

End Semester Examinations - Nov-Dec 2015 Exams

14CE1001 Basic Civil Engineering

Set A

Time : 3 hrs
Total Marks: 100

1. a. A series of offsets were taken from a chain line to a curved boundary line at a regular interval of 10 metres. The length of the offsets are 4.2m , 3.4 m, 3.8 m, 2.8 m, 1.6 m, 4 m, 3.9 m, 3.1 m, and 5.8 m. Find the area of strip between chain line and boundary line by Trapezoidal Rule and Simpson's Rule. (10 marks)
b. List out the characteristics of cement and brick. (10 marks)
- OR**
2. a. Explain the scope of Civil Engineering. (10 marks)
b. A series of offsets were taken from a chain line to a curved boundary line at an interval of 5m in the following order: 0, 5.25 , 6.10, 8.45, 9.90, 6.75, 5.50, 0. Calculate the area between the chain line and the boundary line. (10 marks)
3. a. Summarize the different types of bonds used in brick masonry. (10 marks)
b. Define the terms : 1. Valuation 2. Plinth area 3. Carpet area. A building with plinth area of 100m^2 was constructed over a plot area of 200m^2 , 10 years ago. Plinth area rate at the time of construction was Rs. 900 per m^2 . Find the depreciated value of the building, taking the life of the building as 50 years. (10 marks)
- OR**
4. a. Discuss on beams and classify them according to the support conditions and loading conditions. (10 marks)
b. The total plinth area of the ground floor and first floor of the building is 200m^2 . Plot area is $(10 \times 15)\text{m}$. Find carpet area of ground floor of the building, floor area ratio of the building and approximate cost of the building. Take plinth area rate as Rs. $15000/\text{m}^2$ and take the carpet area to be 75% of the plinth area. (10 marks)
5. a. Recall the various steps involved in water supply scheme. (10 marks)
b. Illustrate the working principle of septic tank. (10 marks)
- OR**
6. a. Describe about the sewerage system, collection and disposal of solid wastes. (10 marks)
b. Summarize on Rain Water Harvesting. (10 marks)
7. a. Formulate the general layout of harbour and its classification. (10 marks)
b. Enumerate the classification of highways. (10 marks)
- OR**
8. a. List out the necessity of bridges and classify them. (10 marks)
b. Draw the general layout of the airport and explain its components. (10 marks)
9. a. List out the purpose and selection of site for a dam. (10 marks)
b. Explain any one type of the dam with neat sketches. (10 marks)

End Semester Examinations - Nov-Dec 2015 Exams

14CE2001 Survey

**Set
B**

**Time : 3 hrs
Total Marks: 100**

1. a. The following consecutive readings were taken with 4m staff at a common interval of 30m. The first reading was taken at a BM having RL of 100m. the instrument was shifted After the 4th and 9th readings rule out a page of level book, enter readings given and also calculate the reduced levels of a points by using Height of collimation(HOC) method and rise and fall method. Also apply arithmetic check

Consecutive readings are: 2.650, 1.745, 0.625, 0.260, 2.525, 2.160, 1.235, 0.870, 1.365, 0.625, 1.790 and 2.535
(15)

- b. A series of offsets were taken from a chain line to a curved boundary line at an interval of 5m in the following order: 0, 3.25, 4.10, 6.45, 8.90, 5.75, 8.50, 0. Calculate the area between the chain line and the boundary line using trapezoidal rule.
(5)

OR

2. a. What are the uses of contour map? (4)

- b. A series of offsets were taken from a chain line to a curved boundary line at a regular interval of 10 meters. The lengths of the offsets are 2.2m, 1.4m, 2.8m, 2m, 2.6m, 4m, 3.2m, 3.4m, 3.8m and 4.2m. Find the area of the strip between chain line and boundary line by using trapezoidal rule and Simpson's rule.
(10)

- c. What are the sources of error in leveling? Is there is better solution to avoid the errors in levelling (6)

3. a. How do you use trigonometric levelling to find the height of object when the base of the object is not accessible and when the height of theodolite at A is lower than that at B? (8)

- b. What are latitudes and departures? (2)

- c. The measured lengths and bearings of the sides of a closed traverse ABCDEA run in an anticlockwise direction, and are tabulated below:

LINE	LENGTH (m)	BEARING
AB	298.7	$0^{\circ}0'$
BC	205.7	N $25^{\circ}12'$ W
CD	L_1	S $75^{\circ}6'$ E
DE	L_2	S $56^{\circ}24'$ E
EA	213.4	N $35^{\circ}36'$ E

(10)

OR

4. a. What are the temporary adjustments of a theodolite? Describe the process of such adjustments. (16)

- b. Explain Bowditch's rule. (4)

5. a. In a tangential method of tacheometry two vanes were fixed 2 m apart, the lower vane being 0.5 m above the foot of the staff held vertical at station A. The vertical angles measured are $+1^{\circ}12'$ and $-1^{\circ}30'$. Find the horizontal distance of A and reduced level of A, if the R.L. of the observation station is 101.365 m and height of instrument is 1.230 m. (8)

- b. Explain the theory of stadia tacheometry. (7)

- c. Sketch the different types of stadia diaphragm. (3)

- d. What are the types of stadia systems? (2)

OR

6. a. Following observations were recorded with a tacheometer fitted with an anallatical lens ($K=100$; $C=0$). Calculate the reduced levels of change point and of station T. the staff was held vertical during the observations and the reduced level of B.M was 500 m.

Instrument station	H.I(m)	Staff station	Vertical angle	Staff Readings(m)
O	1.5	B.M	$-4^{\circ} 30'$	1.25, 1.4, 1.55
O	1.5	C.P	$6^{\circ} 12'$	1.55, 1.75, 1.95
T	1.35	C.P	$-7^{\circ} 45'$	1.39, 1.55, 1.71

(15)

b. Explain about the instruments used in tacheometric surveying? (3)

c. Write the objective of tacheometry (2)

7. a. A simple circular curve is to have a radius of 573 m .the tangents intersect at chainage 1060 m and the angle of intersection is 120° . Find,

- Tangent Distance.
 - Chainage at beginning and end of the curve.
 - Length of the long chord.
 - Degree of the curve.
 - Number of full and sub chords.
- (15)

b. Derive the relationship between radius of curve and degree of curve with neat sketch. (5)

OR

8. a. Name and explain the various components of a simple curve with a neat sketch. (8)

b. Explain the different elements of a simple curve. (8)

c. (i) Calculate degree of the circular curve if the radius of the curve is 393m and

(ii) Calculate radius of the circular curve if the degree of the curve is 5° . (4)

9. a. Define triangulation and Explain classification of triangulation system. (7)

b. What are the criteria for selection of triangulation system? (3)

c. The base line was measured by a steel tape and the following data were collected. the 30m tape was standardised at 15°C under a pull of 4.5 kg. what are the true length of the bay. the tape weights 1kg the unit weight of steel is 8300 kg/m^3 and coefficient of thermal expansion is $0.000011/^{\circ}\text{C}$ and $E= 2.1 \times 10^4 \text{ kg/mm}^2$.

Length(m)	Temperature $^{\circ}\text{C}$	Pull(kg)	Difference of level of support
29.973	12	7	0.3

(10)

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End Semester Examinations - Nov-Dec 2015 Exams

14CE2002 Mechanics of Solids

Set B

Time : 3 hrs
Total Marks: 100

1. A tensile test was conducted on a mild steel bar. The following data was obtained from the test:

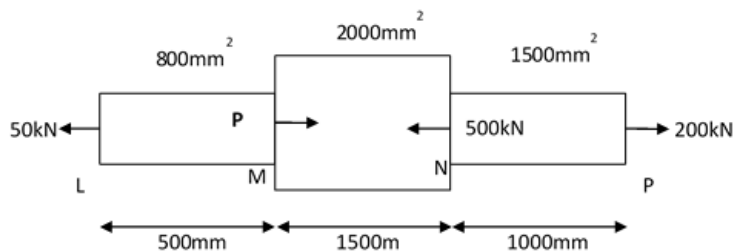
- (i) Diameter of the steel bar = 3 cm
- (ii) Gauge length of the bar = 20cm
- (iii) Load at elastic limit = 250 kN
- (iv) Extension at a load of 150 kN = 0.21 mm
- (v) Maximum load = 380 kN
- (vi) Total extension = 60 mm
- (vii) Diameter of rod at failure = 2.25 cm

Determine:

(1) The Young's modulus (2) The stress at elastic limit (3) The percentage of elongation (4) The percentage decrease in area. (20 marks)

OR

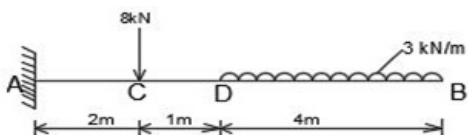
2. A member LMNP is subjected to point loads as shown in fig. Calculate i) Force P necessary for equilibrium ii) Total elongation of the bar. Take $E = 210 \text{ GN/m}^2$. (20 marks)



3. The stresses at a point in a bar are 200 N/mm^2 (tensile) and 100 N/mm^2 (compressive). Determine the resultant stress, normal stress and tangential stress on a plane inclined at 60° to the minor axis by using graphical method. (20 marks)

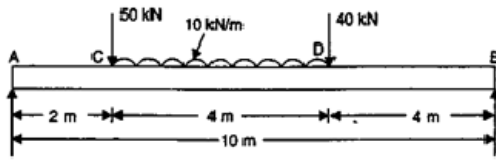
OR

4. At a point in a strained material, the principal stresses 90 N/mm^2 (tensile) and 50 N/mm^2 (compressive). Determine the resultant stress in magnitude and direction on a plane inclined at 30° to the axis of the major principal stress. Also determine the maximum intensity of shear stress in the material at the point. (20 marks)
5. Draw the shear force and bending moment diagrams for the beam shown in Fig (20 marks)

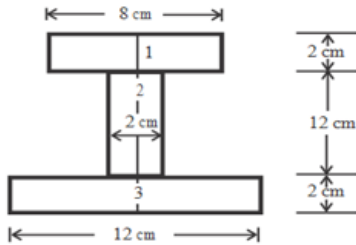


OR

6. Draw the shear force and bending moment diagrams for the beam shown in Fig. (20 marks)

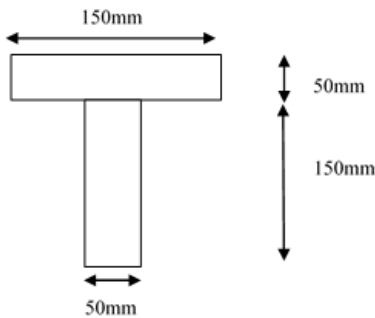


7. Fig shows a cast iron bracket of C/s of I-form. Find (i) Position of the neutral axis and the moment of inertia of the section about the neutral axis (ii) Determine the maximum B.M that should be imposed on this section if the tensile stress in the top flange is not to exceed 30 MN/m^2 . What is then the value of the compressive stress in the bottom flange? (20 marks)



OR

8. A beam is of T section shown in figure. The beam is simply supported over a span of 4m and carries a uniformly distributed load of 1.7 kN/m run over the entire span. Determine the maximum tensile and maximum compressive stress. (20 marks)



9. Determine the diameter of a solid shaft which will transmit 300 kN at 250 rpm . The maximum shear stress should not exceed 30 N/mm^2 & twist should not be more than 1° in a shaft length of 2 m . Take $C = 1 \times 10^5 \text{ N/mm}^2$. (20 marks)

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End Semester Examinations - Nov-Dec 2015 Exams

14CE2003 Mechanics of Fluids

Set A

Time : 3 hrs
Total Marks: 100

1. a) Calculate the specific weight, density and specific gravity of one litre of a liquid which weighs 7 N. (6)
b) Calculate the dynamic viscosity of an oil, which is used for lubrication between a square plate of size 0.8 x 0.8 m and an inclined plane with angle of inclination 30° . The weight of the square plate is 300 N and it slides down the inclined plane with a uniform velocity of 0.3 m/s. The thickness of oil film is 1.5 mm. (14)

OR

2. Find out the differential reading 'h' of an inverted U-tube manometer containing oil of specific gravity 0.7 as the manometric fluid when connected across pipes A and B, conveying liquids of specific gravities 1.2 and 1.0 and immiscible with manometric fluid. Pipes A and B are located at the same level and assume the pressures at A and B to be equal. (20)

3. Define the equation of continuity. Derive an expression for continuity equation for a three-dimensional flow. (20)

OR

4. If for a two-dimensional potential flow, the velocity potential is given by $\phi = x(2y - 1)$, determine the velocity at the point P (4, 5). Determine also the value of stream function ψ at the point P. (20)

5. The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300m, 170 m, and 210 m and of diameters 300 mm, 200 mm, and 400 mm respectively, is 12 m. Determine the rate of flow if coefficient of friction are 0.005, 0.0052 and 0.0048 respectively, considering (a) minor losses also (b) neglecting minor losses. (20)

OR

6. Find the head lost due to friction in a pipe of diameter 300 mm and length 50 m, through which water is flowing at a velocity of 3 m/s using (a) Darcy-Weisbach formula (b) Chezy's formula for which $C = 60$, Take kinematic viscosity(ν) for water is 0.01 stoke.(20)

7. A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of oil of sp.gr.0.8. The discharge of oil through venturimeter is 60 litres/s. Find the reading of the oil-mercury differential manometer. Take $C_d = 0.98$. (20)

OR

8. a) A pitot static tube placed in the centre of a 300 mm pipe line has one orifice pointing upstream and other perpendicular to it. The mean velocity in the pipe is 0.80 of the central velocity. Find the discharge through the pipe if the pressure difference between the two orifices is 60 mm of water. Take the co-efficient of pitot tube as $C_v = 0.98$. (12)

b) Discuss the relative merits and demerits of venturimeter with respect to orifice-meter. (8)

9. a) Water flows over a rectangular weir 1 m wide at a depth of 150 mm and afterwards passes through a triangular right-angled weir. Taking C_d for the rectangular and triangular weir as 0.62 and 0.59 respectively, find the depth over the triangular weir. (14)
b) The head of water over a rectangular notch is 900 mm. The discharge is 300 litres/s. Find the length of the notch when C_d is 0.62 (6)

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14CE2004 Building materials and Geology

Set B

Time : 3 hrs
Total Marks: 100

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|-----------|--|--|
| 1. | a. Summarize the geological work of sea with suitable illustration. (10) | |
| | b. Explain briefly about the continental drift and plate tectonics. (10) | |
| OR | | |
| 2. | Explain the earth structure based on seismological evidence and its components of earth surface with neat sketch? (20) | |
| 3. | a. Give in detail about the different types of faulting occur in earth structure with neat sketches. (10) | |
| | b. Explain briefly about the important crystallographic systems with examples. (10) | |
| OR | | |
| 4. | a. Distinguish between Igneous, Sedimentary and Metamorphic rocks. (10) | |
| | b. Explain the Geophysical methods of investigation (10) | |
| 5. | What are the simple field tests and laboratory tests are usually carried out to determine the quality of cement. (20) | |
| OR | | |
| 6. | a. Briefly explain about the aggregates which is used for the construction purpose. (10) | |
| | b. Discuss about the different forms of steel which is available in the market. (10) | |
| 7. | a. Discuss the heat treatment methods in steel. (10) | |
| | b. Discuss the manufacturing process of clay brick. (10) | |
| OR | | |
| 8. | a. Explain briefly the classification of Geosynthetics (10) | |
| | b. List out the common defects in timber (10) | |
| 9. | a. List out briefly the different types of admixtures and its uses? (10) | |
| | b. Give a brief account of the materials used for water proofing of concrete roofs and basements of buildings. (10) | |
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Wishing you All the Best

