of sun and sky lights in photorealistic rendering. | CO2 | U | 6 |
|  | b. | Illustrate the process of creating and editing materials in Autodesk rendering. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 19. | a. | Analyze the role of elevators, escalators, and parking lot monitoring systems in BIM-enabled buildings. | CO3 | An | 6 |
|  | b. | Explain the process of creating 3D architectural and structural models in BIM. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. |  | Assess the process of creating circuits, conduits, and power distribution systems in BIM, and explain the integration of a fire alarm system into the overall electrical design. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Elaborate the effectiveness of BIM 360 as a cloud-based platform for managing multidisciplinary collaboration, document control, and project coordination. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | Explain the construction and fabrication benefits of BIM with suitable examples. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 23. |  | Examine the complete process of performing virtual and 2D quantity take-off in BIM, and describe the management, updating, and export of data for project use. | CO2 | U | 12 |
|  |  |  |  |  |  |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Analyze the relationship between clash detection results and construction sequencing in BIM 4D/5D environments, explaining how resolving clashes can influence project cost and scheduling outcomes. | CO6 | A | 12 |
|  |  |  |  |  |  |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | Model the architectural features |
| **CO2** | Select the appropriate materials for MEP |
| **CO3** | Analyse the efficiency of HAVC system |
| **CO4** | Plan the schedule for the construction projects |
| **CO5** | Estimate the cost of project |
| **CO6** | Interpret the clash analysis report |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20CE2041** | **Duration** | **3hrs** |
| **Course Title** | **BASICS OF REMOTE SENSING AND GEOGRAPHICAL**  **INFORMATION SYSTEM** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define remote sensing. | | CO1 | R | 1 |
| 2. | List two common types of satellite orbits. | | CO1 | U | 1 |
| 3. | Write about CCD in one sentence. | | CO2 | U | 1 |
| 4. | State the working principle of a space borne Thermal Infrared (TIR) sensor. | | CO2 | R | 1 |
| 5. | Define the term ‘Depth perception’ in 2D. | | CO3 | R | 1 |
| 6. | Identify one key feature of a Geographic Information System (GIS). | | CO3 | U | 1 |
| 7. | Give two examples of open-source software used in GIS. | | CO4 | R | 1 |
| 8. | Name any two standard formats for vector datasets. | | CO4 | R | 1 |
| 9. | Define ‘Quadtree encoding’. | | CO5 | R | 1 |
| 10. | State one specific application of GIS in deformation monitoring. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Recall three key factors that determine the spectral signature of an object. | | CO1 | U | 3 |
| 12. | Specify three fundamental characteristics of a satellite's orbit. | | CO2 | U | 3 |
| 13. | State any three key elements of visual image interpretation. | | CO3 | R | 3 |
| 14. | Brief about the historical development of maps by describing three significant stages. | | CO4 | U | 3 |
| 15. | Cite the fundamental steps involved in the process of manual digitizing. | | CO5 | U | 3 |
| 16. | Write the concept of the Weighted Overlay method and list two typical input layers used for landslide risk zonation. | | 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. | Illustrate interaction of incoming solar radiation with the atmosphere. | CO1 | A | 6 |
|  | b. | Explain the phenomenon of atmospheric scattering and compare the three main forms: Rayleigh, Mie, and Non-selective scattering with neat diagrams. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Differentiate between Instantaneous Field of View (IFOV) and spatial resolution. | CO2 | U | 6 |
|  | b. | Compare the typical sensor payloads found on an Earth resource satellite with those on a meteorological satellite. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 19. | a. | Classify the different types of remote sensing data products derived from sensors. | CO3 | U | 6 |
|  | b. | Differentiate between pixel-based and object-based image classification methods. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. | a. | Illustrate the five basic components of a GIS, using diagrams to illustrate how they interrelate. | CO4 | A | 8 |
|  | b. | Interpret the advantages and key roles of using a Database Management System (DBMS) in a GIS environment. | CO4 | A | 4 |
|  |  |  |  |  |  |
| 21. | a. | Explain the key characteristics of an integrated data model for spatial analysis in GIS. | CO5 | A | 8 |
|  | b. | Describe the key features and functions of a modern Land Information System (LIS). | CO5 | U | 4 |
|  |  |  |  |  |  |
| 22. | a. | Write the process and primary applications of network analysis in GIS. | CO3 | A | 8 |
|  | b. | Summarize the process of post-scanning operations in data digitization. | CO3 | U | 4 |
|  |  |  |  |  |  |
| 23. | a. | Illustrate the workflow, a key application, and a major challenge of multispectral classification. | CO2 | A | 8 |
|  | b. | Differentiate between supervised and unsupervised classification techniques in remote sensing. | CO2 | U | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain the process used in dam deformation monitoring using GIS. | CO6 | A | 8 |
|  | b. | Describe the essential steps for creating a GIS-based flood model using Digital Elevation Model (DEM) and rainfall data. | CO6 | U | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **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. |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20CE2044** | **Duration** | **3hrs** |
| **Course Title** | **SUSTAINABLE DESIGN OF CAMPUS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | List any two major types of waste generated in an educational institute. | | CO1 | R | 1 |
| 2. | Define energy flow in buildings. | | CO1 | R | 1 |
| 3. | State the principle of sustainable agriculture. | | CO2 | R | 1 |
| 4. | Mention two main benefits of food waste reduction. | | CO3 | R | 1 |
| 5. | Define greywater and its significance in water reuse systems. | | CO4 | U | 1 |
| 6. | State two essential features of a water-efficient building. | | CO4 | U | 1 |
| 7. | What is meant by Sick Building Syndrome (SBS)? | | CO5 | R | 1 |
| 8. | Identify any two causes of indoor air pollution. | | CO5 | R | 1 |
| 9. | Recall the main goals of sustainable campus development? | | CO6 | U | 1 |
| 10. | Name two smart monitoring technologies used in green campuses. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Write the objectives of a recycling program in a university campus. | | CO1 | A | 3 |
| 12. | Identify the various types of energy audits conducted in buildings. | | CO2 | U | 3 |
| 13. | Write the four pillars of food security. | | CO3 | A | 3 |
| 14. | Cite any three advanced treatment methods used in water recycling. | | CO4 | U | 3 |
| 15. | List the benefits of walkable campus spaces on student well-being. | | CO5 | U | 3 |
| 16. | Quote the interconnection between waste management, energy conservation, and sustainability in campus planning. | | 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. | Explain the types of waste generated on campus and the recycling techniques applicable to each. | CO1 | U | 6 |
|  | b. | Discuss and analyze the sewerage disposal practices adopted at university gadjah mada (UGM), highlighting their operational features and challenges. | CO1 | An | 6 |
|  |  |  |  |  |  |
| 18. | a. | Describe energy flow analysis and types of energy in building. | CO2 | U | 6 |
