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BT-3/D-23

43155

INTRODUCTION TO CIVIL ENGINEERING  
HM-251A

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

**Unit I**

1. (a) What are various broad disciplines of civil Engineering ? State the importance of each in development of a country. 8
- (b) What are various types of bridges on the basis of varied parameters ? 7
2. (a) What are various materials used in construction industry ? Discuss the brief history of development of these materials 8
- (b) What are the possible career prospects in the field of Civil Engineering ? 7

## Unit II

3. Highlight the position of construction industry *vis-a vis* other industry in the development of a nation. **15**
4. What are traditional surveying techniques ? Explain the use of total station in field. **15**

## Unit III

5. (a) How is recycling of construction and demolition waste carried out ? **7**  
(b) What are various types of bricks ? How do you assess the quality of bricks in field ? **8**
6. Write short notes on the following : **5×3=15**
  - (a) Automation and robotics in construction
  - (b) Importance of contracts management
  - (c) Plastic in construction.

## Unit IV

7. What do you mean by solid waste management ? Discuss various methods to manage solid waste. **15**
8. What are basics of water supply system ? Explain various types of Water Supply Systems. **15**

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HIGHER ENGINEERING MATHEMATICS  
BS-204A

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting *one* at least question from each Section. All questions carry equal marks.

Section A

1. (a) Find the Laplace transform of the function  $t^2 \sin t$ .  
(b) Find the Laplace transform of the function  $e^{-2t} \cos 5t$ .
2. (a) Find the inverse Laplace transform of :

$$\frac{s}{(s^2 + 1)^2}$$

using convolution.

- (b) Using Laplace transformation solve the initial value problem :

$$y'' - 4y' + 4y = 16 \sin 2t, y(0) = 0, y'(0) = 1$$

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### Section B

3. (a) Solve the partial differential equation

$$(p^2 + q^2)y - qz = 0 \text{ using Charpits' method.}$$

- (b) Form the partial differential equation of the surface :

$$z = f(x^2 - y^2)$$

4. (a) Solve the Lagrange equation :

$$y^2 p - xyq = x(z - 2y)$$

- (b) Solve the partial differential equation :

$$\frac{\partial^3 z}{\partial x^3} - 3 \frac{\partial^3 z}{\partial x^2 \partial y} + 4 \frac{\partial^3 z}{\partial y^3} = e^{x+2y}$$

### Section C

5. (a) Using bisection method find the roots of the equation :

$$x^3 - x - 4 = 0$$

correct to two decimal places.

- (b) Using the Newton-divided difference formulas to calculate  $f(3)$  from the following table :

$x$	0	1	2	4	5	6
$f(x)$	1	14	15	5	6	19

6. (a) Find the roots of the equation  $x - e^{-x} = 0$ , correct to three decimal places using Newton-Raphson method.

- (b) Using Lagrange interpolation formula find the unique polynomial  $P(x)$  of degree 2 or less such that :  
 $P(1) = 1, P(3) = 27, P(4) = 64.$

#### Section D

7. (a) Consider the initial value problem :

$$y' = x(y+x) - 2, y(0) = 2$$

Use Euler's method with step sizes  $h = 0.2$  to compute approximations of  $y(0.4)$  (3 decimals).

- (b) Dividing the range into 10 equal parts, find the approximate value of :

$$\int_0^1 \frac{1}{1+x} dx$$

using Trapezoidal Rule.

8. (a) Using Runge-Kutta method of fourth order, find the numerical solution at  $x = 0.8$  for the initial value problem :

$$\frac{dy}{dx} = \sqrt{+y}, y(0.4) = 0.41$$

with the step length  $h = 0.2.$

- (b) Define Taylor Series Method for the solution of an initial value problem.

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**43157**

**INTRODUCTION TO SOLID MECHANICS  
CE-201A**

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

**Unit I**

1. (a) Draw and explain stress-strain diagram for mild steel. 7
- (b) Define the following terms : 4
  - (i) Poisson's ratio
  - (ii) Bulk modulus
  - (iii) Modulus of resilience
  - (iv) Rigidity modulus.
- (c) What are the assumptions in theory of simple bending ? 4
2. Calculate the crippling stress, using Euler's Formula, for a pin-ended 2 m long strut consisting of a tube of 7.5 cm outside diameter and 2.5 mm wall thickness. In a compression test, a short length of this tube failed at a

(5-44/12)L-43157

**P.T.O.**

load of 315 kN when tested as a strut with rounded ends, 2m long, it failed at a load of 174 kN. Find from these data the value of the constant in the Rankine's Formula. Take Young's modulus = 20 MN/cm<sup>2</sup>. 15

### Unit II

3. (a) A cantilever beam of span L, fixed at the left end, carries a gradually varied load from zero at free end to  $w$  per m length at fixed end. Draw the SFD and BMD. 8
- (b) Draw the shear force and bending moment diagram for a cantilever beam of span 5m subjected to uniformly distributed load of 5 kN/m over a length of 2 m starting from the free end. 7
4. A three hinge parabolic arch hinged at the support and crown has a span of 24 m and a central rise of 4m. It carries a concentrated load 15 kN at 18 m from left end support and a uniformly distributed load of 30 kN/m over the left half portion. Determine the moment, thrust and radial shear at a section 6 m from left support. 15

### Unit III

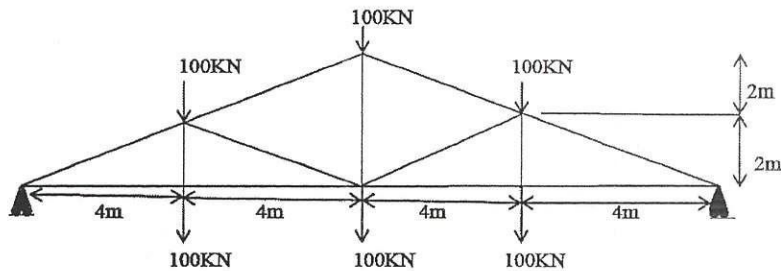
5. (a) A 200 cm long cantilever beam carries a load of 3 kN at a distance of 100 cm from the fixed support end and a load of 2 kN at the free end. Determine the deflection at the free end. Take  $E = 20 \times 10^6$  N/cm<sup>2</sup>,  $I = 1500$  cm<sup>2</sup>. 10