End Semester Examinations - Nov-Dec 2015 Exams

14CE2005 Applied Hydraulics and Hydraulic Machinery

Set A

Time : 3 hrs
Total Marks: 100

1. a. Determine the hydraulic radius of a rectangular channel 7.5m wide for uniform flow having depth of 2.25m. Find the rate of flow if the channel is having a bed slope as 1 in 1000. Chezy's constant = 55 (15)
- b. Differentiate pipe flow and open channel flow. (5)

OR

2. Find the ratios of displacement thickness to momentum thickness and momentum thickness to energy thickness for the velocity distribution in the boundary layer given by $u/U = 2(y/\delta) - (y/\delta)^2$ where u = Velocity in boundary layer at distance y , U = Free- stream velocity, δ = Boundary layer thickness. (20)

3. a. A 3.6 m wide rectangular channel conveys $90\text{ m}^3/\text{s}$ of water with a velocity of 6m/s. Is there a condition for hydraulic jump to occur? If so, calculate the height, length and strength of jump. What is loss of energy/kg of water? (15)
- b. Sketch the specific energy curve. (5)

OR

4. A jet of water of 20mm diameter 20mm strikes a 200mm x 200mm square plate of uniform thickness with a velocity of 10m/s at the centre of the plate which is suspended vertically by a hinge on its top horizontal edge. The weight of the plate is 98N. The jet strikes normal to the plate. What force must be applied at the lower edge of the plate so that plate is kept vertical? If the plate is allowed to deflect freely, what will be the inclination of the plate with vertical due to the force exerted by jet water? (20)

5. A 15 m/s velocity jet of water 5 cm in diameter strikes perpendicularly a flat smooth plate. Determine the force exerted by the jet on the plate, if (i) the plate is at rest (ii) it moves in the direction of jet with a velocity of 5 m/s. (20)

OR

6. The water available for a Pelton wheel is $4\text{ m}^3/\text{s}$ and the total head from the reservoir to the nozzle is 250m. The turbine has two runners with two jets per runner. All the four jets have the same diameters. The pipe is 3km long. The efficiency of transmission through the pipeline and the nozzle is 91% and efficiency of each runner is 90%. The velocity co-efficient of each nozzle is 0.975 and co-efficient of friction '4f' for the pipe is 0.045. Determine a. The power developed by the turbine b. The diameter of the jet and c. The diameter of the pipeline. (20)

7. a. A single acting reciprocating pump has a diameter of 150mm and stroke length 350mm. The centre of the pump is 3.5m above the water surface in the sump and 22m below the delivery water level. Both the suction and delivery pipes have the same diameter of 100mm and are 5m and 30m long. If the pump is working at 30r.p.m. determine (i) The pressure heads on the piston at the beginning, middle and end of both suction and delivery strokes (ii) The power required to drive the pump. Take atmospheric pressure as 10.3m of water. (20)

OR

8. a. A reaction turbine works at 450 rpm under a head of 120 m, its diameter at inlet is 120 cm and the flow area is 0.4 m^2 . The angles made by the absolute and relative velocities at inlet are 20° and 60° respectively with a tangential velocity 30m/s. Determine the volume rate of flow, power developed and hydraulic efficiency assuming whirl at the outlet to be zero. (15)
- b. What is governing of turbines? (5)

9. The centrifugal pump has the following characteristics. Outer diameter of the impellor is 800 mm, width of the impellor vane at the outlet is 400 mm, angle of the impellor vane at the outlet is 40° , the impellor runs at a speed of 550 rpm and discharges $0.98\text{ m}^3/\text{s}$ under an effective head of 35 m. A 500 kw motor is used to drive the pump. Determine manometric, mechanical and overall efficiency of the pump; assume water enters the impeller vanes radially at the inlet. (20)

End Semester Examinations - Nov-Dec 2015 Exams

14CE2007 Soil Mechanics

Set B

Time : 3 hrs
Total Marks: 100

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1. a) Define: (i) void ratio (ii) degree of saturation (iii) percentage air voids (iv) porosity. Also give the formula to calculate it? 8 marks
- b) Define the terms (i) soil (ii) soil mechanics 2 marks
- c) A soil sample with specific gravity of solids 2.70 has a mass specific gravity of 1.84. assuming the soil to be perfectly dry, determine the void ratio 3marks
- d) A saturated sample has a water content of 40%. If the specific gravity of solids is 2.67, Determine the void ratio, saturated density and submerged density 7 marks
- OR**
2. a) Discuss the various methods for determination of water content in a laboratory 15 marks
- b) Differentiate between (a) percentage air voids and air content (b) Specific gravity of solids and mass specific gravity 5marks
3. Explain in detail about the hydrometer analysis for grain size distribution of fine grained soil 20marks
- OR**
4. a) A soil has a dry density is 1.86gm/ml in the natural condition. When 410gm of the soil was poured in a vessel in very loose state, its volume was 290ml. The same soil when vibrated and compacted was found to have a volume of 215ml. Determine the Relative Density 10marks
- b) What are Atterberg limits? Explain the determination of liquid limit 10marks
5. Describe Standard Proctor test and the Modified proctor test. How would you decide the type of the test to be conducted in the laboratory. 20marks
- OR**
6. List and explain the methods to determine the Coefficient of permeability in lab with a neat sketch 20marks
7. List out and explain the methods of determining co-efficient of consolidation of soil 20marks
- OR**
8. A 3.5m thick clay layer beneath a building is overlain by a permeable stratum and it is underlain by an impervious layer. The coefficient of Consolidation of clay was found to be $0.050 \text{ cm}^2 / \text{min}$. The final expected settlement of the layer is 10cm.
- a) How much time will it take for 75% of the total settlement?
- b) Determine the time required for a settlement of 1.5cm
- c) Compute the settlement that would occur in one year 20marks
9. Discuss in detail about Unconfined Compression test and Vane shear test 20marks
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End Semester Examinations - Nov-Dec 2015 Exams

14CE2008 Water and Waste water Engineering

Set A

Time : 3 hrs
Total Marks: 100

1. a. The population of 5 decades from 1930 to 1970 is given below in table. Find out the population after one, two and three decades beyond the last known decade, by using arithmetic increase method. (10)

Year	1930	1940	1950	1960	1970
Population	25000	28000	34000	42000	47000

- b. Bring out the factors affecting per capita demand of water supply. (10)

OR

2. Discuss the advantages and disadvantages of dead end system and grid iron system of pipe distribution networks. (20)
3. Explain the physical characteristics of waste water and effects of disposing the same in the river. (20)

OR

4. Describe the process of equalization and oil separation in the industrial waste water treatment. (20)
5. Describe the process involved in the screening chamber and grid chamber. (20)

OR

6. Describe the types of filtration processes for the removal of suspended solids in industrial waste water treatment. (20)
7. Bring out the types of micro-organisms involved in the biological treatment.(20)

OR

8. Draw the neat sketches of trickling filter in biological treatment and explain the functioning of same. (20)
9. Discuss the underground drainage systems and their benefits.(20)

Wishing you All the Best

End Semester Examinations - Nov-Dec 2015 Exams

14CE2009 Reinforced Concrete Structures

Set B

Time : 3 hrs
Total Marks: 100

1. **Use of IS456 :2000 and SP16 is Permitted**

- a. Explain the modes of failure of reinforced concrete sections under flexure. (15)
- b. Draw the design stress strain curve for concrete and mark its salient point (5)

OR

2. Design the slab of size 6 x 4 m simply supported on 230mm thick masonry walls and subjected to a live load of 3.5 kN/m^2 and a surface finish of 1 kN/m^2 . Assume M20 concrete and Fe415 steel (20)

3. Design a simply supported rectangular beam of span 6m resting on supports 230mm thick if the size of the beam is 230 x 400mm. It carries a live load of 10 kN/m . Use M20 concrete and Fe415 steel. (20)

OR

4. Design a T- beam for a floor system with a span of 6m and center to center distance between the supports is 3 m. Load on beam is 9 kN/m . The thickness of the slab is 150mm and the support width is 230mm. Use M20 concrete and Fe415 steel. (20)

5. Design the reinforcement in a circular column of 400 mm diameter and 3.4 m long subjected to a factored load of 1500kN if the column has i) lateral ties ii) spiral reinforcement. Effective length factor is 0.85. Use M20 concrete and Fe415 steel. (20)

OR

6. Design the reinforcement of a column of size 300 x 600mm and 3.5 m long fixed at both ends. The factored loads on the column are $P_u = 1400 \text{ kN}$, $M_{ux} = 280 \text{ kNm}$ Use M20 concrete and Fe415 steel. (20)

7. It is necessary to design a footing located close to each other. What will be the type of footing to be designed? Describe the step by step procedure for the design. (20)

OR

8. Design the vertical stem of a cantilever retaining wall which is required to support a soil of 5m high above the ground level. Safe bearing capacity of soil is 160 kN/m^2 and unit weight of soil is 16 kN/m^3 . Angle of repose is 30° and coefficient of friction between soil and concrete is 0.5. Use M20 concrete and Fe415 steel. (20)

9. Design the waist slab of a dog-legged staircase for an office building with floor-to-floor height 3.2m. Flight width and landing width of 1.2m. Assume the stairs are supported on 230mm thick wall. Use M20 concrete and Fe415 steel. Assume suitable tread and rise and live load of 5 kN/m^2 . (20)

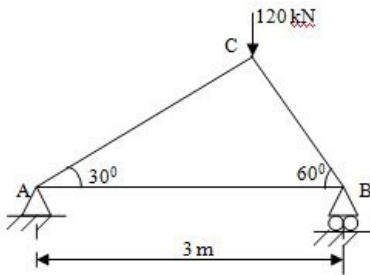
End Semester Examinations - Nov-Dec 2015 Exams

14CE2010 Structural Analysis

Set B

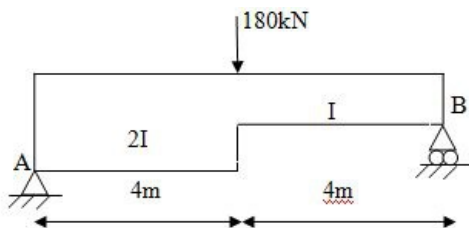
Time : 3 hrs
Total Marks: 100

1. Using the principle of virtual work, determine the vertical and horizontal deflection components of joint C of the truss shown in figure. $E = 200 \times 10^6 \text{ KN/m}^2$ and sectional area of each bar $A = 100 \times 10^{-6} \text{ m}^2$.

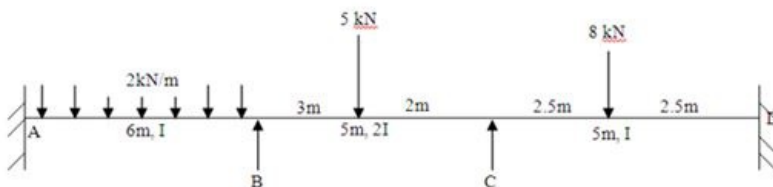


OR

2. Determine the deflection of the given beam by strain – energy method.

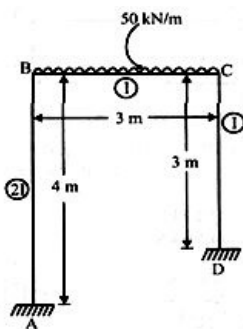


3. Analyze a continuous beam ABCD consisting of 3 spans and loaded as shown in the figure using moment distribution method. Ends A and D are fixed. Determine the bending moments at the supports and plot the BMD.

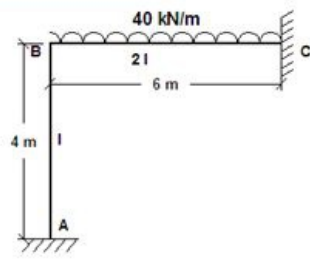


OR

4. Analyze the portal frame loaded as shown in figure by the Moment Distribution method and sketch the bending moment and shear force diagram.

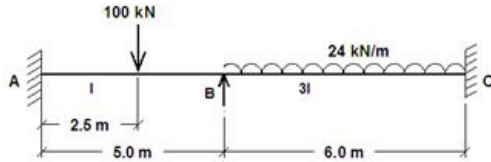


5. Analyze the frame ABC shown in figure by slope deflection method and draw bending moment diagram.

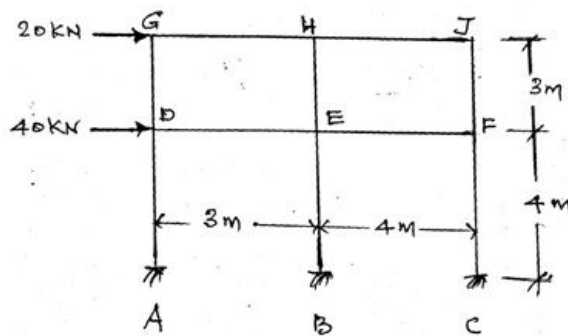


OR

6. Analyze the continuous beam ABC shown in figure by slope deflection method and draw bending moment diagram.



7. Use portal method to perform an approximate method of analysis of the frame given in figure.



OR

8. A UDL of 60 kN/m and length 5 m rolls over a girder of span 16 m. Find the maximum positive and negative shear force, maximum BM at a section 6 m from the left end.

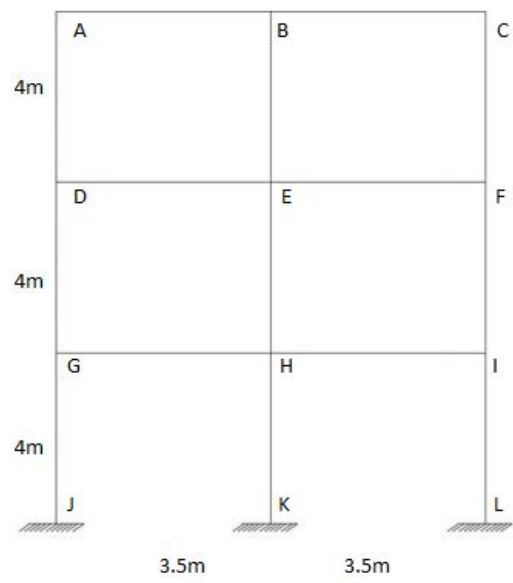
9. Analyze the intermediate frame of a multistoried frame shown in figure.

Spacing between the frames = 4m

DL on floors = 5 kN/m^2

LL on floors = 4 kN/m^2

Self weight of beams = 3 kN/m for all beams Analyse the beams DE and EF in the second floor. Relative stiffness for beams is $2I$ and of columns is I .



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End Semester Examinations - Nov-Dec 2015 Exams

14CE2013 Design of Steel Structures

Set B

Time : 3 hrs
Total Marks: 100

1. A tie member of a roof truss consists of 2 ISA 90 X 60 X10mm. The angels are connected on the either side of 12mm gusset plates and the member is subjected to a factored pull of 325kN. Design the welded connection. Assume welding is to be made in the workshop.
OR
2. Design a lap joint between two plates each of width 120mm, if the thickness of one plate is 16mm and the other is 12mm. The joint has to transfer a design load of 200kN. The plates are of Fe410 grade. Use bearing type bolts.
3. A column 4m long has to support a factored load of 750kN. The column is effectively held at both ends and restrained in direction at one of the ends. Design the column using rolled steel beam sections.
OR
4. Design a double angle tension member connected on each side of a 10mm thick gusset plate, to carry an axial factored load of 415kN. Use 20mm black bolts. Assume shop connection.
5. Design a slab base for a column ISHB 300 @577N/m carrying an axial factored load of 1050kN. M20 concrete is used for the foundation. Provide welded connection between column and base plate.
OR
6. Design a simply supported beam of 7m effective span carrying a total factored load of 60kN/m. The depth of the beam should not exceed 500mm. The compression flange of the beam is laterally supported by floor construction. Assume stiff end bearing is 75mm.
7. A roof truss shed is to be built for an industry in Lucknow. The size of the shed is 32 m x 50 m. The total height of the shed is 9.5 m. Determine the design wind pressure.
OR
8. A non sway column in a building frame with flexible joints is 3.5m high and subjected to factored axial load = 425kN, factored moment M_z at top = 35kN-m and M_z at bottom = 65kN-m. Design the beam column.
9. Design a welded plate girder of span 28m to carry superimposed load of 40kN/m. Aviod using end bearing and intermediate stiffeners. Use f_y 250 N/mm².