|  | b. | Illustrate energy audits and types of energy audits, each varying in depth and cost. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 19. | a. | Describe the principles of sustainable agriculture and sustainable agricultural practices. | CO3 | U | 6 |
|  | b. | Explain food conservation methods and its types with examples. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. | a. | Analyze how the University of Illinois’s food sustainability system integrates technology, policy, and community engagement. | CO3 | An | 6 |
|  | b. | Demonstrate the concept of water recycling and its significance in sustainable water management. | CO4 | A | 6 |
|  |  |  |  |  |  |
| 21. | a. | Examine the vision, goals, and organizational framework adopted by Osaka University to achieve a sustainable campus. | CO4 | U | 6 |
|  | b. | Apply the principles of xeriscaping to reduce water consumption in campus landscaping. | CO4 | A | 6 |
|  |  |  |  |  |  |
| 22. | a. | Elaborate the causes, influencing factors, health impacts, and strategies for managing and preventing Sick Building Syndrome (SBS). | CO5 | A | 6 |
|  | b. | Explain the five key benefits of Active Transportation with its types. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 23. | a. | Elucidate how UBC’s progressive policies emphasize sustainability by prioritizing the well-being of both people and the planet. | CO6 | An | 6 |
|  | b. | Analyze the challenges and solutions in Nanyang Technological University's (NTU) core sustainability goals. | CO6 | An | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Evaluate the sustainability initiatives on your campus, emphasizing energy-efficient practices, green building strategies, and efforts to conserve biodiversity. | CO6 | An | 6 |
|  | b. | Apply a sustainable concept within the campus that addresses any of the key thrust areas of the University. | CO6 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | Identify the Waste management concepts in the institute |
| **CO2** | Apply sustainability principles for Energy |
| **CO3** | Analyze the importance of food and sustainability |
| **CO4** | Apply Water related sustainability concepts |
| **CO5** | Analyze the concepts related to health and sustainability |
| **CO6** | Evaluate a strategy for developing sustainable institute |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. |  | Analyze the continuous beams using Matrix flexibility method. Also draw the Bending moment diagram. P=20 kN, q=10 kN/m  See the source image | CO1 | An | 16 |
|  |  |  |  |  |  |
| 2. |  | Explain the step by step procedure of the Matrix flexibility for a statically determinate and in-determinate structure using semi-automatic method. | CO1 | U | 16 |
|  |  |  |  |  |  |
| 3. |  | Analyze the portal frame ABCD shown in figure by Stiffness matrix method and sketch the bending moment diagram.  Solved] Analyze the portal frame ABCD shown in figure by slope  deflection... | Course Hero | CO2 | An | 16 |
|  |  |  |  |  |  |
| 4. |  | Analyze the continuous beams using Matrix Stiffness method.  EASWARI ENGINEERING COLLEGE, RAMAPURAM | CO2 | An | 16 |
|  |  |  |  |  |  |
| 5. |  | Explain the procedure of sub structuring technique in matrix displacement method. | CO4 | U | 16 |
|  |  |  |  |  |  |
| 6. |  | Analyze the continuous beams using Direct Stiffness method.  EASWARI ENGINEERING COLLEGE, RAMAPURAM | CO2 | An | 16 |
|  |  |  |  |  |  |
| 7. |  | Illustrate the steps involved in the analysis of truss element using Direct Stiffness method. | CO3 | An | 16 |
| **PART – B (1 X 20 = 20 MARKS) [Compulsory Question]** | | | | | |
| 8. |  | Explain the step by step procedure of analysis of truss element using static condensation technique. | CO5 | U | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **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 |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

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

\*1S1893 Part 1 and IS13920: 2016 are permitted.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Determine the natural frequency and time period of the system consisting of a mass of 100kg attached to a horizontal cantilever beam through a linear spring k2. The cantilever beam has a thickness of 8mm and a width of 12mm. E=2x105N/mm2 , L= 700mm and k = 10N/m. | CO1 | A | 12 |
|  | b. | Differentiate between the critically damped, under damped and over damped system. | CO1 | U | 4 |
|  |  |  |  |  |  |
| 2. |  | Derive the expression for forcing function and steady state response of a SDoF system for the given loading function.  F(t) = F0 0 ≤ t ≤ 0.5  = -F0 0.5 ≤ t ≤1 | CO1 | A | 16 |
|  |  |  |  |  |  |
| 3. |  | Analyze the natural frequency and mode shape of the system shown in the following figure | CO2 | An | 16 |
|  |  |  |  |  |  |
| 4. |  | 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. | CO3 | An | 16 |
|  |  |  |  |  |  |
| 5. | a. | Explain the design implication to be adopted for seismic resistant design of masonry structures. | CO4 | U | 8 |
|  | b. | Discuss with a case study the failure of masonry buildings during earthquake. | CO4 | U | 8 |
|  |  |  |  |  |  |
| 6. | a. | Explain the lateral load transfer in an RCC structures. | CO4 | U | 4 |
|  | b. | Analyze the role of ductile detailing in earthquake-resistant structures, and discuss how it enhances the overall performance of buildings during seismic events. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 7. | a. | A two storey building having a floor weight 1500kN and 800kN, for the first and second floor respectively. The height of each floor is 3m and EI = 30x1012 Nmm2. Analyze the natural frequencies and mode shapes. | CO2 | An | 10 |
|  | b. | For a two storey shear building with the following data determine i) the normalized modal shapes of vibration, ii) verify the orthogonality conditions between the modes. m1= 25000 kg, m2 = 12000 kg, a11= 1.00, a21= 1.263, a12 = 1.00 a22 = -1.629. | CO2 | An | 6 |
| **PART – B (1 X 20 = 20 MARKS) [Compulsory Question]** | | | | | |
| 8. |  | Explain Global retrofitting techniques for structures damaged during earthquake. | CO6 | An | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **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 |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20CE3008** | **Duration** | **3hrs** |
| **Course Title** | **THEORY AND APPLICATIONS OF CEMENT COMPOSITES** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Compare the constituent materials and manufacturing processes of conventional Ferrocement and slurry-infiltrated fibrous concrete (SIFCON). | CO2 | U | 10 |
|  | b. | Describe the key characteristics of Engineered Cementitious Composite (ECC) and its uniqueness from standard fiber-reinforced concrete. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the significance of pore size distribution in cement composites and its influence on durability and strength. | CO1 | U | 10 |
|  | b. | Differentiate between isotropic, orthotropic, and anisotropic materials, providing an example of an orthotropic material in cement composites. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Summarize the behavior of fiber-reinforced cement composites under flexural and impact loading, highlighting the role of fibers. | CO3 | U | 10 |
|  | b. | Infer the potential consequences of fiber corrosion on the long-term mechanical performance and structural integrity of a fiber-reinforced concrete element. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the fundamental difference between the "Mechanics of Materials" approach and the "Elasticity" approach for assessing the stiffness of a composite material. | CO4 | U | 10 |