(b) Explain moment area theorems. 5

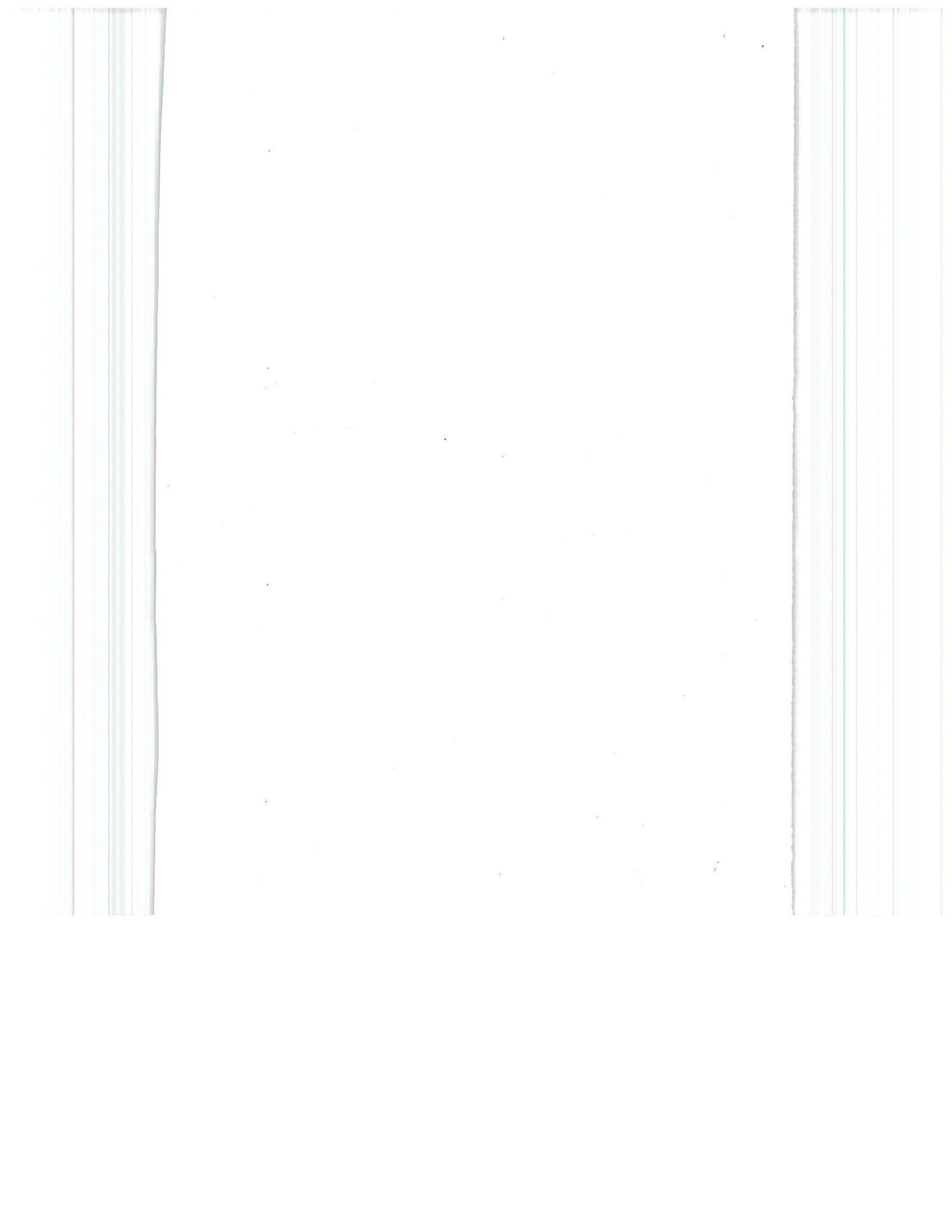
6. A cantilever of length 3 m is carrying a UDL of 10 kN/m over a length of 2 m from fixed end. Find the maximum slope and deflection. Assume  $EI = 4 \times 10^{12} \text{ Nmm}^2$ . 15

#### Unit IV

7. Determine the forces in a member of truss as shown in fig. by method of Joint. 15



8. Explain Tension Coefficient Method for analysis of truss. 15



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43158

INTRODUCTION TO FLUID MECHANICS

CE-203A

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit.

**Unit I**

1. Define and distinguish between the following : **15**

- (a) Real and Ideal Fluid
- (b) Cohesion and Adhesion
- (c) Specific Volume and Specific Gravity
- (d) Dynamic and Kinematics Viscosity
- (e) Newtonian and Non-Newtonian Fluids
- (f) Laminar and Turbulent Flow
- (g) Rotational and Irrotational Flow
- (h) Uniform and Non-uniform Flow
- (i) Compressible and Incompressible flow
- (j) Path Line and Stream Line.