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End Semester Examinations - Nov-Dec 2015 Exams

14CE2014 Transportation Engineering

Set A

Time : 3 hrs
Total Marks: 100

1. a) Explain Sight distance and its types. (8 marks)
- b) Find the minimum sight distance to avoid head on collision of two approaching cars at 90 kmph and 80kmph, Take $f=0.7$, $t=3s$, Brake efficiency=50%. (12 marks)

OR

2. a) Write down the step by step procedure for the Designing of Super elevation. (8 marks)
- b) Find head light sight distance and intermediate sight distance for $V=65$ kmph. (Hint: $f=0.36$, $t=2.5$ s, $HSD=SSD$, $ISD=2*SSD$) (8 marks)
- c) Design rate of super elevation for a horizontal highway curve of radius 500 m and speed 100 kmph (4 marks)
3. a) Explain the test procedure of plate bearing test with diagram (12 marks)
- b) Soil sub grade sample collected from site was analyzed and the results obtained are given below:
- I. Soil portion passing 0.074mm sieve = 50%
 - II. Liquid limit = 40%
 - III. Plastic limit = 20%

Design the pavement section by group index method for the anticipated traffic volume of over 300 commercial vehicles per day. (8marks)

OR

4. a) Explain any four tests on bitumen with neat sketch (14 marks)
- b) Discuss the types of soils (6 marks)
5. a) Define rail gauge and explain the factors governing while choosing it. (10 marks)
- b) Explain the types of rails with neat sketch. (10 marks)

OR

6. a) Explain the uniformity of gauges. (12 marks)
- b) Describe the classification, function and requirements of sleepers. (8 marks)
7. a) Discuss any four characteristics of aircraft and the factors influencing it. (12 marks)
- b) The length of the runway under standard condition is 1000m which is elevated at 1000m above the mean sea level. If the aerodrome reference temperature is $14^{\circ}C$ and the maximum effective gradient is 1%. Determine the corrected length of the runway. (8 marks)

OR

8. a) Discuss the classifications of airports. (10 marks)
- b) Explain the following (10 marks)
- i. Runway
 - ii. Control tower
 - iii. Taxiway
 - iv. Aerodrome
 - v. Parking system

9. Explain the function, requirement, advantage and drawbacks of harbor terminal buildings. (20 marks)

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End Semester Examinations - Nov-Dec 2015 Exams

14CE2033 Building Services

Set B

Time : 3 hrs
Total Marks: 100

-
1. 1 a. Define building drainage and what are the requirements of building drainage? (5)
- b. Sketch and explain different types of traps and the necessity of using traps in different types of sanitary fitting? (10)
- c. What are the points to be kept in mind during layout of house drainage? (5)
- OR**
2. 2a. Discuss about the different classification of sewage treatment with diagrams? (10)
- 2b. Explain the skimming tanks with help of neat sketches? (10)
3. 3 a. Why is earthing important for any building? (4)
- 3 b. Explain in detail the various types of wiring systems adopted in buildings? (10)
- 3 c. Enumerate the various features that have to be ensured in locating a substation in a building as per NBC (6)
- OR**
4. 4 a. Detail on the modern theory of light? (10)
- 4 b. Write notes on design of modern lighting for i) offices ii) schools (10)
5. 5a. What is comfort air conditioning? (5)
- 5b. Explain the different types of air conditioners used in buildings? (15)
- OR**
6. 6. Write notes on the following:
- a. Chilled water plant (7)
- b. Fan Coil systems (7)
- c. Water piping system (6)
7. 7 a. Describe about the causes and effects of fire? (6)
- 7 b. Explain about the planning considerations against fire in buildings? (14)
- OR**
8. 8 a. Write notes on the following
- i. Fire alarm system ii. Smoke detector iii. Fire lightings (15)
- 8 b. What are the tangible and intangible benefits of green buildings? (5)

9. 9 a. Explain the building automation discussing on the major five aspects of intelligent building? (15)
- 9 b. What are smart home and explain its elements (5)

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End Semester Examinations - Nov-Dec 2015 Exams

14CS2035 Object Oriented Programming in C++

Set A

Time : 3 hrs
Total Marks: 100

1. a. Explain the basic object oriented programming concepts. (10)
- b. Write a C++ program to create a structure called coordinate with two members x,y with the data type double. Create two coordinates. Add them and store it into a third coordinate and print all the three coordinates. (10)

OR

2. a. An electricity board charges the following rates to domestic users to discourage consumption of energy. For the first 100 units – 60 Paise per unit. For next 200 units - 80 paise per unit. Beyond 300 units - 90 Paise per unit. All users are charged a minimum of Rs. 50.00. If the total amount is more than Rs. 300 then an additional surcharge of 15% is added. Write a program to get the names of the users and the number of units consumed by the user and display the electricity bill for the users. (10)
- b. Explain the arithmetic and relational operators with necessary examples. (10)
3. a. Explain the following with a suitable example
- Call by value
 - Call by reference
 - Function overloading (use minimum 4 different functions) (12)
- b. Write a C++ program to demonstrate default argument mechanism. (8)

OR

4. a. Create a class to represent an item in a super market with the following members
- Item code, Item Name, price, quantity, discount
- Define a parameterized constructor to initialize the members. Also define Member functions to read and print the data. (12)
- b. Explain the use of an inline function with an example program. (8)
5. a. Write a detailed description on the following (15)
- Simple Inheritance
 - Multiple Inheritance
 - Hierarchical Inheritance
 - Hybrid Inheritance
- b. Explain any five string functions from the string class with suitable example. (5)

OR

6. a. Explain binary operator overloading with a suitable example. (10)
- b. Write a function named "reverse" that takes as its arguments the following: (10)
- (1) an array of floating point values;
 - (2) an integer that tells how many floating point values are in the array.
- The function must reverse the order of the values in the array. Thus, for example, if the array that's passed to the function looks like this:

0	1	2	3	4
5.8	2.6	9.0	3.4	7.1

- then the resultant array will be modified so that it looks like this:

0	1	2	3	4
7.1	3.4	9.0	2.6	5.8

- The function should not return any value.

7.
 - a. Discuss about constant member function with an appropriate example. (8)
 - b. What is virtual function? Illustrate the use of virtual function concept with an appropriate example. (12)
- OR**
8.
 - a. Illustrate the use of friend class with an example program. (10)
 - b. What do you mean by a stream? Discuss the functions of the istream class with syntax and suitable example. (10)
9.
 - a. What is exception handling? Give the types and illustrate the use of exception handling types with appropriate examples. (10)
 - b. Implement the stack operation using template. (10)

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End Semester Examinations - Nov-Dec 2015 Exams

14CE2038 Industrial Waste Treatment and Disposal

Set A

Time : 3 hrs
Total Marks: 100

1. Describe the waste minimization techniques in detail.(20)
OR
 2. a. Discuss the effects of waste into the streams.(10)
b. Write short notes how environment is affected due to air pollution.(10)
 3. Explain ETP in detail with a flow diagram.(20)
OR
 4. Explain in detail about Sedimentation with neat sketch. (20)
 5. Explain the process of rapid sand filtration (20)
OR
 6. Give the advantages of biological treatment methods and explain any one process in detail.(20)
 7. Explain the processes in Cement Industry. State the characteristics of the waste water and explain their treatment processes.(20)
OR
 8. Discuss all about ASP.(20)
 9. Explain the processes in sugar industry with waste characteristics and treatment flow diagram.(20)
-

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End Semester Examinations - Nov-Dec 2015 Exams

14CE3001 Applied Elasticity and Plasticity

**Set
B**

**Time : 3 hrs
Total Marks: 100**

1. **A. Explain Stress at a point and prove that it is a second order tensor (05)**
- B. Explain the properties of direction cosines and derive the stress transformation law in 3 D rectangular coordinates (10)**
- C. The Stress tensor at a point is given by the following array. Calculate the deviator and spherical stress tensors and explain their significance. (05)**

$$\begin{bmatrix} 200 & 200 & 200 \\ 200 & -100 & 200 \\ 200 & 200 & -100 \end{bmatrix} \text{MPa}$$

OR

2. **A. Derive the Naviers Equations of equilibrium in terms of the displacements (05)**
- B. Explain and derive the Generalized Hook's law for an isotropic material (05)**
 and show that there are only two independent elastic constants
- C. Determine the principal strains at a point P(3, 1, -2) and their directions and Compare the strain invariants before and after finding the principal strains for the displacement field in micro units for a body given by (10)**
- $$U = (x^2 + y) \mathbf{i} + (3 + z) \mathbf{j} + (x + 2y) \mathbf{k}$$
3. **A. Explain Airy's stress function and derive the biharmonic equation for plane stress problem. (05)**
- B. Investigate what problem of plane stress is solved by the following stress**

function when applied to the region bounded in $y = \pm c$ on the side x positive (10)

$$f = (q/8c^3)[x^2(y^3 - 3c^2y + 2c^3) - (1/5)(y^5 - 2c^2y^3)]$$

C. For a plane strain problem, derive (05)

$$G \nabla^2 u + \frac{G}{(1-2\nu)} \frac{\partial}{\partial x} \left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} \right) + B_x = 0 \text{ and a companion equation.}$$

OR

4. A. Explain Plane strain problem with example and derive its constitutive relations (05)

B Derive the following stress compatibility equations (05)

$$\nabla^2 (\sigma_x + \sigma_y) = -\frac{1}{(1-\nu)} \left[\frac{\partial F_x}{\partial x} + \frac{\partial F_y}{\partial y} \right] \text{ for plane strain problem}$$

C. Investigate what problem of plane stress is solved by the following stress function

applied to the region bounded in $y = 0, y = d, x = 0$ on the side $x +$ (10)

$$\phi = \frac{-F}{d^3} xy^2 (3d - 2y)$$

- A. Derive the strain displacement relations in polar coordinates (05)
- B. Determine the stress distribution in a thin solid disc rotating at R rpm and compare its maximum stress with the maximum stress developed with a small pin hole at the centre of the disc. (07)

- C. Determine the stresses in an infinite plate with a hole subjected to tension (08)

OR

6. A. Derive the equilibrium equations in polar coordinates (05)
- B. Determine the stress distribution in a curved bar under pure bending (07)
- C. Determine the stress distribution due to a concentrated load on a straight boundary and hence obtain the stress distribution in a circular disc subjected to diametric loading (08)

7. A. Derive the governing equation and boundary conditions for St. Venant warping function approach for torsion of noncircular sections. (10)

- B. Explain why torsion of multicelled tube is a statically indeterminate Problem and hence derive the expressions for torsion of multicelled thin walled tubes. (10)

OR

8. A. Obtain the equation for torsion of a narrow rectangular section by Prandtl Stress function approach and explain its application for torsion of thin walled open section. (10)
- B. A thin walled rectangular box section having dimensions $2a \times a \times t$ is to be compared with a solid circular shaft of diameter 'a'. Determine the Thickness "t" of the box section so that both the sections have (i) the same maximum shearing stress for the same torque and (ii) the same stiffness. (10)

9. A. Explain Nadai's sand heap analogy for torsion. Find the fully plastic torsion capacity of (i) circular section, (ii) equilateral triangular section and (iii) rectangular section (08)

- B. Determine the equations for elasto-plastic yielding of thick cylinder of internal radius R_1 and external radius R_2 subjected to an internal pressure "p". If the yield stress for the cylinder material is S_y , determine the following

i. The pressure at which the cylinder will start yielding just at the inner surface

ii. The stresses in the elastic region and plastic region when the cylinder has a plastic front radius of $R/3$. Assume Von-Mises yield condition and a state of plane strain

(12)

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End Semester Examinations - Nov-Dec 2015 Exams

14CE3002 Advanced Concrete Technology

Set A

Time : 3 hrs
Total Marks: 100

1.
 - a) Explain with neat sketch the manufacture of cement using wet process (12 marks).
 - b) State the advantages and disadvantages of wet process over dry process in manufacture of cement (4 marks).
 - c) Surface texture of aggregates has great impact on the strength of concrete. Explain with reference to various textures of aggregates (4 marks).
- OR**
2.
 - a) Explain the hydrated structure of cement with neat sketches (10 marks)
 - b) Concrete produced with good graded aggregate produces durable concrete. Justify (5 marks).
 - c) Potable water is suitable for concrete. Say yes or no. If yes, explain the upper limits of all properties of water that would affect the performance of concrete (5 marks).
3.
 - a) Describe: (i) Workability; (ii) Segregation; and (iii) Bleeding of fresh concrete. (3 x 2 marks = 6 marks)
 - b) Is curing technical phenomena. Justify with reasons discussing the types of curing methods and its applicability. (2 marks + 6 marks = 8 marks)
 - c) Discuss the measures that can be adopted to reduce bleeding of concrete. (3 marks)
 - d) Water absorption of aggregates should be considered in mix proportioning. Can you describe why it should be? (3 marks)
- OR**
4.
 - a) Proportion a reinforced concrete mix for M25 grade using IS method for:
 - (i) Moderate exposure; and
 - (ii) Severely extreme exposure conditions for the following datas.

Specific gravity.....	Fine aggregate.....	2.75
	Coarse aggregate.....	2.75
Water absorption.....	Fine aggregate.....	1.2%
	Coarse aggregate.....	0.6%
Maximum nominal size of aggregates.....		20mm
 - Assume suitable and relevant datas wherever necessary (2 x 8 marks = 16 marks)
 - b) Tabulate the results of the above proportioning and discuss the following ratios:
 - (i) ca / fa ratio (coarse aggregate / fine aggregate)
 - (ii) Aggregate / binder ratio (2 x 2 marks = 4 marks)
5.
 - a) What are the structural levels of concrete and discuss each level in detail? (8 marks)
 - b) Why there is a necessity to learn the structure of concrete at micro and nano level? (4 marks)
 - c) How is micro structure of concrete influenced by a super – plasticizer? (4 marks).

d) How can the compressive strength of concrete be improved considering its micro – structure? (4 marks)

OR

6. a) What are the factors that influence the properties of fiber reinforced concrete? List and discuss the parameters bettered due to addition of fibers to concrete (4 marks + 3 marks = 7 marks).
- b) Give some applications of light weight concrete and heavy weight concrete. (4 marks)
- c) Define self – levelling concrete and enumerate how flowability is achieved in SCC (2 marks + 3 marks = 5 marks)
- d) Discuss and differentiate polymer impregnated concrete and polymer modified concrete. (4 marks).