|  | b. | Illustrate the purpose and utility of the Halpin-Tsai equations in predicting the elastic properties of fiber-reinforced composites. | CO4 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | Describe the challenges associated with the effective dispersion of nano-materials, such as Carbon Nanotubes, within a cement matrix and the consequences of poor dispersion. | CO5 | U | 10 |
|  | b. | Compare the primary mechanisms of Graphene Oxide and silica fume in the microstructure of hydrated cement paste. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the advantages of using Ferrocement for the construction of water storage tanks and boats compared to conventional reinforced concrete. | CO6 | U | 10 |
|  | b. | Infer the failure analysis of a structure built using cement composites, regarding material selection and quality control during construction. | CO6 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Compare the tension-softening behavior of plain concrete with the tension-hardening behavior typically exhibited by high-performance fiber-reinforced cementitious composites. | CO1 | U | 10 |
|  | b. | Summarize the role of polymers in concrete, focusing on the properties of the cementitious matrix in polymer-modified concretes. | CO6 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Describe the function of shrinkage-compensating agents in concrete and its effects on drying shrinkage. | CO5 | U | 10 |
|  | b. | Explain the restrictions on Poisson's ratio in an orthotropic material like a layered cement composite. | CO1 | U | 10 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Illustrate the potential benefits and challenges of incorporating recycled cellulosic waste as a fiber in cement composites. | CO6 | A | 10 |
|  | b. | Describe a standard test method used for corrosion resistance of steel fibers in a cement composite matrix. | CO4 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Classify the materials as per orthotropic and anisotropic behaviour |
| CO2 | Formulate constitutive behaviour of composite materials |
| CO3 | Estimate strain constants using theories applicable to composite materials |
| CO4 | Compare the mechanical behavior based on the approaches to stiffness. |
| CO5 | Adopt nanomaterials in cement composites |
| CO6 | Develop the new cement composites |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. |  | A post tensioned pre-stressed concrete slab with an effective span of 11m is to be designed to carry a live load of 14kN/m. Provide M45 concrete and 12mm dia high tensile wires of ultimate strength 1450MPa. Design the mid span section of the slab assuming the compressive strength of concrete at transfer 36N/mm2. Assume the loss of pre-stress 15%. Assess the initial and final stresses in the section. | CO3 | E | 16 |
|  |  |  |  |  |  |
| 2. |  | A pre-stressed concrete beam of rectangular section 230mm wide and 500mm deep spanning over 6m. The beam is pre-stressed by straight cable carrying an effective force of 360kN at an eccentricity of 100mm. If it supports an imposed load of 8kN/m and modulus of elasticity of concrete is 45kN/mm2, Estimate the deflection for the following cases  i) Upward deflection  ii) Final downward deflection | CO4 | E | 16 |
|  |  |  |  |  |  |
| 3. |  | A pre-tensioned pre-stressed concrete beam having a rectangular section 230mm wide and 500mm deep has an effective cover of 50mm. Calculate the moment of resistance of the section as per IS 1343. Fck – 50MPa, Ap – 850mm2, fp – 1300MPa | CO6 | A | 16 |
|  |  |  |  |  |  |
| 4. |  | A pre-stressed girder of rectangular section 230mm wide and 450mm depth is to be designed to support an ultimate shear force of 150kN. Use M35 concrete and Fe500 rods as shear reinforcement. Assume 8mm dia stirrups and cover to the rebar as 50mm. Ultimate tensile strength of prestressing steel 1400N/mm2. Examine the shear carrying capacity of the section.  Moment at the critical section (Mo) – 180kNm  Initial prestressing force – 550kN, Eccentricity - 100mm  Loss of pre-stress – 20%  Area of prestressing steel – 850mm2  Assume the relevant data | CO3 | An | 16 |
|  |  |  |  |  |  |
| 5. |  | A post tensioned pre-stressed concrete beam of effective span 7.5m is to be designed to carry a live load of 11kN/m. Provide M50 concrete and 9mm dia high tensile wires of ultimate strength 1400MPa. Design the mid span section of the beam assuming the compressive strength of concrete at transfer 40N/mm2. Assume the loss of pre-stress 15%. Assume Type I member and width of the beam as 350mm. Recommend the suitable trial section to satisfy the permissible stresses. | CO3 | E | 16 |
|  |  |  |  |  |  |
| 6. |  | Compute the bearing strength of anchorage plate and design the end zone reinforcement for the post tensioned beam. A pre-stressing force of 650kN is applied by a single tendon. Size of the end block is 500x500mm. Size of the bearing plate 250x250mm. Compressive strength of concrete at transfer 35N/mm2. Yield strength of steel reinforcement Fe500. Identify the suitable location for the bursting reinforcement. | CO6 | A | 16 |
|  |  |  |  |  |  |
| 7. |  | A post tensioned prestressed concrete slab of effective span 10m is to be designed to carry a live load of 12kN/m2. Provide M35 concrete and 6no of 9mm dia high tensile wires of ultimate strength 1400MPa. Design the mid span section of the slab assuming the compressive strength of concrete at transfer 26N/mm2. Assume the loss of prestress of 20% w.r.t initial prestress. Size of section 600x230mm. Examine the development of stresses before and after loading. Assume relevant data. | CO4 | An | 16 |
|  |  |  |  |  |  |
| **PART – B (1 X 20 = 20 MARKS) [Compulsory Question]** | | | | | |
| 8. | a. | Explain the devices that are used for post tensioning of the structural system. | CO1 | U | 10 |
|  | b. | Write the different types of losses in pre and post tensioned section. | CO2 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | **Identify** various **prestressing techniques** used in modern concrete construction. |
| CO2 | **Explain** the **fundamental principles** governing the behavior of prestressed concrete members. |
| CO3 | **Assess** the **structural performance** prestressed concrete elements under different loading conditions. |
| CO4 | **Develop** suitable **prestressing schemes and detailing strategies** for efficient structural performance. |
| CO5 | **Examine t**he **quality control parameters** and durability aspects of prestressed concrete (PSC) structures. |
| CO6 | **Justify** the **rationale behind failures** in PSC structures for preventive measures. |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20CE3022** | **Duration** | **3hrs** |
| **Course Title** | **CEMENT AND CONCRETE CHEMISTRY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Describe the clinkering process in cement production and its role in the formation of major cement phases. | CO1 | U | 10 |
|  | b. | Compare the chemical composition and hydraulic reactivity of the Alite (Tricalcium Silicate) and Belite (Dicalcium Silicate) phases. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the principle behind the classification of different cement types, referencing their chemical composition. | CO2 | U | 10 |
|  | b. | Illustrate the role of fly ash and silica fume in the formation of secondary gel and the subsequent strength development in blended cement. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Summarize the process of hydration for the major cement constituents and their direct link to the strength development of concrete. | CO3 | U | 10 |
|  | b. | Compare the field and laboratory tests on raw cement. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the effect of the water-cement (w/c) ratio and curing conditions on the pore system of a cement paste. | CO4 | U | 10 |