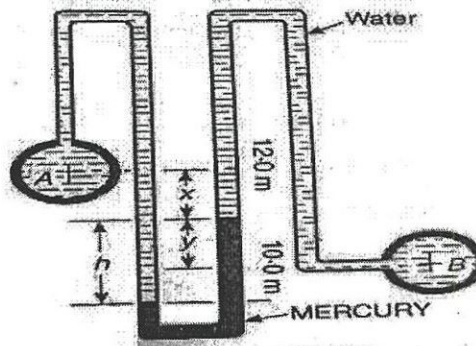
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2. (a) The stream function for a two-dimensional flow is given by  $\psi = 2xy$ . Calculate the velocity at a point P (2, 3). Also find out the velocity potential function  $\phi$ . 7
- (b) A plate 0.0254 mm distant from a fixed plate, moves at 61 cm/sec and requires a force of  $0.2 \text{ kg(f) m}^2$  to maintain this speed. Determine the dynamic viscosity of the fluid between the plates. 8

### Unit II

3. (a) What do you mean by absolute, atmospheric and gauge pressure ? Obtain an expression for the pressure intensity at a point in a liquid mass. 7
- (b) Two vessels A and B contain water under pressures of  $274.68 \text{ kN/m}^2$  [ $2.8 \text{ kg(f/cm}^2)$ ] and  $137.34 \text{ kN/m}^2$  [ $1.4 \text{ kg(f/cm}^2)$ ] respectively. What is the deflection of mercury in the differential gage shown in figure ? 8



4. (a) Explain the terms : force of buoyancy and centre of buoyancy, Metacentre and metacentric height. 7  
(b) Explain experimental method for the determination of metacentric height. 8

### Unit III

5. (a) Explain Bernoulli's theorem, giving its various limitations. 8  
(b) Write short notes on the following with diagram : 7  
(i) Pitot tubes  
(ii) Venturi meter  
(iii) Orifice meter.
6. Derive the formulae for discharge through a triangular notch. Give its advantages over rectangular notch. 15

### Unit IV

7. Assuming that the velocity distribution in the boundary layer is given by :

$$\frac{v}{V} = \left(\frac{y}{\delta}\right)^{1/7}$$

calculate  $\frac{\delta^*}{\delta}$ ,  $\frac{\theta}{\delta}$  and  $\frac{\delta E}{\delta}$ . If at a certain section, free stream velocity  $V$  was observed to be 10 m/s and the thickness of boundary layer as 25 mm, then calculate the energy loss per unit length due to the formation of the boundary layer. Take  $\rho = 1.226 \text{ kg/m}^3$  ( $0.125 \text{ msl/m}^3$ ). 15

8. (a) Outline the procedure for Buckingham method. **10**
- (b) Write the dimensions (in terms of MLT) for the following quantities with their symbol : **5**
- (i) Angular Velocity
  - (ii) Mass Density
  - (iii) Pressure Intensity
  - (iv) Dynamic Viscosity
  - (v) Force.

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SURVEYING AND GEOMATICS

CE-205A

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit. Assume any missing data. All questions carry equal marks.

**Unit I**

1. (a) The following bearings were observed while traversing with a compass : 10

LINE	F.B.	B.B.
PQ	45°45'	226°10'
QR	96°55'	277°5'
RS	29°45'	201°10'
ST	324°48'	144°48'

Determine the corrected bearings.

- (b) Write down the difference between repetition and reiteration method. 5
2. What do you understand by axis signal correction ? Explain and also write down its derivation. 15

(3-51/3) L-43159

P.T.O.

## Unit II

3. (a) The top (B) of a tower was sighted from two stations A and C at different levels, the station A and B being in line with top of tower. The angle of elevation from A to the top of tower is  $48^{\circ}31'$  and that from C to the top of tower was  $31^{\circ}28'$ . The angle of elevation from C to a vane 2 m above the foot of staff held at A was  $25^{\circ}21'$ . The heights of the instrument at A and C were 2.87 m and 2.64 m respectively. The horizontal distance between A and C was 137 m and the reduced level of C was 122.78 m. Calculate the R.L. of the top of the tower and the horizontal distance from A to the tower. 8
- (b) Write down the Three Problem with neat and clean sketch. 7
4. (a) Describe the process of contouring and state the characteristics and methods of locating the contours. 10
- (b) Explain the Intersection and Resection method in detail. 5

## Unit III

5. (a) What do you understand by curve ? Explain and also write down its types. 8

- (b) Explain briefly the linear methods of setting out circular curves. 7
6. (a) Describe the different methods of measuring distance and state the various types of EDM instruments. 10
- (b) Write down the working principle of Total station. 5

#### Unit IV

7. (a) Explain briefly, how GPS works to determine the position co-ordinates of a point ? 8
- (b) What do you understand by stereoscopies ? Explain. 7
8. (a) Derive parallax equations for determining elevation and ground coordinate of a point. 10
- (b) Write down working the principle of GPS. 5



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43160

BUILDING CONSTRUCTION PRACTICE  
CE-207A

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

**Unit I**

1. (a) Draw neat sketches, showing plan and elevation of two consecutive courses of a brick thick wall in English bond at a right-angled corner.  
(b) What are the commonly observed defects in brickwork ? What preventive measure can be taken in each case ?
2. (a) What is the purpose of providing cavity walls ? What advantages do cavity walls have over solid wall construction ?  
(b) What do you understand by the term 'Foundation' ? What is the purpose of providing foundations ?

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## Unit II

3. (a) What do you understand by Damp- proof course ?  
Where is it placed in a building and why ?
- (b) Write a note on King –Post roof truss with sketch.
4. (a) Discuss the various types of Floorings used for ground floor construction. Describe any *one* in detail.
- (b) What do you understand by Deep foundation and shallow foundation ?