7. a) Stress criterion and energy criterion for linear elastic fracture mechanics (LEFM). Discuss. (2 x 4 marks = 8 marks)
- b) What is stress singularity? (3 marks)
- c) There is plastic zone in front of crack tip. Explain and justify. (3 marks)
- d) Describe the special characteristics of a concrete fracture process. (6 marks)

OR

8. a) Define the following:
- (i) Stress Concentration Factor;
- (ii) Stress Intensity Factor. (2 x 3 marks = 6 marks)
- b) Derive $CTOD = K_I^2 / m f_y E$ (8 marks)
- c) How to determine the fracture parameters for the two – parameter model? (6 marks)
9. a) There is a need for deep understanding of hydration to make concrete durable. Discuss. (8 marks)
- b) What are the principles and classifications of non – destructive testing? (2 x 3 marks = 6 marks)
- c) State means of improving the toughness and ductility of concrete. (6 marks)

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End Semester Examinations - Nov-Dec 2015 Exams

14CE3003 Structural Optimization

Set B

Time : 3 hrs
Total Marks: 100

1. 1 a. Explain slack and artificial variable (5)
- 1 b. Use duality and dual–simplex algorithm to solve the L.P.P (15)

$$\text{Maximize } z = 3x_1 + 7x_2$$

$$\text{Such that } x_1 + 4x_2 \leq 20$$

$$2x_1 + x_2 \leq 30$$

$$x_1 + x_2 \leq 8$$

$$x_1, x_2 \geq 0$$

OR

2. 2a. What are the Characteristics of L.P.P (5)
- 2b. Using Simplex Method Solve the following linear programming (15)

$$\text{Minimize } Z = -6x_1 - 4x_2$$

$$\text{Such that } 2x_1 + 3x_2 \leq 20$$

$$3x_1 + 2x_2 \leq 24$$

$$x_1 + x_2 \geq 0$$

$$x_1 \geq 0, x_2 \geq 0$$

3. 3. Find the value of x by Golden section method in the interval (0,1) which minimizes the function $f = x(1.5 - x)$ to within + or – 0.05 (20)

OR

4. 4. It is proposed to shift grain from a ware house to a factory in an open rectangular box of length x_1 width x_2 and height x_3 mts. The bottom sides and ends cost respectively Rs 100/-, Rs 20/- and Rs 40/- per metre square. It causes one rupee per each trip of box. Find the minimum cost of transportation of 80 m^3 of grain and the dimension of box. (20)

5. 6 a. Solve the following problem by the simplex method (17)

$$\text{Max } Z = 3x_1 + 2x_2 + x_3$$

$$\text{subject to } 4x_1 + x_2 + x_3 = 8$$

$$3x_1 + 3x_2 + 2x_3 = 9$$

$$x_1, x_2, x_3 \geq 0$$

6 b. Explain how will you solve a Non linear programming problem with equality and inequality constraint (3)

OR

6. Explain the main features of Genetic Algorithm and also state the advantages and disadvantages of GA over traditional algorithms? (20)

7. Explain how the neural network workscan be applied to Civil Engineering by taking a problem and explaining its architecture and selection of various parameters? (20)

OR

8. Show the meta-heuristic approach of ant colonyalgorithm for solvingCivil Engineering problems ? (20)

9. Explain the steps involved in fuzzy logic and illustrate it with an example (20)

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End Semester Examinations - Nov-Dec 2015 Exams

14CE3004 Advanced Design of Reinforced Concrete Structures

Set A

Time : 3 hrs
Total Marks: 100

1.

1.a) What is meant by crack width? (1)

b) What are the advantages of limit state method? (1)

c) What is a singly reinforced section? (2)

d) What is a composite Column? (2)

e) A rectangular simply supported beam of span 7m is 300mmx600mm in cross section. It carries total loads of 35kN/m over its entire span, out of which 14kN/m is the live load. The beam is reinforced with 4 bars of 20mm on tension side at an effective cover of 50mm. Calculate the deflection at central span due to shrinkage and creep, if

i. Ultimate shrinkage strain =0.003

ii. Creep coefficient =1.7 Concrete mix grade M30 and steel of Fe 415 are used. (14)

OR

2.

a) What are the types of reinforcements used to resist shear? (1)

b) What is a balanced section. (1)

c) How shear reinforcement improves the strength of beam? (2)

d) What will be minimum and maximum area of tension reinforcement in a beam? (2)

e) A simply supported T beam has the following data:

i. Effective width of flange =1500mm

ii. Thickness of flange=130mm

iii. Width of rib=250mm

iv. Effective depth=500mm

v. Effective span=6m. It is reinforced with 4 bars of 25mm. The grade of concrete is M20 and grade of steel is Fe415. Determine the short term and long term deflection due total service a load of 30kN/m. Use IS code specifications for taking shrinkage and creep co-efficient. (14)

3.

a) What is a flat slab? (1)

b) What is a one way slab? (1)

c) What are the difference between one way and two way slab? (2)

d) What is development Length? (2)

e) The interior panel of a flat slab with drop of a commercial building having the following details:

Size of floor = 30x30 m Size of panel: 5x6m. Loading 4kN/m^2 , $f_{ck}=25\text{N/mm}^2$, $f_y=415\text{ N/mm}^2$. Find the column strip and middle strip moment. Check the depth provided is adequate. (14)

OR

4. a) What is an yield line. (1)
- b) Draw the few patterns of yield lines (1)
- c) Write the design steps involved in the design of cantilever slab. (2)
- d) List the advantages of yield lines. (2)
- e) A rectangular slab of size 4mx6m is simply supported along the edges and is reinforces with 10mm bars at 150mmc/c in short direction and with 10mm bars at 200mm c/c in long direction. The average effective depth of slab is 110mm and overall depth is 130mm. Determine the load carrying capacity of the slab using yield line theory. Use M25 grade concrete and Fe 415 steel. (14)
5. a) What is a shell roof? (1)
- b) What is a folded plate? (1)
- c) List the advantages of Shells (2)
- d) List the advantages of folded plates. (2)
- e) Give the classification of shell roofs and define the relevant terms. (14)
- OR**
6. a) List the types of shell roofs. (1)
- b) Where shell roof is used? (1)
- c) What are the disadvantages of foluded plates? (2)
- d) What are the disadvantages of shells? (2)
- e) Expalin in detail the behaviour of folded plate roofs. (14)
7. a) Draw the cross section of a chimney. (2)
- b) What is a silo. (2)
- c) How the bins are classified? (2)
- d) Design a chimney sing M 30 concrete and Fe 415 steel for the following requirement and check the stresses at a depth 60m below the top: Diameter of chimney external=4.5m Internal=4m. Air gap=100mm Thickness of fire brick lining =100mm, Temperature difference =85°C, Co-efficient of thermal expansion = $11 \times 10^{-6}/\text{C}$. Assume missing data suitably. (14)
- OR**
8. a) How the horizontal pressure is calculated in a silo? (2)
- b) What is pressure ratio? (2)
- c) Draw the cross section of a bunker. (2)
- d) A reinforced concrete grid floor of size 9m by 12m is required for an assembly hall. Assuming rib spacing of 1.5m in short span direction and 2m in long span direction, design the grid floor. Adopt M-25 grade concrete Fe 415 grade tor steel. Live load may be assumed as 4.2kN/m^2 . (14)
9. a) What is an indeterminate structure? (2)

b) What are assumptions made in bakers method? (4)

c) Explain Bakers method of analysis of continuous beams in detail. (14)

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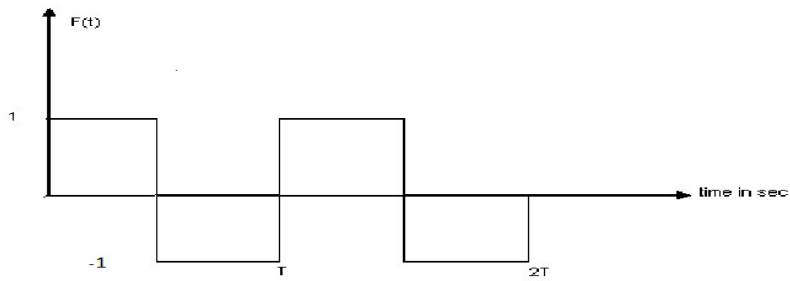
End Semester Examinations - Nov-Dec 2015 Exams

14CE3005 Structural Dynamics

Set A

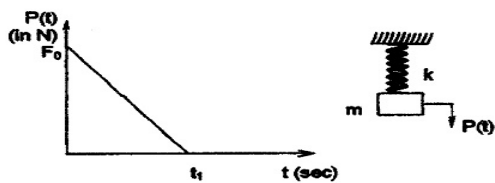
Time : 3 hrs
Total Marks: 100

-
1. **A. Explain static load and various types of dynamic loads with examples and discuss how vibration is imparted to a structure. (05)**
- B. Derive the equation of motion for damped free vibration of a SDoF system and explain with figures the phenomena of over damping, critical damping and under damping. Give a practical example . (05)**
- C. A block of weight 500N (moving within vertical guides) is supported by a spring of stiffness 10^6 N/m. The block is given an initial displacement of 50mm with a velocity of 300 mm/s. (i) Determine the period of vibration, natural frequency, amplitude of motion, maximum velocity and maximum acceleration of the block. (ii) Assuming a damping of 20%, determine the logarithmic decrement and the damping coefficient of the system. (10)**
- OR**
2. **A. What is damping? What is its effect on vibration? Explain the different types of damping? (05)**
- B. Derive the equation of motion for damped forced vibration of a SDoF system and hence determine its response due to a simple harmonic loading. (07)**
- C. Explain the two types of Vibration Isolation (Active or Force Isolation and Passive or Displacement Isolation) and derive the expressions for Transmissibility in the case of Active isolation. (08)**
3. **A. Explain how you will find the response of a undamped forced vibration of a single degree of freedom system subjected by an arbitrary periodic load . Determine the undamped forced response due to the loading shown . (10)**



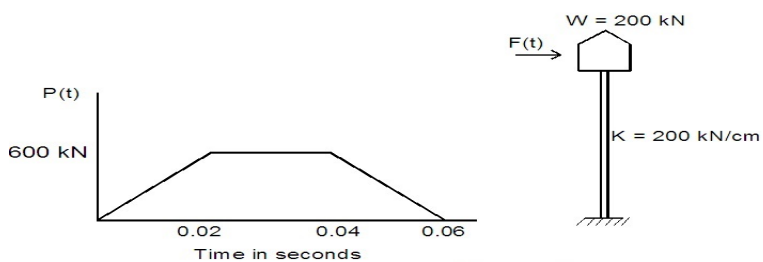
- B. Explain Duhamel's Integral and hence find the response with zero initial conditions for the forced and free vibration phases of the SDOF system shown .

(10)



OR

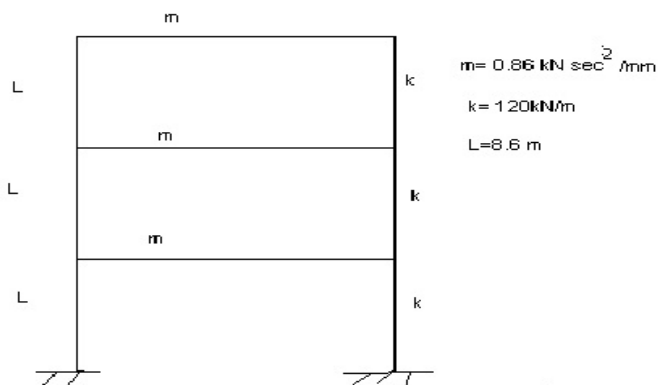
4. A. Derive the equation of motion for damped forced vibration of a 2 DoF System and hence explain the concept of Vibration Absorber. (10)
- B. Determine the dynamic response of a tower, subjected to a blast loading as shown in figure. Neglect damping. (10)



5. A. Show that Dunkerley's method underestimates the fundamental frequency (10)

B. Analyse the frame for its fundamental frequency and mode shape..

(10)



OR

6.

A. Derive the equation of motion for damped forced vibration of a MDoF

System and prove the orthogonality of normal modes.

(10)

B. Calculate the first mode shape and frequency of the three storey building

frame having the following properties using Stodola method.

(10)

Flexibility matrix is given as

$$\frac{1}{3600} \begin{bmatrix} 11 & 5 & 2 \\ 5 & 5 & 2 \\ 2 & 2 & 2 \end{bmatrix} \text{ units}$$

Mass matrix is given as

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1.5 & 0 \\ 0 & 0 & 2 \end{bmatrix} \text{ units}$$

7.

A. Derive the equation of motion for undamped free longitudinal

vibration of a uniform bar and hence obtain the solution for the bar

fixed at the left end and carrying a concentrated mass 'M' at the right end

(10)

B. A simply supported beam of span 8m is subjected to a concentrated force of

700 N applied suddenly at a point 2m from the left end. Mass of the beam is 750

kg/m & $EI = 30 \times 10^6 \text{ Nm}^2$. Determine the response by considering first two modes (1 0)

OR

8. A. Find the response in longitudinal undamped forced vibration of a uniform bar fixed at one end and subjected to a sinusoidal axial force at the other end. (10)

B. Find the fundamental frequency of a uniform cantilever beam of length 'L' carrying two equal masses 'M', one at the free end and the other at the midspan using Rayleigh's method. Take mass per unit length of the beam as ' m_b ' and flexural rigidity of the beam ' EI ' (10)

9. A. Find the response of a two degree of freedom system whose mass and Stiffness Matrices are given below. The system starts at rest. Find its response by Central Difference method. Use time step as 0.28 sec. (10)

$$[m] = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix} \text{ and } [k] = \begin{bmatrix} 6 & -2 \\ -2 & 8 \end{bmatrix} \quad F(t) = \begin{Bmatrix} 0 \\ 10 \end{Bmatrix}$$

B. Write Short Notes on (10)

- (i) Mode superposition method
- (ii) Vibration due to blast load
- (iii) Wind induced vibration.

Wishing you All the Best

End Semester Examinations - Nov-Dec 2015 Exams

14CE3006 Finite Element Methods in Engineering

Set B

Time : 3 hrs
Total Marks: 100

1. a. Discuss the factors to be considered while discretization
 b. List the properties of shape function

OR
2. Using two finite elements, find the displacement and stress in a uniformly tapering bar of circular cross section area 3cm^2 and 2cm^2 at their ends, length 100mm, subjected to an axial tensile load of 50N at smaller end and fixed at larger end. Take the value of Young's modulus $2 \times 10^5 \text{N/mm}^2$.
3. Derive the shape functions for 1D beam element

OR
4. Derive the shape functions for 2D Triangular element
5. Explain higher order element and derive the basis functions for any one higher order element

OR
6. Derive one dimensional Finite element formulation for a fluid flow through a porous medium
7. Determine the temperature distribution in a one dimensional aluminium fin having length 75mm, 5mm wide and 1mm thickness. The base temperature of the fin is maintained at 100°C and the atmospheric temperature around the fin is 20°C . The thermal conductivity of the aluminium fin is $168\text{W/m}^\circ\text{C}$ and the convective heat transfer coefficient with surrounding air is $30\text{W/m}^2\text{C}$. Assume that convection heat loss occurs from the right end of the fin. (use 3 element idealization)

OR
8. Find the deflection at the centre of a clamped beam of length L subjected to uniformly distributed load of 'w' N/m throughout its length. Use point collocation method to find the solution. Assume the trial function as $y=a(x^5-2Lx^4+L^2x^3)$
9. Consider a cantilever beam of 500mm length, 20mm width and 15 mm depth, carrying point load of 1KN at free end. Take $E = 2 \times 10^5 \text{N/mm}^2$. Find the maximum deflection and slope at the free end. Also compare the finite element solution obtained with exact solution.