|  | b. | Describe any five workability tests on fresh concrete. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Illustrate the hardened properties of concrete with a suitable example. | CO5 | A | 10 |
|  | b. | Explain the mechanism of corrosion of steel reinforcement in concrete exposed to chloride solutions. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Describe the durability properties of hardened concrete subjected to marine exposure. | CO5 | U | 10 |
|  | b. | Compare the fresh and hardened properties of concrete blended with natural and recycled aggregates. | CO5 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Differentiate between the mechanisms of action of Polycarboxylate Ether-based superplasticizers and Naphthalene-based superplasticizers. | CO4 | U | 10 |
|  | b. | Explain the concept of cement-admixture compatibility and the potential issues that arise from incompatibility. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Compare the mineral and chemical admixtures used to enhance the special properties of concrete. | CO6 | U | 10 |
|  | b. | Describe the factors that influence the mix design of concrete in accordance with IS 456:2000. | CO6 | U | 10 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Illustrate the need for special concrete in the construction sector with a suitable example. | CO6 | A | 10 |
|  | b. | Summarize the purpose of using microstructural analysis in the field of cement chemistry. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Classify the phase system of cement |
| CO2 | Explain the cement hydration process |
| CO3 | Analyse the properties of cement paste and concrete |
| CO4 | Illustrate the hydration of cement with mineral admixtures |
| CO5 | Examine the properties of hardened paste |
| CO6 | Adopt modern micro structure analysis technique |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20CE3024** | **Duration** | **3hrs** |
| **Course Title** | **SUSTAINABLE CONSTRUCTION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the importance of sustainable design principles in the built environment. | CO1 | U | 10 |
|  | b. | **Illustrate** the principles of sustainable design in planning an eco-friendly campus building. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the significance of integrating human and economic aspects into sustainable infrastructure design. | CO2 | U | 10 |
|  | b. | Describe how population growth and energy consumption affect sustainable building design. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. |  | Evaluate the environmental impact of a conventional building versus a sustainable building. | CO2 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the role of recycled concrete aggregate in promoting sustainability in construction. | CO3 | U | 10 |
|  | b. | Describe how eco-friendly materials contribute to cost-effective sustainable construction. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 5. |  | **Explain** sustainable planning techniques used for rehabilitating an existing concrete building. | CO4 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | **Explain** the principles of sustainable HVAC or lighting systems for energy-efficient buildings. | CO4 | A | 20 |
|  |  |  |  |  |  |
| 7. | a. | Explain the concept of energy efficiency in building design. | CO5 | U | 10 |
|  | b. | Explain the importance of reducing water consumption in buildings. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Suggest design modifications to improve the energy efficiency of an existing building. | CO5 | A | 20 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the key elements and principles of green building design. | CO6 | U | 10 |
|  | b. | Compare the LEED and GRIHA rating systems in assessing the sustainability of a building project. | CO6 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Identify sustainable design aspects |
| CO2 | Evaluate the life cycle assessment |
| CO3 | Design building based on environmental aspects |
| CO4 | Incorporate energy efficiency in design of buildings |
| CO5 | Design environmental friendly buildings |
| CO6 | Apply green building ratings |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20CE3024** | **Duration** | **3hrs** |
| **Course Title** | **SUSTAINABLE CONSTRUCTION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Describe the core objectives involved in the Principles of Design for Sustainability in the built environment. | CO1 | U | 8 |
|  | b. | Explain the basic building design modification that results in a low impact on the local environment. | CO1 | A | 8 |
|  |  |  |  |  |  |
| 2. | a. | Examine the integration of human well-being as a crucial factor in the life-cycle assessment of infrastructure. | CO2 | U | 8 |
|  | b. | Infer the potential long-term consequences of population growth and increased consumption from sustainable building design considerations. | CO2 | U | 8 |
|  |  |  |  |  |  |
| 3. | a. | Compare the properties and performance of conventional concrete with concrete made using recycled concrete aggregate. | CO3 | U | 8 |
|  | b. | Summarize the key challenges the construction industry faces in the disposal of its waste. | CO3 | U | 8 |
|  |  |  |  |  |  |
| 4. | a. | Illustrate the application of "inspiration from nature" (biomimicry) in the engineering design of sustainable buildings. | CO4 | A | 8 |
|  | b. | Explain the relationship between personal occupant behavior and the overall energy performance of an engineered building system. | CO4 | U | 8 |
|  |  |  |  |  |  |
| 5. | a. | Differentiate between passive and active solar design strategies for energy-efficient buildings. | CO5 | U | 8 |
|  | b. | Describe any three key strategies to decrease water consumption inside buildings. | CO5 | U | 8 |
|  |  |  |  |  |  |
| 6. | a. | Compare the primary focus areas of the Leadership in Energy and Environmental Design (LEED) rating system and the Green Rating for Integrated Habitat Assessment (GRIHA) rating system. | CO6 | U | 8 |
|  | b. | Summarize the role of the Indian Green Building Council (IGBC) in promoting sustainability in the Indian context. | CO6 | U | 8 |
|  |  |  |  |  |  |
| 7. | a. | Infer the key steps involved in performing an energy-load analysis of an existing residential building. | CO4 | U | 8 |
|  | b. | Elaborate the principle of building-integrated photovoltaics (BIPV) and its advantages over conventional photovoltaic systems. | CO4 | U | 8 |
| **PART – B (1 X 20 = 20 MARKS) [Compulsory Question]** | | | | | |
| 8. | a. | Describe the planning stage considerations for an eco-friendly construction project. | CO5 | U | 10 |
|  | b. | Illustrate the use of local materials as a cost-effective technique in sustainable construction. | CO5 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Identify sustainable design aspects |
| CO2 | Evaluate the life cycle assessment |
| CO3 | Design building based on environmental aspects |
| CO4 | Incorporate energy efficiency in design of buildings |
| CO5 | Design environmentally friendly buildings |
| CO6 | Apply green building ratings |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21CE3003** | **Duration** | **3hrs** |
| **Course Title** | **ADVANCED DESIGN OF CONCRETE STRUCTURAL SYSTEMS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions (IS 456:2000 and IS 456:1978 are permitted)** | | **CO** | **BL** | **M** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. |  | Calculate the area of steel reinforcement required for the interior panel of the flat slab. The interior panel has a size of 5m × 5m without a drop panel and column head. The Column holding the slab has a size of 0.4m × 0.4m. The live load and floor load on the panel were 4 kN/m2 and 1 kN/m2. Consider M20 grade concrete and Fe415 grade steel. Assume that any data is required. | CO2 | A | 16 |