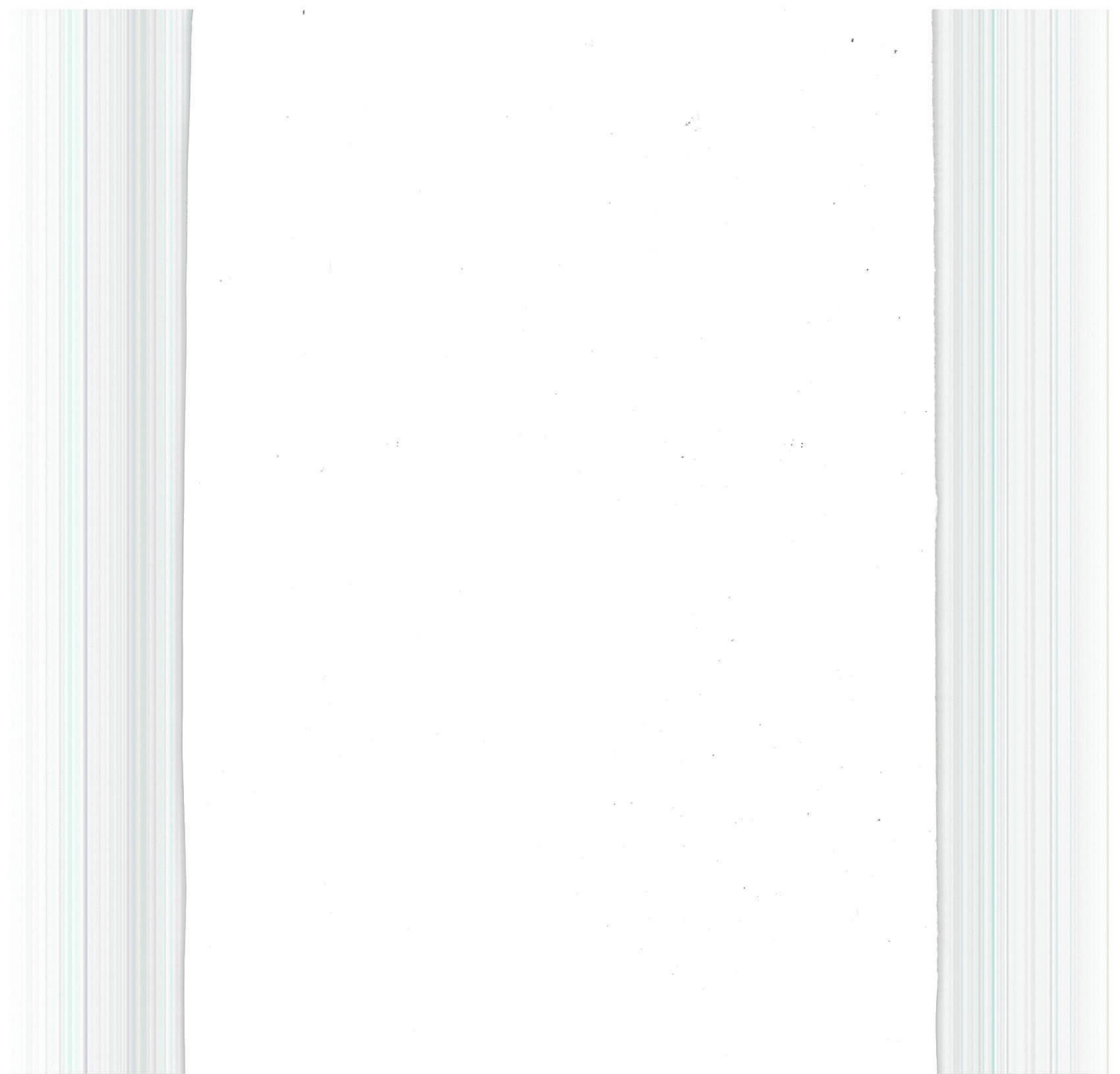
## Unit III

5. (a) What do you understand by soundness of cement ?  
How will it be tested in the laboratory ?
- (b) Describe the working of Bull's Trench Kiln for the burning of bricks.
6. (a) What are the precautions which are to be taken for the storage of cement ?
- (b) Write down the manufacturing process of terracotta.

## Unit IV

7. (a) What are the various methods of Quarrying ?  
Explain any *one* in detail.

- (b) Write down the various defects in timber caused due to conversion and fungi.
8. (a) What are the ingredients of Vanish ? Briefly describe each of them.
- (b) What do you understand by seasoning of timber ?



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45188

PROFESSIONAL PRACTICE, LAW AND  
ETHICS  
HM-255A

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

**Unit I**

1. What are the roles of civil engineers and government mentioned in the professional practice ? Also discuss the roles of manufacturers and contractors. **15**
2. Write short notes on the following : **15**
  - (a) IRC
  - (b) BIS
  - (c) IIA
  - (d) ECI
  - (e) RERA.

**Unit II**

3. Explain the following terms : **15**
  - (a) Professional ethics

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- (b) Business ethics
  - (c) Engineering ethics
  - (d) Personal ethics
  - (e) Corporate ethics
4. (a) What do you mean by conflict of interest ? Explain with the help of suitable example. 7
- (b) Write a detailed note on deficiencies in the state-of-the-art and whistleblowing. 8