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End Semester Examinations - Nov-Dec 2015 Exams

14CE3007 Seismic Design of Structures

Set A

Time : 3 hrs
Total Marks: 100

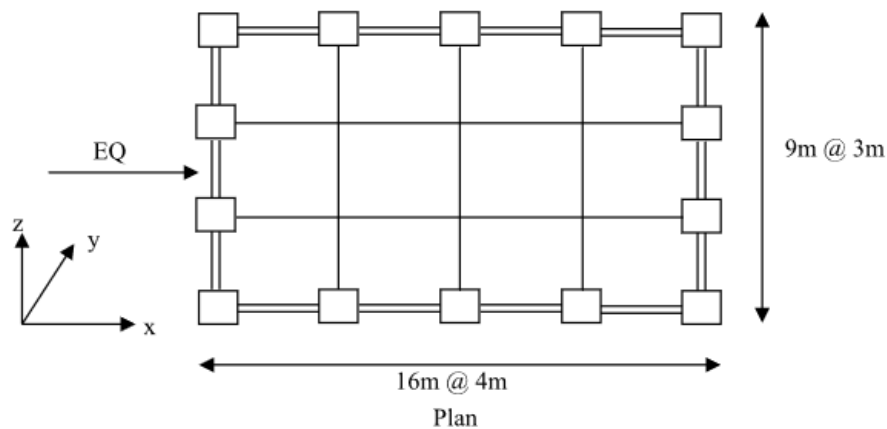
1. Explain the Conceptual design considerations of earthquake resistant structural system (20)
OR
2. a) List the different methods of seismic analysis with concepts (12)
b) Compare the different types of irregularities in the building (8)
3. A five story steel building shown in figure is located in seismic zone III on soft soil. The framing system of the building is special moment-resisting frames with brick masonry infill panels. Analyze the building and find the base shear along with its distribution.

Column sections: Ground floor: ISHB 450 @872N/m

Beam sections: Along 16m beams (L1) ISMB 400 @616 N/m

All other beams (L2): ISMB 225@312N/m, Slab: 150mm thick RCC slab on all floors

Walls: 300 mm thick wall on periphery of the building.



(20)

OR

4. Examine the Ductile design and detailing considerations of the following
 - a) Flexural members (7.5)
 - b) Compression members (7.5)
 - c) Beam column joint (5)
5. Compare the behaviour of the following subjected to seismic loading.
 - a) Reinforced and unreinforced masonry
 - b) Infill walls

Also discuss about the necessary reinforcements to be provided to strengthen the masonry Structures with neat sketches (20)

OR

6. Briefly explain the following

- a) Types of shear wall (7)
 - b) Functions of shear wall (5)
 - c) Design considerations of shear wall (8)
7. Explain in detail the concept of base isolation technique, also discuss the various types of techniques adopted in RCC and steel buildings with examples (20)
- OR**
8. a) Explain in detail the concept of Nonlinear time history analysis of structures (10)
- b) Examine the seismic behaviour of steel structures with neat sketches (10)
9. Explain different retrofitting techniques which is used for seismic resistant structures. (20)
-

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End Semester Examinations - Nov-Dec 2015 Exams

14CE3008 Experimental Techniques and Instrumentation

Set A

Time : 3 hrs
Total Marks: 100

-
1. Explain the working principle of Universal Testing Machine with neat sketch. (20)
OR
 2. Discuss in detail the different types of strain gauges with diagrams. (20)
 3. Recommend the flowmeters to measure the dense fuel flow and with less loss of friction and explain its working principle. (20)
OR
 4. a. Explain in detail about the working principle of LVDT with neat sketches. (16)
b. Discuss the types of the Graphic Recorders. (4)
 5. Reason out the causes of cracks in structures and explain the methods to measure. (20)
OR
 6. Why is it necessary to carry out wind tunnel studies for a structure? Explain briefly with its working principle. (20)
 7. a. Discuss the factors influencing the corrosion in concrete. (5)
b. Explain with the experiments for corrosion attack. (15)
OR
 8. Discuss in detail with sketch about the Vibration sensing devices and how it is used in elastic elements. (10)
Discuss the controlled blasting for demolition. (10)
 9. The strength of the concrete in bridge is to be determined using NDT technique. Suggest suitable method and explain the procedure with neat sketches. (20)

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End Semester Examinations - Nov-Dec 2015 Exams

14CE3009 Advanced Design of Metal structures

Set A

Time : 3 hrs
Total Marks: 100

1. Design a laterally restrained simply supported beam of span 5m carrying dead load of 15 kN/m and live load of 15kN/m from RCC slab. Use Fe 410 grade steel. Assume the relevant design data.
OR
2. Design a laterally restrained column in a building frame of 5m height, Column subjected to the following loads. Assume the relevant design data.

Factored Axial load = 750 kN

Factored Moment in Z-Direction = 80 kN-m
3. Design a welded stiffened seat connection to join ISMB 350 with a column section ISHB 400. The beam transmits an end reaction of 600kN due to factored loads. Use Fe 410 grade steel. Assume the relevant design data.
OR
4. Design a bolted seat connection to join ISMB 400 @ 61.5kg/m with a column section ISHB 450@ 92.5kg/m. The beam transmits an end reaction of 600kN due to factored loads. Use Fe 410 grade steel. Assume the relevant design data.
5. Design the purlin of the industrial building for the following data, Purlin resting on rafter at a slope of 21deg. Span of the Purlin – 4.5m, Spacing b/w purlin 2m, Dead load – 2kN/m², Live load – 1 kN/m², Wind load – 3 kN/m²
OR
6. Design the tension member for the load of 300kN and Compression member for the load of 350kN as per IS 800-2007
7. Design the slab base for the following data. Column section ISHB 400, Compressive force due to DL+LL is 400kN, Tensile force due to DL+WL is 100kN, Assume Fe410 grade steel.
OR
8. a) Derive the Plastic section modulus in Z and Y direction of I section (15)

b) Write short notes on Plastic hinge with neat sketches. (5)
9. Analyse the gantry girder for the following data

Crane capacity –250kN, Self wt of trolley and electric motor – 50kN, Self wt of rail section – 300N/m, c/c distance between gantry rails – 15m, c/c distance between column – 7.5m

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End Semester Examinations - Nov-Dec 2015 Exams

14CE3010 Advanced Bridge Engineering

Set A

Time : 3 hrs
Total Marks: 100

1. a) Classify the bridges according to a) alignment and b) purpose. 4 Marks
b) State the disadvantages of skew alignment of bridges. 4 Marks
c) Explain in detail the various IRC loadings. 12 Marks

OR

2. A reinforced concrete simply supported slab is required for the deck of a road bridge having the following data:
Width of carriage way = 7.5m
Kerbs = 600mm wide
Clear Span = 5m
Type of loading = IRC Class AA or Class A whichever
Gives the worst effect
Materials – M20 grade concrete and Fe 415 grade steel.
Design the deck slab 20 marks

3. **Design a post tensioned prestressed concrete T beam slab bridge deck for a national highway crossing to suit the following data:**
Effective span = 30m
Width of road = 7.5m
Kerbs = 600mm on each side
Food path = 1.5m wide on each side
Thickness of the slab = 250mm
Thickness of wearing coat = 80mm
Loading = IRC Class AA or Class A whichever gives the worst effect
For the prestressed concrete girders, adopt M50 grade concrete with loss ratio 0.85
Spacings of cross girders = 5m
Design the Longitudinal girder 20 Marks

OR

4. a) How do you determine the impact effect of class AA loading for road bridges? 4 Marks
b) Summarize the principal requirements of complete investigations of sub-surface irrigation. 4 Marks
c) What are the studies to be made to assess the economic benefits of a bridge facility? Also list out the various economic benefits derived from the above. 12 Marks

5. The effective span of a through type plate girder two lane highway bridge is 30m. The reinforced concrete slab is 250mm thick inclusive of the wearing coat. The footpaths are provided on both the sides of the carriageway. The cross girders are provided at 3m c/c. The stringers are spaced at 2.45m c/c. The spacing between main girders is 9.8m. Design the maximum section of the plate girder, if the bridge is to carry IRC class A standard load.

20 Marks

OR

6. a) What are the assumptions for the design of Plate Girder Bridges? 4 Marks
- b) Why end-bearing stiffeners are required for the Plate Girders 4 Marks
- c) Write the design procedure for lateral bracing for deck type Plate Girder Bridge. 12 Marks
7. Verify the adequacy of the dimensions for the pier as shown in Fig.1. The following details are available.

Top width of the pier	= 1.8m
Height of the pier upto springing level	= 12m
C/c of bearings on either side	= 1.00m
Side batter	= 1 in 10
High flood level	= 1m below bearing level
Span of the bridge	= 16m
Loading on span	= IRC Class AA
Road: Two-lane road with 1m wide foot path on either side	

Super Structure: Consists of three longitudinal girders of 1.3m depth with a Deck slab of 200mm depth. Rib width of girders = 300mm.

Material of the pier = Concrete M20 20 Marks

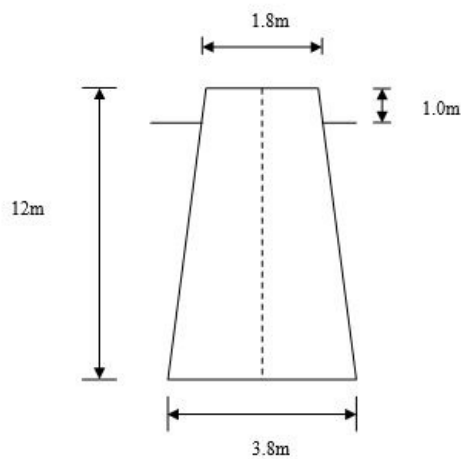


Fig. 1

OR

8. a) What are the components of well foundations? 5 Marks
- b) What are the different types of bearings? 5 Marks
- c) What is counterfort abutment? 5 Marks
- d) What are the different types of piers? 5 Marks
9. Explain in detail the inventory, inspection and rehabilitation process of managing the Bridge maintenance

20 Marks

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End Semester Examinations - Nov-Dec 2015 Exams

14CE3015 Design of Tall Buildings

Set B

Time : 3 hrs
Total Marks: 100

1. The dominant factor in design of tall building is providing appropriate internal layout for the building. Justify this statement. (20)

OR

2. Enumerate the loads to be considered in the design of tall buildings (20)
3. a. A quarter model can be used for analysis of an axi- symmetrical structure. Justify with suitable examples (10)
- b. Discuss the types of lumping of a tall structure (10)

OR

4. What are the components in the behavior of braced bents? Discuss how drift is calculated for the components. (20)
5. Determine the member forces in a 3 storey frame with 3.5m storey height. The bents are spaced at 5m and the spacing between bays are 3.5m. Intensity of wind loading in 1.5kN/m^2 throughout the height. (20)

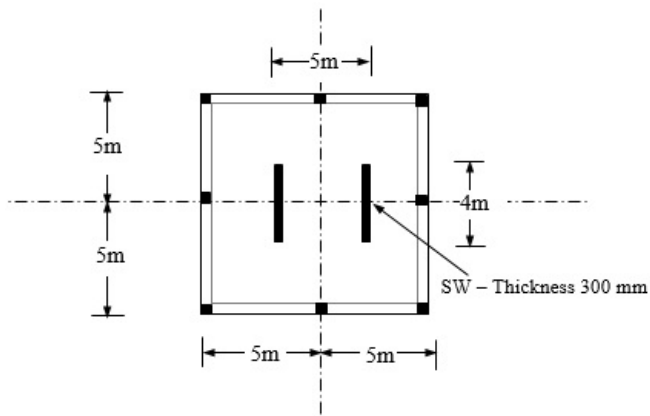
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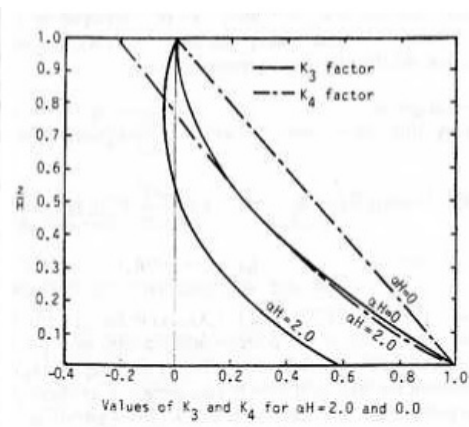
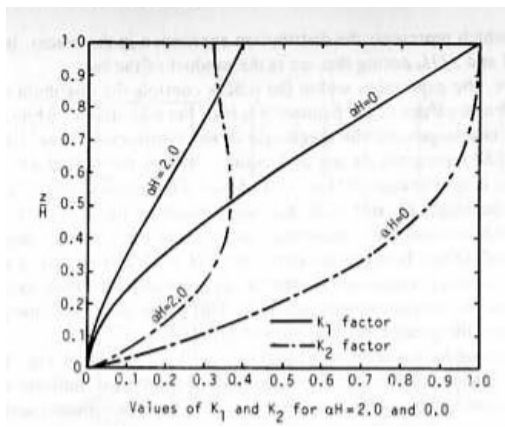
6. How infilled frames behavior is different from that of a shear wall? Discuss in detail (20)
7. Coupled shear walls develop moments at the bottom of the walls. Explain the procedure to determine the moment in a coupled shear wall (20)

OR

8. Fig.No.2 shows the plan of a 12-storied RC building of height 36m consists of frames and 2 shear walls. Column size is $500 \times 500 \text{ mm}$ and girder size is $400 \times 750 \text{ mm}$. Determine the drift, shear force and moment in the top floor. (20)

Fig 2





9. Second order effects of gravity loading are vital in the design of tall buildings. Justify the statement and explain the analysis procedure (20)

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End Semester Examinations - Nov-Dec 2015 Exams

14CE3017 Geotechnical Earthquake Engineering

Set A

Time : 3 hrs
Total Marks: 100

-
1. Discuss any two laboratory experiments conducted to determine the dynamic soil properties. (20)

OR
 2. What are the Waves in a semi-infinite body? Discuss on the types of waves (20)
 3. Response of the motion of the structure is influenced by the response of the soil and vice versa. Define this phenomenon and discuss the direct method and multistep method of analysis. (20)

OR
 4. The equivalent linear approach of ground response analysis makes use of transfer functions to relate parameters of interest to known parameters. Justify the statement. (20)
 5. Both flow liquefaction and cyclic mobility is likely to produce damage at a particular site. A systematic evaluation of the potential liquefaction hazard is required. Discuss the process of evaluation. (20)

OR
 6. Explain the seismic design considerations for a retaining wall design (20)
 7. Earthquakes induces landslides. Justify the statement mentioning the various types with suitable case studies (20)

OR
 8. Explain any two methods of Seismic slope stability analysis (20)
 9. The buildup of pore water pressure in the soil media during earthquake has to be reduced. Discuss on the most appropriate methods that can be adopted to achieve the results expected. (20)
-

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End Semester Examinations - Nov-Dec 2015 Exams