|  |  |  |  |  |  |
| 2. |  | Calculate the load acting on the topping slab and ribs in the grid floor, with an area of 14m × 18m. The floor was supported on the wall, and the ribs were spaced at an interval of 1.5m centre-to-centre in both directions. The floor has a total load of 4 kN/m2. Use M20 grade concrete and Fe415 grade steel. Assume that any data is required. | CO2 | A | 16 |
|  |  |  |  |  |  |
| 3. |  | Calculate the moment of the deep beam having a 200mm width, and 2000mm depth for a span of 4m, the beam carries a load of 170 kN/m and is supported on a wall of 500mm wide on each end. Use M20 grade concrete, Fe415 steel, and the permissible stress on the steel was 220 N/mm2. Assume that any data is required. | CO3 | A | 16 |
|  |  |  |  |  |  |
| 4. |  | Calculate the eccentricity level and steel reinforcement for a reinforced concrete wall having an overall height of 3000mm with a thickness of 0.1m. The wall has to carry a load of factored load of 550 kN. The grades of concrete and steel were 20 N/mm² (characteristic strength) and 415 N/mm² (yield strength). Assume that any data is required. | CO4 | A | 16 |
|  |  |  |  |  |  |
| 5. |  | Determine the overall depth of the corbel. The overall load acting on the corbel was 600 kN at a distance of 250mm from the face of the column of size 0.4m × 0.4m, and steel plates were considered as bearing. Use M25 grade and Fe415 steel. Assume that any data is required. | CO5 | A | 16 |
|  |  |  |  |  |  |
| 6. |  | Explain the moment curvature relation of reinforced concrete sections, with the advantages and disadvantages of the moment redistribution. | CO1 | U | 16 |
|  |  |  |  |  |  |
| 7. |  | Calculate the area of steel reinforcement for a shear wall of length 4.5m and thickness of 250mm, subjected to the following forces:   |  |  |  |  | | --- | --- | --- | --- | | Loading | Axial force (kN) | Moment (kN.m) | Shear (kN) | | Dead load + Live load | 1950 | 600 | 20 | | Seismic load | 250 | 4800 | 700 |   Use M25 grade and Fe415 steel. Assume that any data is required. | CO5 | A | 16 |
| **PART – B (1 X 20 = 20 MARKS) [Compulsory Question]** | | | | | |
| 8. |  | Calculate the area of steel reinforcement for the circular water tank with a flexible base on the ground to store 50,000 litres of water. The depth of the tank may be kept at 4m using M25 concrete and Fe415 steel. Assume that any data is required. | CO6 | A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Identify the behavior of structural elements |
| CO2 | Analyze the structure for different loading system |
| CO3 | Design the RC structures for its behavior |
| CO4 | Design and detail the structural elements |
| CO5 | Adopt suitable structural systems to ensure the stability |
| CO6 | Understand the reasons for the failure of structural system |

A black background with red text

Description automatically generated

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **23CE3001** | **Duration** | **3hrs** |
| **Course Title** | **CONTROL OF CORROSION IN CONCRETE STRUCTURES** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a | Explain the mechanism of corrosion with neat sketches. | CO1 | U | 10 |
|  | b | Illustrate the significant performance of concrete and steel in construction | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Classify different types of corrosion, also discuss the factors affecting the effects of corrosion. | CO2 | R | 20 |
|  |  |  |  |  |  |
| 3. | a | Draft a case study on “ the salt attack on Pamban Bridge” | CO3 | A | 10 |
| b | Write the causes and effects of corrosion. | CO3 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Discuss in detail the following types of test,  i)Acid attack  ii)Chloride attack  iii)Carbonation  iv) Biological attack | CO3 | U | 5  5  5  5 |
|  |  |  |  |  |  |
| 5. |  | Analyze the influencing parameters that affects the corrosion performance of concrete structures as per the code guidelines. | CO6 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Explain the corrosion mechanism evaluation and resistance of fiber reinforced high strength cementitious composites | CO5 | U | 20 |
|  |  |  |  |  |  |
| 7. | a | Summarize the types of corrosion protection methods for concrete with a detailed procedure. | CO5 | A | 10 |
|  | b | Summarize the coatings given for steel reinforcements for corrosion resistance in offshore structures | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. |  | List different types of materials and its application that are used for corrosion resistance in construction of RCC buildings. | CO4 | R | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Examine the corroded concrete member with any two types of suitable test methods. | CO5 | A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Identify the corrosion mechanism |
| CO2 | Classify the types of corrosion |
| CO3 | Select the appropriate methodology for testing the corrosion |
| CO4 | Adopt the suitable materials for corrosion protection |
| CO5 | Evaluate the corrosion damaged structures |
| CO6 | Analyse the extent of corrosion in concrete element |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **23CE3002** | **Duration** | **3hrs** |
| **Course Title** | **ADVANCED CONCRETE TECHNOLOGY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the mechanism of hydration and its significance in the development of concrete strength. | CO1 | U | 10 |
|  | b. | Illustrate the relationship between concrete rheology and the Bingham model through practical examples. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain how the porosity of concrete affects its mechanical strength and durability. | CO2 | U | 10 |
|  | b. | Discuss the factors influencing the rate of hydration in cement. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Illustrate the effect of water-cement ratio on the compressive strength of concrete. | CO3 | A | 10 |
|  | b. | Explain the impact of sulphate attack and chloride penetration on the durability of reinforced concrete structures. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Describe the different types of shrinkage observed in concrete and their causes. | CO3 | U | 10 |
|  | b. | Explain the factors influencing the creep behavior of concrete. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain the working principle of the Rebound Hammer and Ultrasonic Pulse Velocity methods. | CO4 | U | 15 |
|  | b. | Describe the importance of non-destructive testing in assessing the structural integrity of concrete structures. | CO4 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Compare the applicability of different NDT methods for assessing concrete, masonry, and steel structures. | CO4 | A | 20 |
|  |  |  |  |  |  |
| 7. |  | Design a concrete mix for **M30 grade concrete** as per **IS 10262:2019** using the following data:   * Type of cement: OPC 43 grade * Maximum size of aggregate: 20 mm * Specific gravity of cement: 3.15 * Specific gravity of fine aggregate: 2.65 * Specific gravity of coarse aggregate: 2.70 * Water absorption of fine aggregate: 1% * Water absorption of coarse aggregate: 0.5% * Surface moisture of fine aggregate: 2% * Workability: 75 mm slump * Exposure condition: Moderate * Method of placing: Hand compaction | CO5 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the factors considered in the design of a concrete mix. | CO5 | U | 10 |
|  | b. | Describe the characteristics of self-compacting and high-performance concretes. | CO6 | U | 10 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the potential benefits of using nanomaterials and 3D printing technology in modern concrete construction. | CO6 | U | 10 |