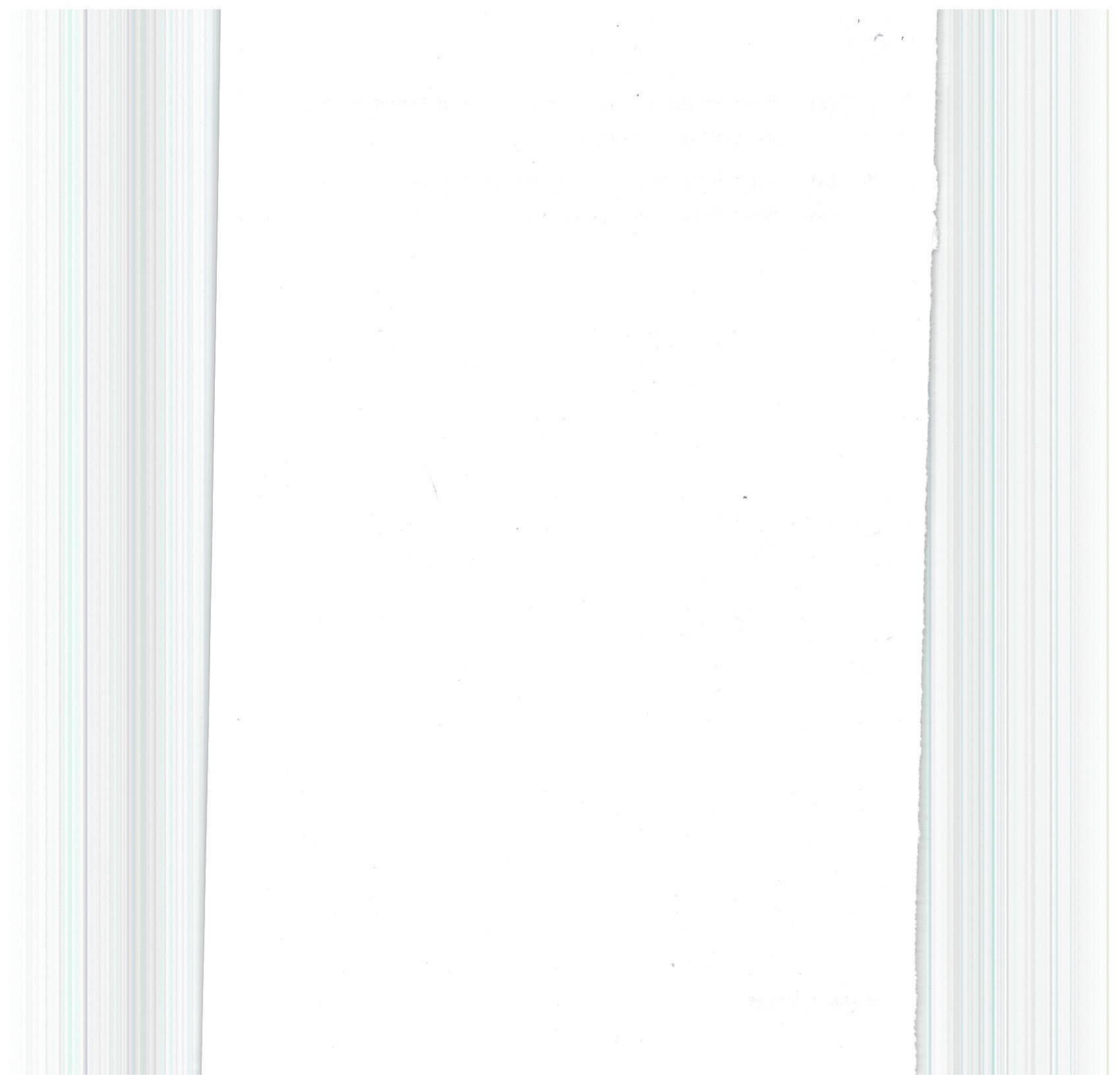
### Unit III

5. (a) Explain the process of contract formulation and features of the contracts. 8
- (b) What is the difference between (i) valid and voidable contracts (ii) prime and sub-contracts ? 7
6. (a) What is the process of bid evaluation ? Explain with the process with suitable example. 7
- (b) What are the wrong practices in contracting ? 8

### Unit IV

7. (a) Write in detail about Industrial Disputes Act, 1947. 8

- (b) What are the different engagements of labour in the construction industries ? 7
- 8. (a) Explain the Workman's Compensation Act, 1923. 8
- (b) What do you understand by RERA Act, 2017 ? 7



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**45189**

**STRUCTURAL ANALYSIS-II**

**CE-301A**

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks. Assume any missing data.

**Unit I**

1. Explain the Muller Breslau Principle in detail with taking suitable example. 15
2. Draw the ILD for horizontal thrust, bending moment, normal thrust and radial shear for a three hinged parabolic arch. 15

**Unit II**

3. Write short notes on the following : 5×3=15
  - (i) ILD
  - (ii) Shear Force
  - (iii) Bending Moment
  - (iv) UDL
  - (v) UVL.

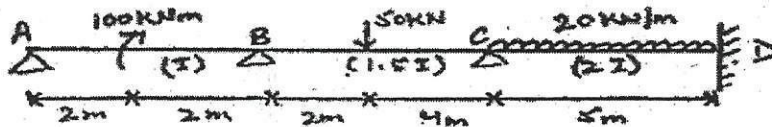
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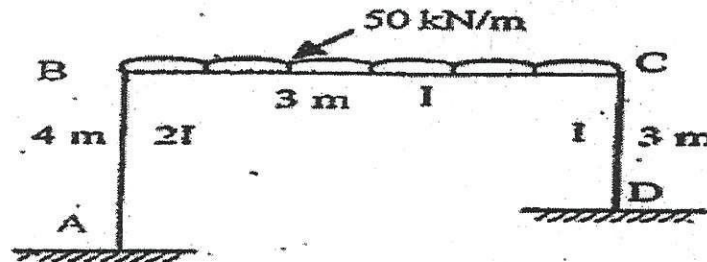
4. A two hinge parabolic arch has span  $L = 30$  m and rise  $h = 6$  m, construct the ILD for :
- Horizontal reaction
  - B.M., S.F. and N.T. at 7.5 m from left and side.