14CE3018 Design of Substructures

Set B

Time : 3 hrs
Total Marks: 100

-
1. a. Explain the different types of raft foundation with sketch. (5)
- b. A trapezoidal footing is to be provided with the following details. The footing is to support two square columns of 50cm and 30cm sides respectively. Columns are 5m apart and safe bearing capacity of soil is 400KN/m^2 . The bigger column has to take up a load of 5000KN and smaller one 3000KN. Design the footing. (15)
- OR**
2. a. When will you go for strap footing. (2)
- b. Design the strap footing for the two columns. The areas of cross section of both the columns are $0.4\text{m} \times 0.4\text{m}$. Take eccentricity of the column footing for column one as 1m. Distance between upward reaction of soil between both column footings is 5m. Find the intensity of pressure per meter of the footing. (18)
3. A circular well of 6m external diameter and 4m internal diameter is embedded to a depth of 15m below the maximum scour level in a sandy soil deposit. The well is subjected to a horizontal force of 800KN acting at a height of 8m above the scour level. Determine the allowable load equivalent resisting force due to earth pressure assuming
- i. Rotation is about a point above the base.
- ii. Rotation is at the base
- Take unit weight of saturated soil as 20KN/m^3 . The angle of internal friction is 30° . The factor of safety for passive resistance is 2.0, Use Terzaghi's analysis. (20)
- OR**
4. A column carrying a load of 3000KN has to be supported by four piles each of $350\text{mm} \times 350\text{mm}$. The piles are spaced at 1m centers. The column size is $650\text{mm} \times 650\text{mm}$. Design the pile cap. Given the grade of concrete is M15 and steel $F_e=250$. Use limit state method. (20)
5. Bring out the criteria for the design of foundation for reciprocating machines (20)
- OR**
6. a. Discuss the types of damping. (8)
- b. A machine weight 550KN is mounted on a concrete foundation block on soil layer, having area 26m^2 and its weight is 1025KN. The system is subjected to a central vertical linear forced vibration. The coefficient of elastic compression for the soil is $12 \times 10^4 \text{ KN/m}^3$.
- i. Calculate the natural frequency of the system.
- ii. Calculate the natural frequency if a. The weights are kept constant and the foundation area is doubled.
- b. The area of foundation is kept constant and weights are doubled. (12)
7. a. Determine the load carrying capacity of 4.0m long single under reamed pile of 50cm stem diameter. Average cohesion value both within the strata of pile depth and below the toe is 100KN/m^2 (8)
- b. Explain the terms free well and swelling pressure in relation to expansive soils. How can these values be determined for given soil samples in the laboratory? (12)
- OR**
8. a. Discuss the special techniques that are employed for the design of foundation in expansive soils. (10)

b. A straight shaft is constructed in an expansive soil. If the length of pier is 6m and shaft diameter is 0.75, determine the factor of safety for a no dead load and that for a dead load of 200kN. The depth of active zone is 2.5m. Take the swell pressure as 400kN/m². The coefficient of uplift between concrete and soil is 0.15. The coefficient of adhesion is 0.55. The undrained coefficient of cohesion is 100kN/m². (10)

9. Bring out the types of ground anchors and their applications with sketches. (20)

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End Semester Examinations - Nov-Dec 2015 Exams

14CE3019 Design of Composite structures

Set B

Time : 3 hrs
Total Marks: 100

1. Explain the elastic behaviour and ultimate theory of composite beams with neat sketches
OR
2. Design a simply supported composite beam with 5m span. The thickness of the slab is 125mm. The floor is to carry a imposed load of 2.5kN/m^2 , partition load of 1kN/m^2 and floor finish load of 1kN/m^2 . Take Construction load as 1kN/m^2 . $f_{ck} = 20\text{N/mm}^2$
3. Design a profiled deck slab of 4m span. The thickness of the slab is 125mm. The floor is to carry a imposed load of 3kN/m^2 , partition load of 1kN/m^2 and floor finish load of 1kN/m^2 . Take Construction load as 1kN/m^2 . $f_{ck} = 25\text{N/mm}^2$. Moment of Inertia of the section – $0.85 \times 10^6 \text{ mm}^4$, Plastic Moment of Resistance – 7.5 kNm, Area of cross section – 1200mm^2 , Depth of the profile – 100mm
OR
4. What are shear connectors? Explain different tests to be carried out to check the load bearing capacity of shear connector.
5. Obtain the axial resistance of a concrete filled square composite column having size of 350mmx350mm, height of the column is 5m and is pin ended. Assume M30 grade concrete. Assume the steel section of ISHB 250.
OR
6. a) Draw different types of composite beam to column connections as per the standards.
b) Sketch the different elements of composite buildings?
7. Design the composite truss for the following data
Span – 5m, Spacing of truss – 2.5m, Slab thickness – 200mm, Profile depth – 100mm, Self wt of deck slab – 4kN/m^2 , Grade of concrete – M25, Max axial tensile force – 400kN, Max axial compressive force – 650kN
OR
8. Write the possibilities of failure on the interface of Shear connector
9. Explain the merits of using composite materials with examples. Also discuss the behaviour of composite members in buildings and bridges.

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End Semester Examinations - Nov-Dec 2015 Exams

14CE3021 Prestressed Concrete Structures

Set B

Time : 3 hrs
Total Marks: 100

1. a) Differentiate between full prestressing and partial prestressing (5 Marks)
- b) Design a Post-tensioned slab of 12m for a live load of 20kN per metre run. Adopt concrete grade of M45 and 7mm diameter steel wires of characteristic strength 1520MPa. Design the beam as type 1 structure. Assume that the strength of concrete at transfer is 35.6MPa and the wires can be initially stretched to 1100MPa. (15 Marks)

OR

2. A prestressed concrete beam 200mm wide and 300mm deep is prestressed with wires (area 320mm²) located at a constant eccentricity of 50mm and carrying an initial stress of 1000N/mm². The span of the beam is 10m. Calculate the percentage loss of stress in wires if (a) the beam is pretensioned, and (b) the beam is post-tensioned using the following data:

$$E_c = 35 \text{ kN/mm}^2, E_s = 210 \text{ kN/mm}^2$$

$$\text{Relaxation of steel stress} = 5 \text{ percent of the initial stress}$$

$$\text{Shrinkage of concrete} = 300 \times 10^{-6} \text{ for pretensioning and } 200 \times 10^{-6} \text{ for post tensioning}$$

$$\text{Creep coefficient} = 1.6$$

$$\text{Slip at anchorage} = 1 \text{ mm}$$

$$\text{Frictional coefficient for wave effect} = 0.0015 \text{ per m}$$

(20 Marks)

3. a) Sketch the different layouts of prestressing cables and state where they are applied (5 Marks)
- b) Determine the limit state moment of Resistance of the midspan section of an I beam for the following data:

$$\text{Breadth of the top flange} = 600 \text{ mm}$$

$$\text{Thickness of top flange} = 120 \text{ mm}$$

$$\text{Thickness of web} = 100 \text{ mm}$$

$$\text{Breadth of bottom flange} = 400 \text{ mm}$$

$$\text{Thickness of bottom flange} = 200 \text{ mm}$$

$$\text{Clear depth of web} = 550 \text{ mm}$$

$$\text{Eccentricity of prestressing wire} = 358.48 \text{ mm below the centroidal axis}$$

$$\text{Area of prestressing steel} = 2 \text{ Freyssinet cables of 7mm diameter wires}$$

$$\text{Initial Prestressing force} = 1213361 \text{ N}$$

$$f_{ck} = 45 \text{ MPa and 5mm HTS wires with ultimate stress of } 1600 \text{ N/mm}^2$$

Find also the Factor of Safety (15 Marks)

OR

4. a) Discuss the significance of Magnel and Guyon's methods in anchorage zone design. (5 Marks)

b) For a simply supported beam of span 15m and live load of 20kN/m, an unsymmetrical section having the following dimensions is designed adopting M45 grade concrete.

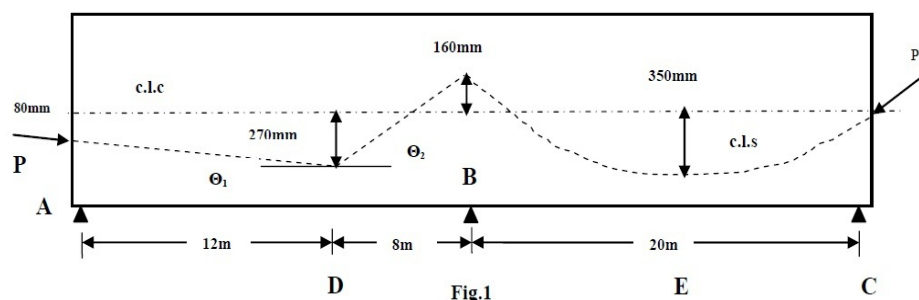
Breadth of the top flange	= 650mm
Thickness of top flange	= 130mm
Thickness of web	= 120mm
Breadth of bottom flange	= 400mm
Thickness of bottom flange	= 200mm
Depth of the section	= 990mm
Eccentricity of prestressing wire	= 432mm below the centroidal axis
Eccentricity of the cable at the end sections	= 0
Area of prestressing steel	= 1630 mm ²
Initial Prestressing force	= 1957069N
$f_{ck} = 45\text{MPa}$ and 5mm HTS wires with ultimate stress of 1600N/mm ²	
Expected loss of prestress	= 20%

Design the shear reinforcement for the section which is at span/6 from the support. (15 Marks)

5. a) Discuss the IS method design of an end block of a Post-tensioned prestressed concrete beam (5 Marks)
- b) Design a composite T beam for a span of 10m with a beam spacing of 1m c/c. The expected loss of prestress is 20%. The live load on the beam is 34kN/m. The grade of concrete adopted is M45 and HTS wires of 5mm diameter are used. (15 Marks)

OR

6. a) What are the factors that influence deflection on a prestressed concrete girder? (5 Marks)
- b) Derive the expressions for the deflection on straight tendon, parabolic tendons with central anchors and trapezoidal tendons. (15 Marks)
7. a) Discuss about the term 'pressure line and concordant cable' (5 Marks)
- b) A continuous prestressed concrete beam of uniform section has cable profile as shown in Fig.1. The magnitude of the prestressing force is 1500kN
- Locate the line of pressure (C-line) in the concrete due to prestress alone not considering the dead load of the beam
 - What is the secondary moment at section B
 - Determine the maximum stress at the mid span section of BC due to dead load and prestressing force if cross section is a rectangle of breadth 300mm and depth 800mm



OR

(15 Marks)

8. a) Write short notes on 'Partial Prestressing' – methods of achieving, advantages and disadvantages (5 Marks)
- b) A rectangular beam of 200mm width and 400mm depth is simply supported over a span of 10m and carries a concentrated load of 15kN. The prestressing cable is straight with sharp bend at midspan section. The magnitude of the prestressing force is 400kN. If the modulus of elasticity of concrete is 40kN/mm^2 find the maximum deflection when the central concentrated load is applied.
- (15 Marks)
9. a) What minimum load factors are provided against cracking and ultimate collapse for circular water tanks in the relevant Indian codes. (5 Marks)
- b) The solid end block of a post tensioned prestressed beam of 25m span, with three cables, each of 7-15mm strands, tensioned to 1200kN is shown in Fig. 2. The anchorage plates are square with a side length with a side of 180mm. Design the end block for bursting forces and sketch the details of reinforcement according to the provisions of the IS 1343-2012.

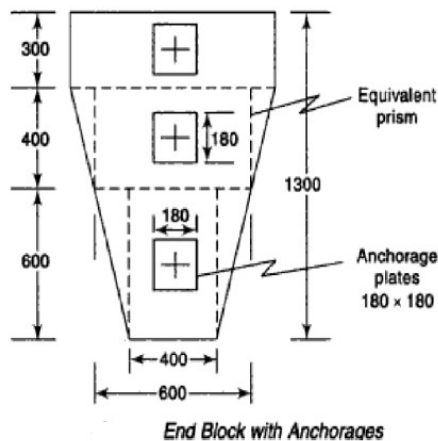


Fig. 2

(15 Marks)

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End Semester Examinations - Nov-Dec 2015 Exams

14CE3023 Advanced Design of Prefabricated structures

Set A

Time : 3 hrs
Total Marks: 100

1. 1. Discuss the various stages of erection process involved in precast concrete structural elements
OR
 2. 2. Discuss in detail the different stages involved in transportation of precast products to the site
 3. 3. Analyse the structural behaviour of precast concrete slab section with neat sketches
OR
 4. 4. Analyse the structural behaviour of precast concrete column section with neat sketches
 5. 5. Write the Principles of precast concrete member design in detail
OR
 6. 6. Draw the different types of tensile joints, also discuss the applications of tensile joints in precast concrete structures.
 7. 7. Explain the loads to be considered and construction of precast roof truss.
OR
 8. 8. Write the behavior and detailed design procedure of precast shear walls with neat sketches
 9. 9. How to design the precast concrete structures against progressive collapse as per the standards.
-

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End Semester Examinations - Nov-Dec 2015 Exams

14CE3027 Hydrologic Processes

Set A

Time : 3 hrs
Total Marks: 100

1. a. Calculate the frequency factor for the normal distribution for an event with a return period of 50 years. (5)
- b. The following data are the observed times between rainfall events at a given location. Assuming that the interarrival time of rainfall events follows an exponential distribution. Determine the parameter λ for this process by the method of maximum likelihood. The times Between rainfalls (days) are: 2.40, 4.25, 0.77, 13.32, 3.55 and 1.37. (15)

OR

2. a. Discuss in detail about Double Mass curve analysis. (5)
- b. Explain the methods of estimating missing rainfall data. (7)
- c. Theissen polygon constructed for a network of 10 rain gauges in a river basin yielded Theissen weights of 0.10, 0.16, 0.12, 0.11, 0.09, 0.08, 0.07, 0.11, 0.06 and 0.06. If the rainfalls recorded at the rain gauges during a cyclonic storm are 132, 114, 162, 138, 207, 156, 135, 158, 168 and 150 mm respectively determine the average depth of rainfall by Theissen mean and arithmetic mean methods. Also determine the volume of surface runoff at the basin outlet if 35% of the rainfall is lost as infiltration. Take the area of the basin as 5800 km². (8)
3. a. How will you estimate precipitation using radar and satellites? (5)
- b. In a catchment area, there exist 5 rain gauges and the average rainfall at these stations were found to be 89, 54, 45, 41 and 55 cm. How many additional gauges should be installed in the basin, If the error in the estimation of basin mean rainfall should not exceed 10%. (7)
- c. Explain the various types of raingauges used for measuring precipitation. (8)

OR

4. The ordinates of a 6-hour unit hydrograph of a catchment is given below: (14)

Time, Hour	0	3	6	9	12	15	18	24	30	36
Ordinate of 6h UHc	0	25	50	85	125	160	185	160	110	60

Time, Hour	42	48	54	60	69
Ordinate of 6h UHc	36	25	16	8	0

Derive the flood hydrograph in the catchment due to the storm given below

Time from start of storm (h)	0	6	12	18
Accumulated Rainfall (cm)	0	3.5	11	16.5

The storm loss rate(Φ – index) for the catchment is estimated as 0.25cm/hr. The base flow can be assumed to be 15m³/s at the beginning and increasing by 2.0m³/s for every 12 hours till the end of the direct runoff hydrograph

- b. Explain the infiltration (6)
5. a. Estimate the daily evaporation from a water surface using the Penman's approach, at a place of Latitude 20° N from the following Data. Air temperature = 26° C; Saturation vapour pressure at 26° C = 33.608 mb; Vapour pressure of air = 13.25 mm of mercury; Number of sunshine hours = 7.6; Maximum probable bright sunshine hours = 13.2; Solar radiation = 958 cal/cm/day; Wind velocity at 2 m height = 2.5 m/s; Atmospheric pressure = 752 mm of mercury (14)
- b. Explain the water budget method of reservoir evaporation estimation. (6)

OR

6. a. Explain the factors influencing the infiltration. (12)
- b. A 7-hour storm produced the following rainfall intensities (mm/hr) at half an hour intervals over a basin of area 1830 km^2 is 4, 9, 20, 18, 13, 11, 12, 2, 8, 16, 17, 13, 6 and 1. If the corresponding observed runoff is 36.6 million m^3 , estimate Φ – index for the storm. (8)
7. a. Explain the various sources of streamflow and types of flow occurring on the surface due to this. (10)
- b. Which is the most suitable routing method for deriving a discharge-storage relationship in a river? Elaborate the Method. (10)