|  | b. | Explain the importance of fiber reinforcement in enhancing the mechanical properties of concrete. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Examine the properties of concrete materials as per standards. |
| CO2 | Identify suitable admixtures for concreting. |
| CO3 | Determine the properties of fresh and hardened concrete. |
| CO4 | Recommend suitable non-destructive testing of concrete for field applications. |
| CO5 | Design concrete mix as per IS standards. |
| CO6 | Recommend the appropriate proportion of materials for high performance concrete. |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **23CE3002** | **Duration** | **3hrs** |
| **Course Title** | **ADVANCED CONCRETE TECHNOLOGY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. |  | Compare the wet and dry processes of cement production in terms of their energy requirements, advantages and disadvantages. | CO1 | An | 16 |
|  |  |  |  |  |  |
| 2. |  | Interpret the relationship between porosity, maturity, and stress-strain behavior in concrete, illustrating how hydration chemistry affects failure modes and mechanical performance. | CO2 | A | 16 |
|  |  |  |  |  |  |
| 3. | a. | Explain the influence of water-cement ratio on compressive, tensile, and flexural strength. | CO3 | U | 8 |
|  | b. | Discuss the factors influencing permeability and cracking in concrete structures. | CO3 | U | 8 |
|  |  |  |  |  |  |
| 4. |  | Illustrate the ultrasonic pulse velocity method and its role in detecting cracks or voids. | CO4 | U | 16 |
|  |  |  |  |  |  |
| 5. |  | Analyze the influence of sampling, testing, and statistical parameters (mean strength, standard deviation, and coefficient of variation) on the design and quality assurance of concrete mixes. | CO5 | An | 16 |
|  |  |  |  |  |  |
| 6. | a. | Explain the mechanism of action of superplasticizers and retarders in concrete. | CO1 | U | 8 |
|  | b. | Describe the types, testing, and selection criteria for natural and artificial aggregates in concrete. | CO1 | U | 8 |
|  |  |  |  |  |  |
| 7. | a. | Illustrate the process of CSH gel formation and its role in strength development. | CO2 | U | 8 |
|  | b. | Describe the concept of concrete maturity and its use in predicting strength development. | CO2 | U | 8 |
| **PART – B (1 X 20 = 20 MARKS) [Compulsory Question]** | | | | | |
| 8. | a. | Explain the composition and applications of lightweight and heavyweight concretes. | CO6 | A | 10 |
|  | b. | Illustrate the role of nano-materials and self-healing agents in enhancing concrete durability. | CO6 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Examine the properties of concrete materials as per standards |
| CO2 | Identify suitable admixtures for concreting. |
| CO3 | Determine the properties of fresh and hardened concrete. |
| CO4 | Recommend suitable non-destructive testing of concrete for field applications. |
| CO5 | Design concrete mix as per IS standards. |
| CO6 | Recommend the appropriate proportion of materials for high performance concrete. |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **24CE2001** | **Duration** | **3hrs** |
| **Course Title** | **SURVEYING AND GEOMATICS ENGINEERING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Classify surveying based on instrument used. | | CO1 | U | 1 |
| 2. | What are the sources of errors? | | CO1 | R | 1 |
| 3. | List any three uses of theodolite. | | CO2 | R | 1 |
| 4. | Differentiate between transit and non-transit theodolites. | | CO2 | R | 1 |
| 5. | List out the different methods of tacheometry | | CO3 | U | 1 |
| 6. | Compare tangential method and stadia method. | | CO3 | R | 1 |
| 7. | Define curve and mention any two types. | | CO4 | U | 1 |
| 8. | What is the significance of offsets in tangent method for curve setting? | | CO4 | R | 1 |
| 9. | Describe rapid static method of GPS surveying. | | CO5 | U | 1 |
| 10. | Give the applications of drone surveying | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Define contour and write its characteristics. | | CO1 | U | 3 |
| 12. | Mention the temporary adjustments of theodolite with neat sketch | | CO2 | U | 3 |
| 13. | Explain the key differences between a tacheometer and a theodolite | | CO3 | U | 3 |
| 14. | Explain the components of a simple curve with neat sketches | | CO4 | U | 3 |
| 15. | Explain the different sources of error in total station data | | CO5 | U | 3 |
| 16. | Discuss at least five major benefits of using drones for surveying as compared to traditional methods. | | 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 following consecutive readings were taken with a dumpy level. The level was shifted after 4th, 6th and 8th readings. Reduced level at the first point was  100.00. Prepare a level field work table. Calculate the reduced levels of the points by height of instrument method and apply the usual arithmetic check. I  6.21, 4.92, 6.12, 8.42, 9.81, 6.63,7 .91, 8.26, 9.71, 10.21. | CO1 | An | 6 |
|  | b. | What are the different types of levelling operation? Write a short notes on reciprocal levelling | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. |  | The following records are obtained in a traverse survey, where the length and bearing of the last line were not recorded:   |  |  |  | | --- | --- | --- | | **LINE** | **LENGTH (m)** | **BEARING** | | PQ | 70.80 | 140o 15’ | | QR | 195.9 | 36 o 25’ | | RS | 35.20 | 338 o45’ | | SP | ? | ? |   Calculate the length and bearing of the line SP. | CO2 | An | 12 |
|  |  |  |  |  |  |
| 19. |  | The following notes refer to a line levelled tacheometrically with an anallatic tacheometer, the multiplying constant being 100:   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Inst. station | Height of axis (m) | Staff station | Vertical angles | Hair readings | Remarks | | P | 1.5 | B.M | -6°12′ | 0.963, 1.515, 2.067 | R.L. of B.M. = 460.65 m  Staff held vertically. | | P | 1.5 | Q | +7°5′ | 0.819, 1.341, 1.863 | | Q | 1.6 | R | +12°27′ | 1.860, 2.445, 3.030 | | CO3 | An | 12 |
|  |  |  |  |  |  |
| 20. | a. | Using Rankine’s tangential angle method, compute the setting-out data for a simple right-hand curve where two straights intersect at chainage 1420 m, the deflection angle = 9.5°, and the radius = 450 m. Take the peg interval = 15 m. Prepare a table of deflection angles. | CO4 | An | 8 |
|  | b. | Explain the step by step procedure for setting out a circular curve by Rankine's method of tangential angle. | CO4 | A | 4 |
|  |  |  |  |  |  |
| 21. | a. | Explain the working principle of a total station, detailing how it measures distances and angles. | CO5 | A | 8 |
|  | b. | Describe the various applications of total station surveying in civil engineering. Compare the advantages and disadvantages of using a total station over conventional surveying methods | CO5 | A | 4 |
|  |  |  |  |  |  |
| 22. | a. | A theodolite was set up at a distance of 200m from a tower. The angle of elevations to the top of the tower was 8˚18’ while angle of depression was 2˚24’. The staff reading on the BM of RL 248.362 with the telescope horizontal was 1.286m. Find the height of the tower and RL of the top of the tower | CO2 | A | 8 |
|  | b. | Explain any one method of traversing using a theodolite | CO2 | A | 4 |
|  |  |  |  |  |  |
| 23. | a. | The following offsets were taken at 15 m intervals from a survey line to an irregular boundary line. 3.50, 4.30, 6.75, 5.25, 7.50, 8.80, 7.90, 6.40, 4.40, 3.25 m. Calculate the area enclosed between the survey line, the irregular boundary line and the first and last offsets by: (a) Trapezoidal Rule (b) Simpson’s Rule | CO1 | A | 8 |
|  | b. | Compute the cost of earth work involved in cutting open a trench of following size. Length 200 m, side slope 2: 1, depth of trench 4 m, bottom, width of trench 1.5 m. Cost of earth work Rs. 50 per m3 | CO1 | A | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain the concept of drone surveying. How does drone survey accuracy compare to traditional methods in different environments? | CO6 | A | 6 |