### Unit III

5. Determine the support moment at A, B, C and D for the continuous beam by Kani's method as shown in fig.

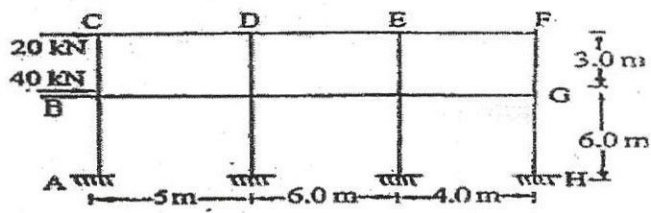


6. Analyse the rigid Portal frame as shown in fig. by Kani method and draw B.M.D.

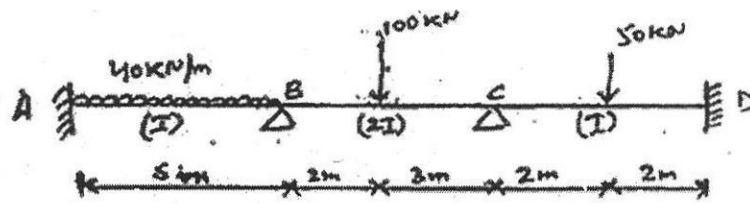


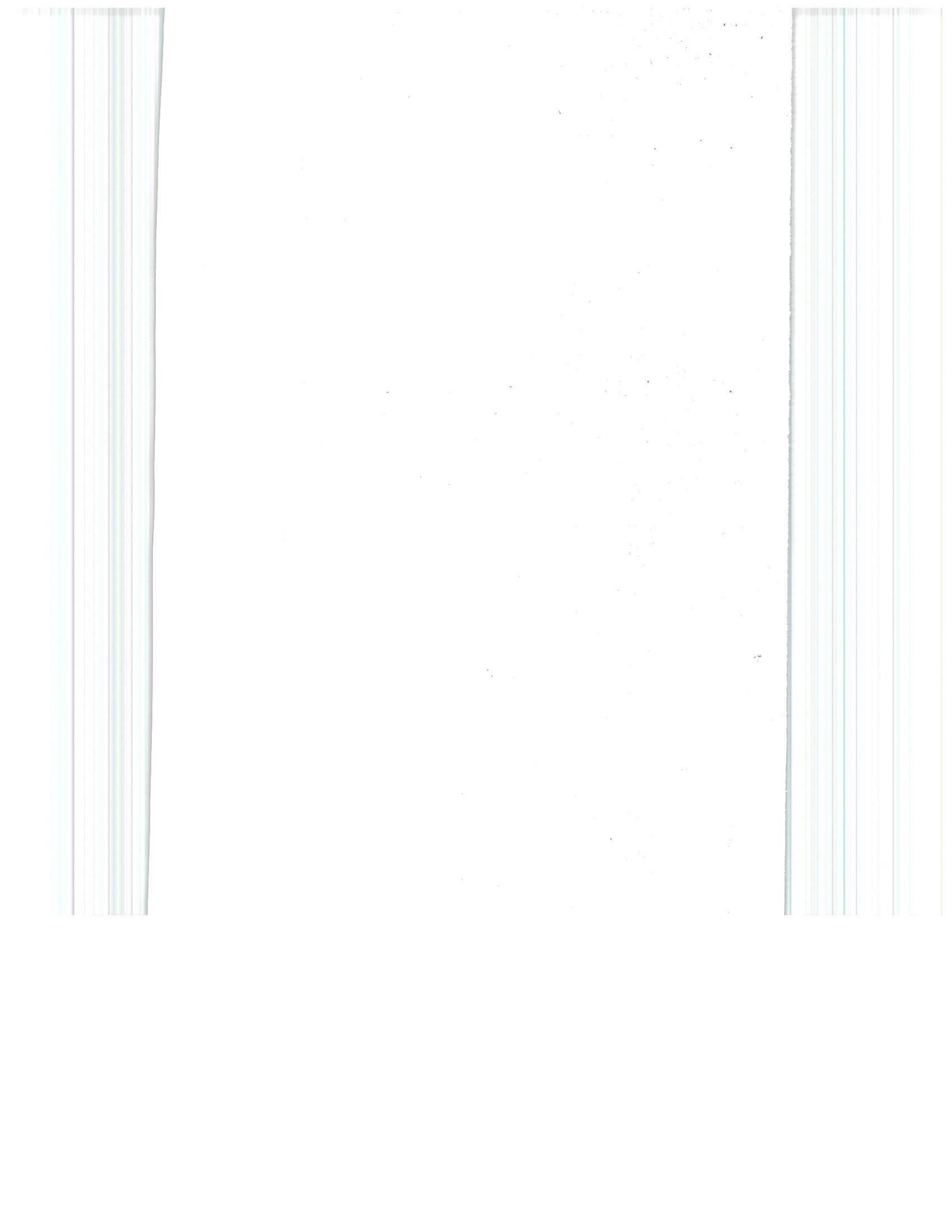
### Unit IV

7. Using Portal method analyse the frame as shown in fig. Also draw the B.M. diagram for entire frame.



8. Analyse the continuous beam by flexibility matrix as shown in fig.





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45190

DESIGN OF CONCRETE STRUCTURE-I  
CE-303A

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

**Unit I**

1. Explain the following terms : 15
  - (i) Workability
  - (ii) Durability
  - (iii) Abram's water cement ratio law
  - (iv) Consistency.
  
2. What are the major advantages of limit state design method? Discuss three different types of limit states under each condition of limit state of collapse and serviceability. 15