OR

8. a. Show the various subsurface zones with a neat sketch and explain their classification. (8)
- b. What are the characteristics of saturated zone? Define and discuss their application in ground water study. (12)
9. a. Enumerate the various processes undergone by water in the surface, subsurface and in the atmosphere. Explain with a diagram the complete circulation processes. (5)
- b. Explain the significance of radiation in atmosphere with reference to condensation. (7)
- c. What do you mean by hydrologic budget or water balance of drainage basin. (8)

Wishing you All the Best

End Semester Examinations - Nov-Dec 2015 Exams

14CE3028 Groundwater Hydrology

Set A

Time : 3 hrs
Total Marks: 100

1. a. Determine the daily flow rate and the transmissivity of a sandstone aquifer if:
- The aquifer height is 15 m
 - The aquifer width is 800 m
 - The aquifer length is 2 km
 - The head change over the length of 2 km is 3m
 - Assume $K = 6 \times 10^{-7}$ m/sec (5)
- b. Consider a 300 m sequence of interbedded sandstone and shale that has 75% sandstone. The sandstone has horizontal and vertical hydraulic conductivity of 10^{-5} m/sec, and shale has horizontal and vertical hydraulic conductivity of 1.92×10^{-12} m/sec. Calculate equivalent conductivities for a system of layers. (5)
- c. What is the intrinsic permeability of a water-saturated medium that has a hydraulic conductivity of 15.42 m/day? Assume the groundwater is 20°C and 1 atm pressure. The density and the dynamic viscosity of water are 998.2 kg/m^3 and $1.002 \times 10^{-3} \text{ kg/(m.sec)}$, respectively. (4)
- d. Explain in detail about the storage properties of confined and unconfined aquifers (6)
- OR**
2. a. State Darcy's law and its limitations. (3)
- b. A constant-head permeameter has a cross-sectional area of 78.5 cm^2 . The sample is 23 cm long. At a head of 3.4 cm, the permeameter discharges 50 cm^3 in 38 s.(7)
- What is the hydraulic conductivity in centimeters per second and feet per day?
 - What is the intrinsic permeability if the hydraulic conductivity was measured at 15°C ?
 - From the hydraulic conductivity value, name the type of soil.
- c. A piezometer is screened 723.4 m above mean sea level. The point-water pressure head in the piezometer is 17.9 m and the water in the aquifer is fresh at a temperature of 20°C . (7)
- What is the total head in the aquifer at the point where the piezometer is screened?
 - What is the fluid pressure in the aquifer at the point where the piezometer is screened?
- d. What is the average flow velocity in pores? (3)
3. a. The transmissivity and storativity of a confined aquifer are $100 \text{ m}^2/\text{day}$ and 0.0001 respectively. An observation well is located 500 m away from a pumping well. For a pumping period of 220 min, calculate (a) the drawdown at the observation well if the discharge rate is $1000 \text{ m}^3/\text{day}$; (b) the pumping rate required to provide a drawdown of 1 m at that well after 220 min. (12)
- b. Write short notes on draw down and the radius of influence of a well. (4)
- c. How will you estimate aquifer parameters 'S' and 'T'? (4)
- OR**
4. a. A 30 cm well penetrates 45m below the static water table. After a long period of pumping at a rate of 1200lpm, the drawdown in the wells 20 and 45 m from the pumped well is found to be 3.8 and 2.4 m respectively. Determine the transmissibility of the aquifer. What is the drawdown in the pumped well? (10)
- b. What are the assumptions of the Thiem's and Dupit equations? (10)

5. a. Explain in detail about the following
1. Dug wells and bore wells (5)
 2. Electrical sounding technique for measuring water level with sketch (5)
 3. Intake structures (5)
- b. Write about the groundwater hydrograph (5)

OR

6. a. When actual sea water intrusion takes place? (3)
- b. How will you locate the fresh water-seawater interface? (4)
- c. Write in detail about the practical methods to control sea water intrusion. (5)
- d. List down the ways of groundwater and surface interactions (4)
- e. What are the causes of land subsidence and list down the control measures (4)
7. a. Explain in detail about advection, hydrodynamic dispersion, diffusion and sorption in pollutant migration in groundwater. (10)
- b. What is the relative velocity of a solute front of a solute-soil system with a distribution coefficient of 83 mL/g, a dry bulk density of 2.12 gm/cm^3 , and a volumetric water content of 0.26? (5)
- c. What is retardation and briefly explain the causes of retardation. (5)
- OR**
8. a. An aquifer has a hydraulic conductivity of $2 \times 10^{-5} \text{ m/s}$, a hydraulic gradient of 0.003 m/m and an effective porosity $n_e = 0.2$, and an effective diffusion coefficient $D^* = 0.5 \times 10^{-9} \text{ m}^2/\text{s}$. A chloride solution with a concentration of 500 mg/l penetrates in the aquifer along a line source. Find the chloride concentration at a distance of 20 m from the point of entry, after a period of two years. (14)
- b. Write short notes on sorption Isotherms and Retardation Factor in groundwater (6)
9. a. Explain in detail about different processes in hydrologic cycle. (12)
- b. .Write short notes on groundwater budget (8)

Wishing you All the Best

End Semester Examinations - Nov-Dec 2015 Exams

14CE3029 Systems Analysis

Set A

Time : 3 hrs
Total Marks: 100

1. a. Define Systems and types of systems. (10)
- b. What do you mean by design and analysis of a system? Explain with an example. (5)
- c. Discuss the problems in systems analysis in relation to water resources. (5)

OR

2. a. Explain the procedures for optimization of functions with single variable and multi-variables. (10)
- b. Explain Sensitivity Analysis with reference to optimality and feasibility. (10)
3. a. For all LP problems, the optimum solution will always fall on the boundary of the feasible space. Explain this with a graphical approach. (4)
- b. Determine the required capacity of a reservoir whose inflows and demands over a 6-period sequence are as given below: (release R_t = demand D_t) (16)

Period, t	1	2	3	4	5	6
Inflow, Q_t	4	8	7	3	2	0
Demand, D_t	5	0	5	6	2	6

OR

4. a. An irrigation project is to be developed. There is 20 Mm³ of water available annually. Two high-value specialty crops, A and B, are considered for which water consumption requirements are 9000 m³ and 6000 m³, respectively. It has also been determined that the planting of more than 1600 hectares to crop A or 2400 hectares to crop B would cause an adverse effect on the market for these special crops. It has been estimated that each acre devoted to crop A will result in Rs. 28800 profit, while an acre of crop B will net Rs. 48,000. Structure the LP model for this problem stating the logics involved. (12)
- b. Explain the process of Inflow as a stochastic process. (8)
5. a. Canal water is to be supplied from an irrigation to three distinct regions. The available annual water supply is 300 units of water. The table shows the net annual irrigation benefits in monetary units which would accrue to the three regions.

Annual water supplied (Units of water)	Net annual irrigation benefits to regions (monetary units)		
	I	II	III
0	0	0	0
100	300	100	400
200	600	300	500
300	800	900	600

i. Determine the annual water delivery to be made to each of the regions so as to maximize the annual profits. Also determine the maximum annual profit.

(17)

ii. Present a network representation of the sequential decision process.

(3)

OR

6. a. Consider that funds are allocated to three water resources development project namely, A, B and C in order to maximize the total expected revenue. Each water resources development project consists of different alternative configurations that require different funding levels and yield different revenues. Due to budget limitations, the total available funds for the entire development are fixed. Describe the general philosophy of the dynamic programming technique in deriving the optimal allocation of funds to the three projects with the objective of maximizing the total revenues. (10)

b. Explain the concept of suboptimization and principle of optimality (10)

7. a. Two types of crops can be grown in a particular irrigation area each year. Each unit quantity of crop A can be sold for a price Rs.2400/- and requires 2 units of water, 5 units of land, 3 units of fertilizer and 1 units of labour. Similarly, crop B can be sold at a unit price of Rs.2000/- and requires 3, 2, 2 and 2 units of water, land, fertilizer and labour, respectively, per unit of crop B. Assume that the available quantities of water, land, fertilizer, and labour are 60, 80, 60 and 40 respectively. Expressing the problem statement in a table form, structure the LP model for estimating the quantities of each of the two crops that should be produced in order to maximize total income. (20)

OR

8. a. Explain Conjunctive use of Surface and Groundwater resources. List out the benefits and the conditions under which Conjunctive use of Surface and Groundwater resources is to be carried out. (10)

b. Explain the steady state reservoir operating policy for irrigation. (10)

9. a. Explain simulation and its importance in Water resources systems. (8)
- b. Explain the components of a simulation model. (5)
- c. Explain the usefulness of simulation runs and the combination of simulation and optimization. (7)

Wishing you All the Best

Reg. No. _____

Karunya University

(Karunya Institute of Technology and Sciences)

(Declared as Deemed to be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – November / December - 2015

Subject Title: Computational Methods and Techniques

Time : 3 hours

Subject Code: 14CE3030

Maximum Marks: 100

Answer ALL questions (5 x 20 = 100 Marks)

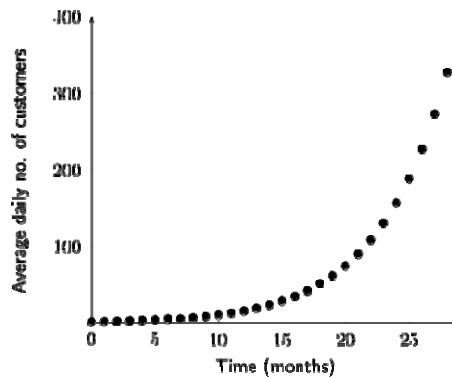
1. a. Explain how different finite different schemes are derived from using Taylor's series (10)
- b. Explain in detail how regression is useful in rainfall runoff prediction and modelling (10)

(OR)

2. a. A physics process can be described with the equation $y = f(x) = a_0/x + a_1/x^2$. The measured values of (x, y) are listed in the following table: Use direct nonlinear regression method to determine a_0 and a_1 . (15)

x	1	2	3	4
y	3	0.9	0.6	0.4

- b. Examine the scatter plot below of data collected from a new shop (5)



- i. What are the two variables being compared?
 - ii. What type of function best fits the data?
 - iii. Is the relationship between the two variables strong or weak?
 - iv. Is the relationship between the two variables positive or negative?
 - v. Using your answers above, describe the relationship between the two variables in one sentence.
3. a. Write short notes on (give example for ii, iii, iv, v sub divisions)
 - i. Data reduction technique (2)
 - ii. Scree plot and Kaiser criterion (3)
 - iii. Correlation matrix in Factor analysis (3)
 - iv. Extraction method (3)
 - v. Rotation methods (3)
 - b. How histogram and scatterplot can be applied in data analysis with an example. (6)

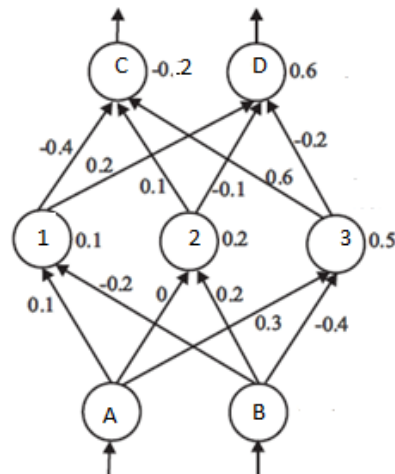
(OR)

4. a. Explain with an example how Database Management is helpful in water resources problems. Mention its advantages and limitations (12)
- b. What is SPSS and list down its applications (3)
- c. Mention different type of relationship with tables in RDMBS with example (5)

5. a. Explain the following terms with an example
 - i. Fuzzification (4)
 - ii. Evaluation of rules (4)
- b. What is a fuzzy set? (2)
- c. What is a membership function of a fuzzy set? (2)
- d. Can a fuzzy membership be True and False at the same time? (2)
- e. What is a fuzzy variable? (2)
- f. What is the purpose of defuzzification? Name at least one method used for defuzzification (4)

(OR)

6. Train the following neural network using Backpropagation algorithm for one cycle and calculate the error and new weights. (15)



- a. Is the following statement true or false? “Artificial neural networks are parallel computing devices consisting of many interconnected simple processors.”
 - i. TRUE. (1)
 - ii. FALSE. (1)
- b. Which of the following is true for neural networks? (1)
 - (i) The training time depends on the size of the network.
 - (ii) Neural networks can be simulated on a conventional computer.
 - (iii) Artificial neurons are identical in operation to biological ones.
 - (a) all of them are true.
 - (b) (ii) is true.
 - (c) (i) and (ii) are true.
- c. How do Neural Networks Work? Explain sigmoidal neurons (3)
7. Describe in detail how the groundwater flow and contaminant transport simulation can be carried out using MODFLOW. Explain with an example (20)

(OR)

8. Explain step by step procedure involved in simulation of rainfall runoff using SWAT model (20)

Compulsory :

9. a. Explain in detail about conceptual, physical and mathematical model with an example in context to your subject (12)
- b. Write short notes on
 - i. Calibration of models (4)
 - ii. Verification and Validation of models (4)

End Semester Examinations - Nov-Dec 2015 Exams

14CE3031 Participatory Water Management

Set A

Time : 3 hrs
Total Marks: 100

-
1. 1. Explain about the “Basic concepts of Sociology and Social system”? (20)

OR

2. Explain about the steps involved in the “Scientific Method of Investigation” ? (20)

3. What are the roles of SHGs and NGOs in participatory development ? (20)

OR

4. Explain in detail about “Participation in drinking water sector ? (20)

5. Explain in detail about “Participatory Mapping” and “Transect study tours” ? (20)

OR

6. Explain in detail about “SWOT Analysis” ? (20)

7. 7. Explain any case study on Peoples Participation in “Mini water supply project” ? (20)

OR

8. Explain any case study on Peoples Participation in “Micro lift irrigation project” ? (20)

9. Explain in detail about “Preparation of case studies with reference to field visit and appraisal” ? (20)

Wishing you All the Best

Reg. No. _____

Karunya University

(Karunya Institute of Technology and Sciences)

(Declared as Deemed to be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – November / December - 2015

Subject Title: Water Resources Planning and Development

Time : 3 hours

Subject Code: 14CE3032

Maximum Marks: 100

Answer ALL questions (5 x 20 = 100 Marks)

1. a. What are the different phases of water resources planning and explain them in detail. Also list down the physical and environmental conditions influencing the water resources planning project (10)
- b. Explain in detail about five sections of National Water Policy adopted to meet challenges for water resources development and management (10)

(OR)

2. a. Describe in detail about international funding agencies and the guidelines followed by them in allocating funds in water resources development projects (10)
- b. Explain in detail about data requirements for water resources planning. (10)
3. a. Write short notes on (with schematic sketch) (15)
 - i. Divide wall
 - ii. Fish ladder
 - iii. Scouring sluice
 - iv. Canal head regulator
 - v. Silt ejectors
 - vi. Groyne
- b. What are the different factors to be considered while considering the construction of diversion head networks (5)

(OR)

4. a. Explain in detail about different types of canal alignment with sketches (10)
- b. List down the differences between weir and barrage (5)
- c. What are different types of canal works. Explain any one of them in detail (5)
5. a. Explain in detail about the different types of reservoirs and list down the engineering and geological investigations to be considered while selecting the site for reservoir locations (6)
- b. The yield of water in Mm^3 from a catchment area during each successive months is given by table below.