|  | b. | Discuss the process of image acquisition in drone surveys. Include a flowchart or stepwise outline of the procedure. | CO6 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | Understanding of levelling types, area calculation by numerical methods, and earthwork volume and cost estimation for practical surveying and civil engineering applications. |
| **CO2** | Able to explain and apply the working principles of total station surveying, describe its major civil engineering applications, and critically compare total stations with conventional surveying methods. |
| **CO3** | Apply various tacheometric methods, understand their instrumentational differences, and select appropriate techniques for efficient distance and elevation measurements in surveying. |
| **CO4** | Understanding critical surveying concepts relevant for fieldwork and civil engineering design. |
| **CO5** | imparts the knowledge on modern surveying instruments |
| **CO6** | able to explain and apply the principles, accuracy considerations, and image acquisition workflow of drone surveying, |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **24CE2002** | **Duration** | **3hrs** |
| **Course Title** | **MECHANICS OF MATERIALS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Determine the stress in a rod of length 150 cm and of diameter 2 cm subjected to an axial pull of 20 kN. | | CO1 | A | 1 |
| 2. | State the Principle of Superposition. | | CO1 | R | 1 |
| 3. | Define point of contraflexure. | | CO2 | R | 1 |
| 4. | Define pure bending or simple bending. | | CO2 | R | 1 |
| 5. | Explain the difference between slope and deflection with a neat sketch. | | CO3 | U | 1 |
| 6. | Identify any one advantage of using Macaulay’s method in deflection analysis. | | CO3 | R | 1 |
| 7. | Define hoop stress in a thin-walled cylinder. | | CO4 | R | 1 |
| 8. | Identify any two types of stresses acting in a thin cylindrical shell under internal pressure. | | CO4 | R | 1 |
| 9. | Calculate the maximum torque for a solid shaft with a diameter of 50 mm and a shear stress of 80 MPa. | | CO5 | A | 1 |
| 10. | Examine the differences in design considerations for short and long columns based on their failure mechanisms. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Calculate the thermal stress induced in a steel rod of length 2 m, fixed at both ends, when the temperature rises by 40 °C. (Take α = 12 × 10⁻⁶ /°C, E = 200 GPa). | | CO1 | A | 3 |
| 12. | Determine the point of contraflexure in a beam where the bending moment equation is given as (𝑥) = 20𝑥 − 5𝑥2. | | CO2 | A | 3 |
| 13. | Calculate the maximum deflection at the center of a simply supported beam of span 6 m carrying a central point load of 10 kN. Take EI = 2 × 107 kN/m2. | | CO3 | A | 3 |
| 14. | Calculate the hoop stress for a thin cylinder of 500 mm diameter and 10 mm thickness under an internal pressure of 2 N/mm². | | CO4 | A | 3 |
| 15. | Determine the relation for a circular shaft when subjected to torsion. | | CO5 | A | 3 |
| 16. | Summarize the significance of understanding the assumptions in Euler’s column theory and their implications for structural engineering. | | 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. |  | Determine the stresses developed in both the steel rod and the copper tube, as well as the load carried by each, when a composite bar consisting of a steel rod of 3 cm diameter enclosed centrally in a hollow copper tube (external diameter = 5 cm, internal diameter = 4 cm, length = 15 cm) is subjected to an axial pull of 45,000 N.  Take  𝐸steel = 2.1×105 N/mm2, and 𝐸copper = 1.1×105 N/mm2 | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. | a. | Calculate the shear force and bending moment at key points along a cantilever beam of length 2 m, which carries point loads of 300 N, 500 N, and 800 N at distances of 0.5 m, 1.2 m, and 2 m, respectively, from the fixed end. Plot the shear force and bending moment diagrams for the beam. | CO2 | A | 8 |
|  | b. | Apply the principles of equilibrium to determine the support reactions of a simply supported beam of span 6 m carrying two point loads of 3 kN and 6 kN at distances of 2 m and 4 m from the left support. Then, draw the shear force diagram (S.F.D.) for the beam. | CO2 | A | 4 |
|  |  |  |  |  |  |
| 19. |  | A beam of length 6 m is simply supported at its ends and carries two concentrated loads: 48 kN at 1 m and 40 kN at 3 m from the left support. Calculate:  (i) the deflection under each load,  (ii) the maximum deflection of the beam, and  (iii) the point at which maximum deflection occurs.  Given: E = 2×105 N/mm2, I = 85×106 mm4. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Calculate the circumferential and longitudinal stresses induced in a cylindrical shell 3 meters long, closed at both ends, with an internal diameter of 1 m and a wall thickness of 15 mm, when subjected to an internal pressure of 1.5 N/mm². Also find the changes in the dimensions of the shell under this pressure. Take E = 2 x 105 N/mm2 and µ= 0.3. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. | a. | Determine the diameter and length of a solid steel shaft transmitting 90 kW at 160 r.p.m, if the twist must not exceed 1° over the entire length. The maximum shear stress is limited to 60 N/mm2. Take the value of modulus of rigidity = 8 x 104 N/mm². | CO5 | A | 6 |
|  | b. | Compute the maximum internal diameter of a hollow shaft with an external diameter of 120 mm, transmitting 300 kW of power at 200 r.p.m., subject to a maximum shear stress of 60 N/mm². | CO5 | A | 6 |
|  |  |  |  |  |  |
| 22. |  | Calculate the following properties for a steel bar subjected to a tensile test using the given data:  a) Young’s modulus.  b) Stress at the elastic limit.  c) Percentage elongation of the gauge length.  d) Percentage reduction in cross-sectional area.  Data given:  Initial diameter of the steel bar = 30 mm  Original gauge length = 200 mm  Load at elastic limit = 250 kN  Extension under a load of 150 kN = 0.21 mm  Maximum applied load = 380 kN  Total elongation at failure = 60 mm  Diameter at fracture = 22.5 mm | CO1 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Determine the shear force and bending moment at significant sections of a cantilever beam that is 1.5 m long, subjected to a uniformly distributed load of 2 kN/m extending over 1.25 m from the free end, along with a concentrated load of 3 kN acting at a point 0.25 m from the free end. Using these loading conditions, construct the shear force and bending moment diagrams for the beam. | CO2 | A | 12 |
|  |  |  |  |  |  |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Determine Euler’s critical buckling load for an I-section column having overall dimensions of 400 mm × 200 mm × 10 mm and a length of 5 m, when used as a strut with both ends fixed. Assume Young’s modulus = 2 × 10⁵ N/mm². | CO6 | A | 12 |
|  |  |  |  |  |  |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | Analyze the state of stress, evaluate principal stresses and principal strains. |
| **CO2** | Determine bending moment and shear force distribution along the beam. |
| **CO3** | Compute slope, deflection of determinate beams. |
| **CO4** | Determine the effect of torsion of shafts. |
| **CO5** | Calculate stresses in thin and thick cylindrical shells using Lame's equations. |
| **CO6** | Analyze columns using Euler’s, Rankine’s theories of columns. |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV / DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **24CE2003** | **Duration** | **3hrs** |