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## Unit II

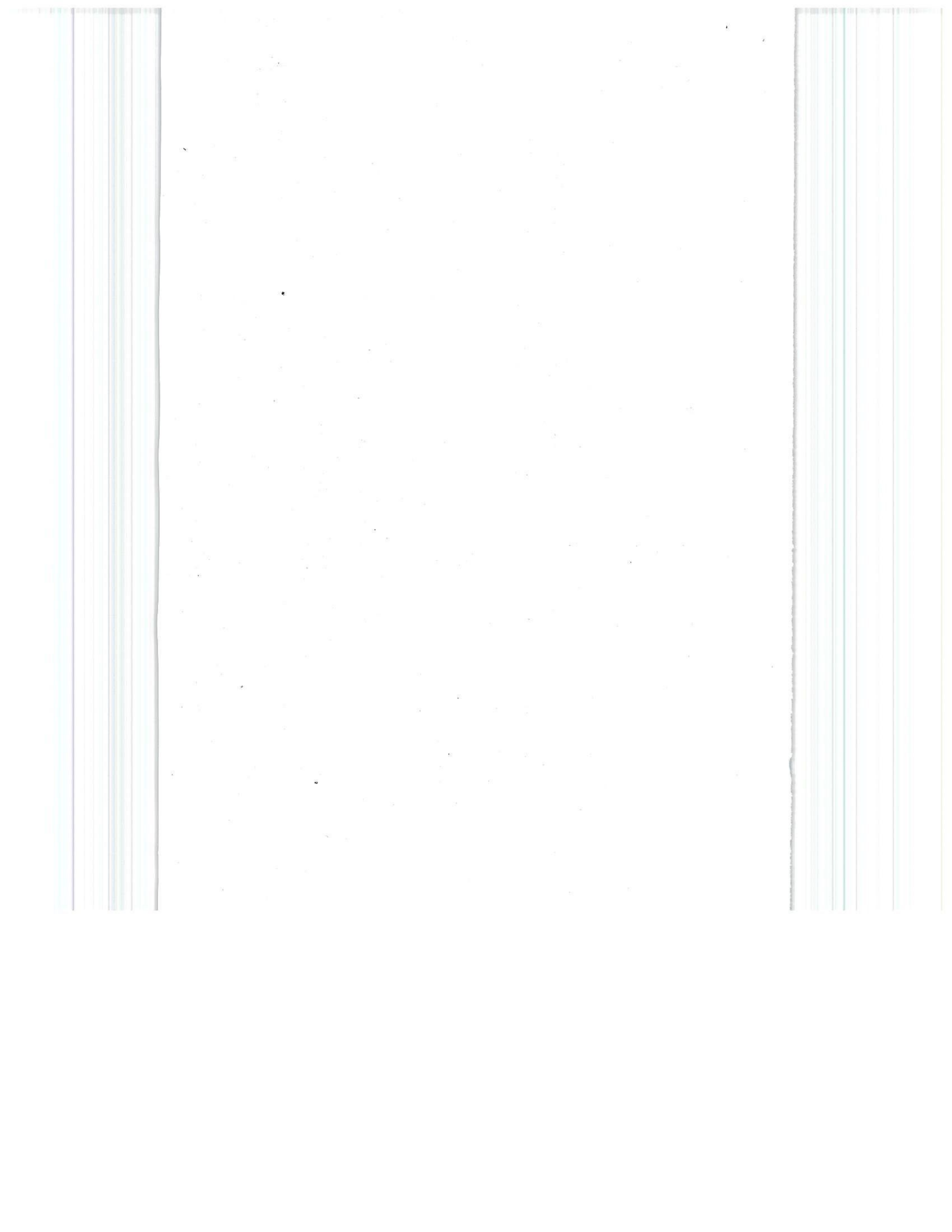
3. A RCC beam  $400 \times 600$  mm with 40 mm cover to the centre of reinforcements has been provided with 4-20 mm  $\phi$  steel at bottom and 4-16 mm  $\phi$  at top. If the permissible stresses in concrete and steel are 7 MPa and 230 MPa, find the moment of resistance of the beam (WSM). **15**
4. Design a reinforced concrete beam  $250 \times 400$  mm to carry factored moment 200 kNm at mid span using M20 grade of concrete and Fe 500 grade of steel. **15**

## Unit III

5. Design a short circular spiral column of not more than 450 mm in diameter to carry axial load 3000 kN. Use working stress method, M25 grade of concrete and Fe 250 grade of steel. **15**
6. Design a rectangular beam section to carry a factored bending moment 200 kNm, factored shear force 100 kN and a factored torsional moment 50 kNm. M 20 grade of concrete and Fe 415 grade of steel are to be used. **15**

## Unit IV

7. Design a floor slab simply supported over a clear span of 4 metre. The slab is to be finished with 25 mm thick cement concrete flooring. The superimposed load on the slab is  $4 \text{ kN/m}^2$ . The bearing of the slab on the supporting walls may be taken 230 mm. Use M 20 grade of concrete and Fe 415 grade of steel. Designed slab should pass all the checks. **15**
8. Discuss different types of retaining walls with the help of figures and differentiate in their structural behaviour. **15**



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**45191**

**HYDROLOGY**

**CE-305A**

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

**Unit I**

1. Explain 'Hydrological cycle' with neat sketch, divisions of hydrological cycle and application of hydrology to engineering problems. **15**
2. Explain the following : **15**
  - (i) Precipitation and its measurement
  - (ii) SIMON'S non-recording rain gauge
  - (iii) Frequency of point rainfall.

**Unit II**

3. (a) Explain Evaporation and factors affecting rate of evaporation also Dalton's law of Evaporation. **10**  
(b) Define Evapotranspiration and its measurement. **5**

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P.T.O.

4. (a) Explain the following terms in brief : 10  
(i) Infiltration capacity  
(ii) Infiltration rate  
(iii) Infiltration indices (w-index and  $\phi$ -index)  
(b) Describe the factors affecting for infiltration rates. 5