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1.4	2.1	2.8	8.4	11.9	11.9	7.7	2.8	2.52	2.24	1.98	1.68

Determine the reservoir capacity using graphical and Analytical method. (10)

- c. Explain the formulation of rule curves for reservoirs in Parallel and Series (4)

(OR)

6. a. Explain in detail about the Sequent Peak method and Mass curve method to determine the capacity of the reservoir. (10)
- b. Explain in detail (with sketch) about the gravity and masonry dams with advantages and disadvantages (5)
- c. Write in detail about any one method of flood routing (5)

- 7. a. Explain in detail about embankments and dykes in flood control (8)
- b. What are the steps involved in decision making for a multipurpose reservoir project (8)
- c. Write short notes on flood cushioning (4)

(OR)

- 8. a. Explain in detail (with sketches) about various methods that can be adopted in flood proofing in urban areas (10)
- b. What are the steps involved in flood forecasting. Write in detail about any one of the methods (6)
- c. Write short notes on flood plain management (4)

Compulsory :

- 9. a. Write short notes on (8)
 - i. Shadow pricing
 - ii. Master plan approach
- b. Explain in detail about the different cost involved in water resources planning and development projects (12)

End Semester Examinations - Nov-Dec 2015 Exams

14CE3033 Irrigation Water Management

Set A

Time : 3 hrs
Total Marks: 100

1. (a) Describe the importance of irrigation in meeting the crop water requirements **8**
(b) Highlight the role of irrigation in food production of India after Independence **8**
(c) Explain the influence of south west monsoon on the Indian agriculture **4**
- OR**
2. (a) Give a critical analysis of the important statements on irrigation in the National Water Policy **8**
(b) Explain the harmful effects of excess irrigation **6**
(c) Classify the different rainfall zones **6**
3. (a) Define infiltration **4**
(b) With the help of a sketch, describe the double ring infiltrator and its functioning **6**
(c) Rainfall of 3.8 cm and 2.8 cm occurring on two consecutive 4-h durations on a catchment of area 27 sq km produced the following hydrograph of flow at the outlet of the catchment:
- | | | | | | | | | | | | | | |
|---------------------------------|----|---|----|----|----|----|----|----|----|----|----|-----|-----|
| Time from start of rainfall (h) | -6 | 0 | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 66 |
| Observed flow (cu m/sec) | 6 | 5 | 13 | 26 | 21 | 16 | 12 | 9 | 7 | 5 | 5 | 4.5 | 4.5 |
- Estimate the rainfall excess (10)
- OR**
4. (a) What is meant by effective rainfall? **4**
(b) What are the methods used to estimate effective rainfall? **6**
(c) Estimate the water requirement of wheat crop of 130 days duration when the duty of water for crop is 2496 ha **10**
5. (a) List the different devices used for measuring canal flows **4**
(b) Sketch at least two of the methods used for such measurements **6**
(c) Explain the *warabandi* system of turn irrigation with the help of a neat sketch **10**
- OR**
6. (a) Give the different criteria for scheduling irrigation. **5**
(b) What are the factors affecting frequency of irrigation? **5**
(c) Find out the depth to which 0.5 ha of rice field can be irrigated with a flow of 7.5 litre/sec in 8 hours **10**
7. (a) Discuss the advantages and disadvantages of surface irrigation methods **8**
(b) Describe straight border irrigation **6**
(c) Discuss ideal conditions for straight border irrigation **6**

OR

8. (a) Define drainage **4**
- (b) What are the methods of drainage generally adopted? **6**
- (c) Describe the component drains in a drainage system and give the general sizes and spacing of drains in different soils **10**
9. (a) Give details of different components of drip irrigation system with sketches **6**
- (b) Highlight the suitable crops and land types where drip irrigation can be used **6**
- (c) What are the different components of a typical sprinkler irrigation system? Explain with sketch. **8**

Wishing you All the Best

End Semester Examinations - Nov-Dec 2015 Exams

14CE3034 Fundamentals of MATLAB programming

Set A

Time : 3 hrs
Total Marks: 100

1. a. Which MATLAB command generates the solution to the system of equations $AX=B$? (2)
- a. $X = A/B$ c. $X = \text{sum}(A.*B)$
b. $X = \text{inv}(A)*B$ d. $X = B*A'$
- b. If $x=5$, $y=15$ and $z=-2$, determine the value of each of the following logical expression,. List the order of operations carried out in each expression (6)
- (i) $x > y \ \& \ x < z$
(ii) $x < y \ \& \ x > z$
(iii) $x == y \ \& \ y > x$
- c. Which MATLAB statement is correct for obtaining a vector where the elements are formed using $y = x \cos(x) + \sin(x)/(4 + \cos(x))$; where x has been defined as $x = (0 : .01 : 6)$? (3)
- A. $y = x * \cos(x). + \sin(x)/(4 + \cos(x))$
B. $y = x.*\cos(x) + \sin(x)/(4 + \cos(x))$
C. $y = x.*\cos(x) + \sin(x). / (4 + \cos(x))$
D. $y = x*\cos(x.) .+ \sin(x.) / (4 + \cos(x))$
E. None of these will work with that definition of x .
- d. Given the matrix P: (6)
- $P = [3 \ 4 \ 5 \ 1; 5 \ 6 \ 7 \ 2; 7 \ 8 \ 9 \ 3]$; Reshape this matrix as a
- (a) Column vector (b) (4x3) matrix (c) (6x2) matrix
- e. State a single Matlab command that will assign to the variable x the vector $[5, 10, 15, 990, 995, 1000]$ without displaying the result. (3)
- OR**
2. a. Write the MATLAB functions for the following (3)
- a. $2^5/2^5 - 1$ and compare with $(1 - 1/2^5)^{-1}$
b. $\sqrt{5-1} (\sqrt{5+1})^2$
c. e^3
d. $\ln(e^3)$
e. $\log_{10}(e^3)$
f. $\log_{10}(10^5)$
- b. Given the following matrix, show the results generated by these MATLAB commands.
- $v = [3.7 \ 2.4 \ 0.3 \ 5.2 \ 4.8]$ (3)
- $h = \text{find}(v > 3.5)$
- $\text{high} = v(h)$
- c. True/False (circle your choice): (4)

T F The final step of the **Engineering Problem-Solving Methodology** is algorithm development.

T F The **semicolon (;)** suppresses output when used with MATLAB commands.

T F The **transpose operator (T)** interchanges the rows and columns of a matrix.

T F The **disp** command pauses a MATLAB program and prompts the user for input.

d. What are the rules governing variable names and strings? (3)

e. What are arithmetic, relational and logical operators? List them out. (3)

f. How Matrices can be generated in MATLAB and how the sub matrix can be extracted in MATLAB? (4)

3. a. In the following example a random integer number x from the set $\{1, 2, \dots, 10\}$ is generated. If $x = 1$ or $x = 2$, then the message Probability = 20% is displayed to the screen. If $x = 3$ or 4 or 5, then the message Probability = 30% is displayed, otherwise the message Probability = 50% is generated. Write a MATLAB program for it. (6)

- b. Write the MATLAB script to solve the following systems of linear equations. (8)

$$5x + 3y - z = 10 \quad 3x + 2y + z = 4 \quad 4x - y + 3z = 12$$

Differentiate between 'while' loop and 'for' loop with an example. What are the rules governing the structure. (6)

OR

4. a. What are different types of control structures in MATLAB? Explain any one of the control structures with an example in the field of water resources Management (10)

b. Write a function file that classifies a flow according to the values of its Reynolds (Re) and Mach (Ma) numbers, such that if $Re < 2000$, the flow is laminar; if $2000 < Re < 5000$, the flow is transitional; if $Re > 5000$, the flow is turbulent; if $Ma < 1$, the flow is sub-sonic, if $Ma = 1$, the flow is sonic; and, if $Ma > 1$, the flow is super-sonic. (10)

5. a. How the *fprint* command can be used to display a mix of text and numerical data. Explain how this command can be used to insert more than one number. Explain with example. List down the rules governing the *fprint* command. (10)

- b. Write a script that will use the random-number generator **rand** to determine the following:

1. The number of random numbers it takes to add up to 20 (or more).

2. The number of random numbers it takes before a number between 0.8 and 0.85 occurs.

3. The number of random numbers it takes before the mean of those numbers is within 0.01 of 0.5 (the mean of this random-number generator). (10)

OR

6. a. Write a MATLAB program to copy the data from one file to another file (5)

b. . Write a program to illustrate how a menu can be created using MATLAB (4)

c. Write a function 'exchange' to interchange the values of two variables, say p and q . Illustrate the used of this function in calling program with $p = 4.5$ and $q = 7.3$ (5)

d. Create a text file in MATLAB. Write a program to search and report for a particular string in the text file. (6)

7. a. Write a Matlab function to evaluate the function $f(x) = (2x + 1/x + 3) e^{-x}$. Write a script file to plot a graph of f using 50 values of x from 0 to 20. (6)
- b. What are the commands for adding title, text, and axis labels in two dimensional graphical plot in MATLAB. Also write the commands for adding linestyle, markers and colors in the plot. (8)
- c. Write about scripts and functions in MATLAB (6)
- OR**
8. How the following plots can be created in MATLAB using an example (20)
- Mesh plot
 - Surface plot
 - Contour plot
 - Mesh and contour plot
 - bar and pie
 - histogram
 - step and stem plot
9. a. List down the steps involved in GUI design in MATLAB (5)
- b. What is a use of handle in MATLAB GUI? (3)
- c. What are uicontrol objects? How will you create Menus, Edit box and sliders in MATLAB GUI. Explain with an example. (12)

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End Semester Examinations - Nov-Dec 2015 Exams

14CE3039 Isotope Techniques in Water Resources Management

Set A

Time : 3 hrs
Total Marks: 100

1. a. Water molecule is formed by the combination of hydrogen and oxygen atoms in the ratio 2:1. If hydrogen and oxygen have three isotopes each, find out the following: (10)
- Number of water molecules in which no two identical isotopes are present.
 - Number of water molecules in which two identical isotopes are present.
 - Number of water molecules which are radioactive in nature.
 - Number of water molecules in which deuterium is present.
 - Number of water molecules having ^{18}O isotope.

Support your answers with molecular formulae for each.

b. Define the following:

a. Radioactivity b. Half- life c. Mean- life d. Specific activity.

- Give the units of radioactivity. Which is the unit currently in use? Give their relationship..
- Name the element which has no natural existence but still find useful in hydrology.
- Name the element which has no neutron in its nucleus. How many isotopes does it have? Is anyone among them radioactive? If so, give the number of neutrons present in its nucleus.
- Write down the standard form in which a nuclide is presented. Give the symbols used for proton number, neutron number and mass number. (10)

OR

2. a. Explain isotope ratio and isotope concentration. Derive an expression showing the relationship between them. (10)
- b. A compound undergoes isotope fractionation resulting in the formation of two components A and B of different isotope ratios. Give the expression for isotope fractionation factor. Explain enrichment and depletion factor. (10)
3. a. Explain how tritium and carbon-14 are produced naturally showing clear nuclear reactions responsible for their production. How do they reach earth? Give the unit by which natural tritium is expressed. (5)
- b. How are isotopes classified? Give at least two isotopes under each class (5)
- c. Calculate and express in grammes, the activity, equivalent to 1Ci of Carbon-14 Half- life of Carbon-14 is 5770 years and Avogadro's number is 6.023×10^{23} (5)
- d. If the half life of tritium is 12.42 years, find its mean life. What is the activity of tritium left after 24.84 years if the initial activity is equal to 1Ci.? (5)

OR

4. a. Define isotope fractionation factor and fractionation. Discuss kinetic isotope fractionation. Give at least three examples for kinetic isotope fractionation. (5)
- b. What are the limitations for measuring the kinetic fractionation effect? (5)
- c. Discuss in detail the reasons for the physical and chemical properties observed in a molecule labelled with a heavier isotope taking water molecule as an example. (10)
5. a. Derive a relationship between ^2H and ^{18}O for water. What is D-excess? Why does it vary from region to region? (8)

b. What are the values for $\delta^2\text{H}$ and $\delta^{18}\text{O}$ for ocean water? (2)

c. What do GMWL and LMWL stand for? Explain. (4)

d. Explain the following: a. Altitude effect b. Latitude effect c. Continental effect d. Amount effect. (6)

OR

6. a. What do, a. CF-IRMS b. DI-IRMS c. SMOW d. SLAP e. GISP and e. IAEA stands for? (6)

b. Which are the standard materials used for ^{15}N , ^{34}S and ^{13}C respectively during their analyses on a mass spectrometer? What are their δ - values? (6)

c. Discuss the methods used for reduction of water using metals during its analysis for ^2H . Support your answer with necessary equations indicating the reaction conditions. Which metal is preferred? Give reasons. (8)

7. a. Mention the three processes identified which lead to groundwater salinisation. 6

b. Development of salinity is independent of isotope composition of water-Explain. 3

c. Explain how stable isotopic composition of water is a useful tool to find:

1. Salinity arising from the mixing of saline water and freshwater 4

2. Salinity arising from the concentration of dissolved salts 4

3. Explain how ^{34}S helps to find the source of salinity in groundwater. 3

OR

8. a. What is a percolation tank ? How is environmental tracers like ^2H or ^{18}O is used to find the fractions of water from percolation tank and groundwater which reach a well in the vicinity of a percolation tank (10)

b. Which are the isotopes used to find the sedimentation rate in a lake? (2)

c. Explain what is meant by supported lead ($^{210}\text{Pb}_{\text{supported}}$) and excess lead ($^{210}\text{Pb}_{\text{excess}}$) (2)

d. Describe how Cesium -137 (^{137}Cs) is used to find the sedimentation rate in a lake (6)

9. a. Explain the working of a mass spectrometer with the help of a simple diagram showing different components of the system. (10)

b. Why solid scintillation technique is preferred over liquid scintillation for the analysis of isotopes emitting gamma radiation? (2)

c. Explain the role of PPO and POPOP in the scintillation cocktail used during the analysis on a liquid scintillation spectrometer. (3)

d. Draw a simple sketch of the electrolytic cell used for enriching water samples for natural tritium. What are the cathode and anode made of? (5)

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Time : 3 hrs
Total Marks: 100

1.
 1. a. Distinguish between galvanic and electrolytic processes with examples. (10)
 - b. Describe the electrode reactions when aqueous NaCl and molten NaCl are electrolysed (10)
- OR**
2.
 2. a. Write a note on reference electrodes. Describe standard hydrogen electrode. (8)
 - b. Write a note on costing of electrolytic process. (6)
 - c. What is space time yield? Why is it important in electrochemical processes. (6)
3.
 3. a. what is a gallon? (1)
 - b. What are the groups necessarily to be present in cation and anion exchange membranes in a ED unit to remove the cations and anions of waste water? (3)
 - c. Distinguish between material yield and current efficiency with example. (8)
 - a. Describe the effect of operating parameters of a general purpose electrodialysis system. (8)

4.
 3. Define and distinguish between the following
 - a. Batch reactor and backmix reactor (6)
 - b. Tank cell and flow cell (7)
 - c. Monopolar and bipolar cell (7)
5.
 5. a. In an ED process of water treatment how one can come to know the desalination process is over? (4)
 - e. Write about the industrial applications of electrodialysis. (16)

6.
 1. a. Calculate the electric charge required to produce 8 g of hydrogen from an electrolytic cell. (7)
 - b. Distinguish between material yield and current efficiency with example. (6)
 - a. Describe the effect of operating parameters of a general purpose electrodialysis system. (7)
7.
 - a. Distinguish between Material yield and current efficiency (8)
 - b. Describe the electrochemical process for the recovery of Fe in acid bath (12)

8.
 - a. Write a note on two stage electroflotation system (7)
 - b. Bring out the cathodic and anodic processes involved in electroflotation (8)
 - c. Write a note on the residential water softeners (5)

- 9.
- a. Describe the principles of electrodialysis with suitable diagram (7)
 - b. Write a note on applications of electrodialysis (5)
 - c. Describe the effect of operating parameters of a general purpose electrodialysis system (8)

Wishing you All the Best