| **Course Title** | **WATER SUPPLY AND WASTEWATER ENGINEERING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define the term potable water. | | CO1 | R | 1 |
| 2. | State any two sources of raw water. | | CO1 | R | 1 |
| 3. | List the types of water demand. | | CO1 | R | 1 |
| 4. | State any two waterborne diseases. | | CO1 | R | 1 |
| 5. | List any two treatment units used in water treatment plants. | | CO2 | R | 1 |
| 6. | Define sedimentation. | | CO2 | R | 1 |
| 7. | List any two types of valves used in water distribution. | | CO3 | R | 1 |
| 8. | Define leakage control in pipe networks. | | CO4 | R | 1 |
| 9. | List any two types of traps used in plumbing systems. | | CO5 | R | 1 |
| 10. | State the importance of recycling wastewater. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | State the significance of water quality standards for drinking water. | | CO1 | R | 3 |
| 12. | Apply appropriate population forecasting techniques to estimate future water demand for a developing urban area. | | CO1 | A | 3 |
| 13. | Cite the primary, secondary, and tertiary treatments in wastewater management. | | CO2 | U | 3 |
| 14. | Write4 the components of a water distribution network with a neat sketch. | | CO3 | U | 3 |
| 15. | Classify the types of sanitation systems and their advantages. | | CO4 | U | 3 |
| 16. | Interpret the concept of decentralized wastewater recycling systems. | | 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. | Apply the characteristics of different water sources to determine their suitability for domestic purposes. | CO1 | A | 6 |
|  | b. | Explain the importance of water quality parameters in determining its suitability. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. |  | Explain the working principles of coagulation, sedimentation, filtration, and disinfection. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. | a. | Illustrate the design principles of water conveyance systems with examples. | CO3 | U | 6 |
|  | b. | Explain the types of valves, joints, and meters used in water distribution system. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. | a. | Explain the objectives and components of an effective sanitation system. | CO4 | U | 6 |
|  | b. | Explain the safety measures and maintenance practices required for efficient operation of sewer systems. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 21. | a. | Distinguish the key components of house drainage systems and common plumbing fixtures. | CO5 | U | 6 |
|  | b. | Explain the functions of traps and accessories used in plumbing systems. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 22. |  | Apply modern wastewater recycling and resource recovery techniques to develop a sustainable treatment plan. | CO6 | A | 12 |
|  |  |  |  |  |  |
| 23. | a. | Analyze the advantages and limitations of decentralized wastewater systems compared to centralized systems. | CO6 | An | 6 |
|  | b. | Apply the concepts of modern recycling technologies like HydraLoop and BIDA® to design an efficient household water reuse system. | CO6 | An | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Illustrate a water treatment and recycling system for a small residential community, incorporating water demand, treatment, and reuse strategies. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | Select suitable treatments for raw water |
| **CO2** | Design efficient water supply and sewage disposal |
| **CO3** | Estimate water quantity and quality for domestic and industrial uses |
| **CO4** | Interpret water distribution and sewer networks |
| **CO5** | Analyze compliance with relevant standards in plumbing and sanitation |
| **CO6** | Plan effective plumbing systems effectively |

A black background with red text

Description automatically generated

**END SEMESTER EXAMINATION – NOV/ DEC 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **24WI3010** | **Duration** | **3hrs** |
| **Course Title** | **REMOTE SENSING AND GIS APPLICATIONS IN WATER RESOURCES MANAGEMENT** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Explain the **properties of EMR** and their relevance in remote sensing. | CO1 | U | 5 |
|  | b. | Differentiate between active and passive remote sensing systems. | CO1 | U | 5 |
|  | c. | Explain the concept of Microwave Remote Sensing and summarize its advantages. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 2. | a. | Differentiate between **supervised** and **unsupervised classification** in digital image processing. | CO2 | An | 5 |
|  | b. | Demonstrate how to perform **radiometric correction** on remotely sensed imagery. | CO2 | Ap | 5 |
|  | c. | Discuss **multi-temporal** and **multi-sensor image analysis.** | CO2 | U | 6 |
|  |  |  |  |  |  |
| 3 | a. | Distinguish between **raster** and **vector data models** in GIS. | CO3 | Ap | 5 |
|  | b. | Analyze the **common sources of error** in both **digital image processing** and **GIS data.** | CO3 | An | 5 |
|  | c. | Examine the **macro, micro, and usage-level components** of data quality. | CO3 | An | 6 |
|  |  |  |  |  |  |
| 4. | a. | Apply **neighborhood functions** to analyze spatial relationships in GIS data. | CO4 | Ap | 5 |
|  | b. | Define **buffering** in GIS. List three applications in water resources management. | CO4 | R | 5 |
|  | c. | Show how to **measure length, perimeter, and area** using GIS tools. | CO4 | Ap | 6 |
|  |  |  |  |  |  |
| 5. | a. | Explain **rainfall–runoff modeling** and **water quality modeling** in the context of GIS and remote sensing. | CO5 | U | 5 |
|  | b. | Assess the **importance of drought monitoring** using remote sensing data. | CO5 | E | 5 |
|  | c. | Design a **comprehensive workflow** for **land use and land cover mapping** to support water resource planning. | CO5 | An | 6 |
|  |  |  |  |  |  |
| 6. | a. | Define Google Earth Engine (GEE) and explain its importance in geospatial analysis. | CO6 | U | 5 |
|  | b. | Develop a **case study** demonstrating the use of **GEE in water resource monitoring.** | CO6 | E | 6 |
|  | c. | Outline the **basic steps for importing satellite data into GEE.** | CO6 | Ap | 5 |
|  |  |  |  |  |  |
| 7. | a. | Illustrate the steps involved in **image preprocessing** for remote sensing analysis. | CO1 | Ap | 5 |
|  | b. | Discuss the **effectiveness of flood inundation mapping** using GIS datasets. | CO4 | E | 5 |
|  | c. | Analyze how **multi-sensor data fusion** improves interpretation accuracy. | CO2 | An | 6 |
| **PART – B (1 X 20 = 20 MARKS) [Compulsory Question]** | | | | | |
| 8. | a. | Define **Geographic Information System (GIS)** and list its main components. | CO3 | R | 5 |
|  | b. | Compare **various geodatabase models**—hierarchical, network, and relational. | CO4 | An | 5 |
|  | c. | Describe how **scanners** and **radiometers** work in remote sensing. | CO2 | Ap | 5 |
|  | d. | Critically evaluate **site selection methods** for artificial recharge structures using GIS analysis. | CO5 | E | 5 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Utilize remote sensing concepts for monitoring and analyzing atmospheric, terrestrial, and aquatic environments. |
| CO2 | Demonstrate proficiency in satellite image interpretation, enhancement, and classification in the field of water resources management |
| CO3 | Create thematic maps using GIS, data analysis, and spatial decision-making using different data structures and geodatabase models. |
| CO4 | Perform detailed spatial analyses, such as network analysis, spatial interpolation, and digital elevation modeling. |
| CO5 | Apply GIS and remote sensing to real-world water resource challenges, such as flood mapping, drought monitoring, and irrigation performance evaluation. |
| CO6 | Develop operational skills in GEE to navigate the GEE platform, perform basic operations, and script simple tasks for environmental data processing |