### Unit III

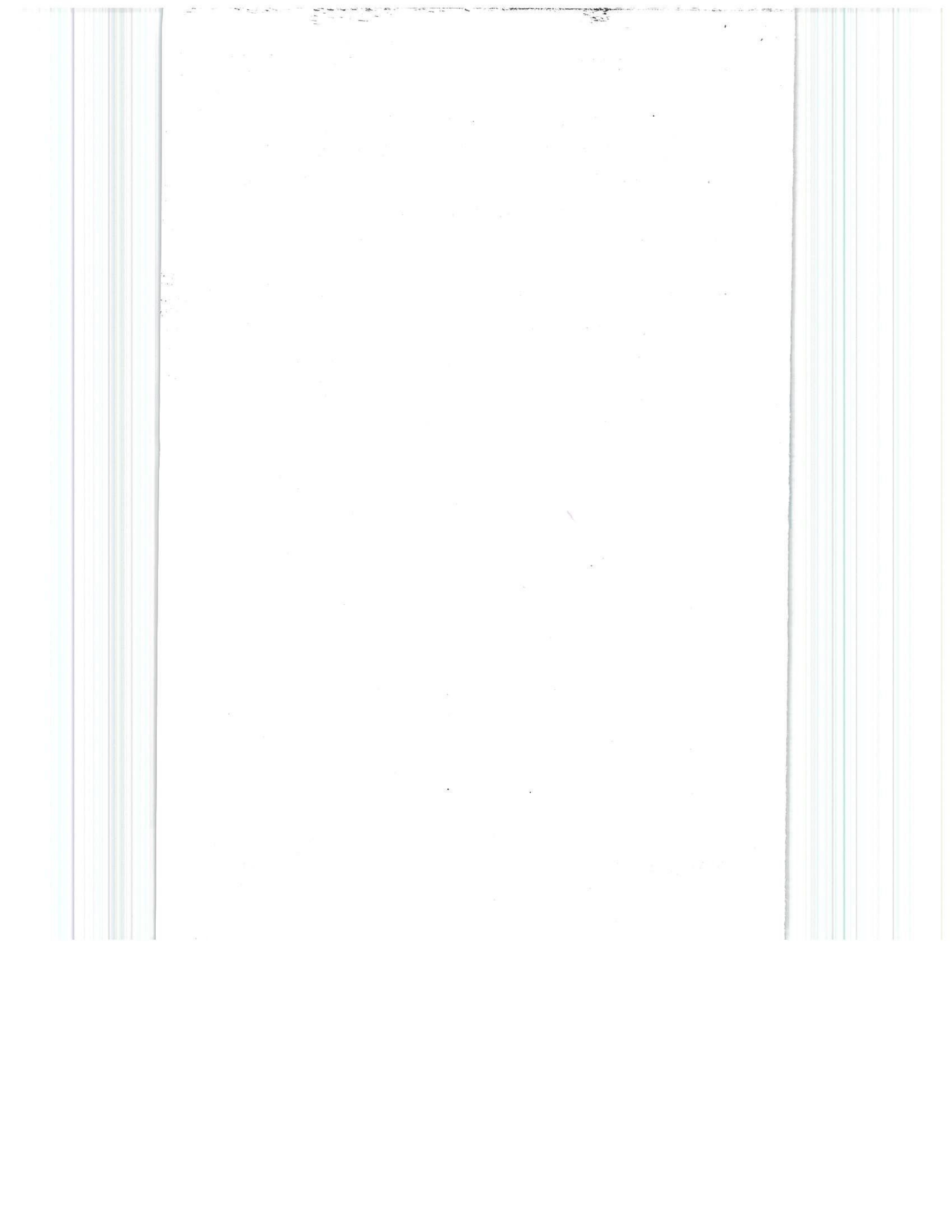
5. Explain in detail direct and indirect methods of stream flow measurement. 15
6. What do you understand by flood ? Explain the Gumbel's theoretical method of extreme value to determine the magnitude of a flood and also explain the empirical formulae to estimate peak discharge. 15

### Unit IV

7. (a) Explain the terms : Aquifer, Artesian well, Perched Aquifer, Darcy's law, Confined Aquifer. 8  
(b) Two tube wells, each of 20 cm diameters are spaced at 100 m distance. Both the wells penetrate fully a confined aquifer of 12 m thickness. Calculate the discharge if only one well is discharging under a depression head of 3 m. What will be the percentage

decrease in the discharge of the well if both the wells are discharging under the depression head of 3 m ? Take radius of influence for each well equal to 250 metres and co-efficient of permeability of the quifer as 60 metres/day. 7

8. (a) Explain pollutant of ground water and possible sources. 8
- (b) What are the remedies and prevention measures as per Indian Standard ? 7



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45192

GEOTECHNICAL ENGINEERING

CE-307-A

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

**Unit I**

1. Discuss various types of samplers and discuss the difference between them. Explain electrical resistivity method of geophysical exploration. 15
2. What are the advantages of SCPT over SPT ? Differentiate between disturbed and un-disturbed samples. 15

**Unit II**

3. Determine ultimate bearing capacity of a strip footing 1.5 m wide, with its base at 1m below ground level, resting on a dry sand stratum. Use IS code method. Take  $\gamma = 17 \text{ kN/m}^3$ ,  $\phi = 38$  degrees,  $N_q = 48.9$ ,  $N_\gamma = 56.2$ . 15

(3-40/2) L-45192

P.T.O.

4. Define shallow foundation along with plate load test with neat and clean diagram in detail. **15**

### **Unit III**

5. Discuss various types of pile foundations, with neat sketches. Discuss the classification based on their functions as well on material and composition. **15**
6. A group of 9 piles 12 m long and 250 mm diameter are to be arranged in square format in a clay soil with UCS 60 kN/m<sup>2</sup>. Work out the c/c spacing of piles if group efficiency factor is 1. Neglect bearing support. **15**

### **Unit IV**

7. Draw and explain all the components of a well foundation in detail. **15**
8. Describe various shapes of wells and reasons of choice of particular shape. List and explain various steps of sinking of wells. What are the precautions to avoid Tilts and shifts ? **15**

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**45193**

**CONCRETE TECHNOLOGY**

**CE-309A**

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

**Unit I**

1. (a) What are Bouge's compounds ? Explain in detail how each one of these compounds influences the strength and setting properties of cement.  
(b) Explain heat of hydration and hydration process of cement in detail.
2. (a) Define the term "Bulking of aggregates". Explain its significance with reference to concrete making.  
(b) Explain different methods of measurement of moisture content of aggregates.

**Unit II**

3. (a) Explain the mix design procedure of concrete as per ACI code Method.  
(b) Brief explain about factors affecting choice of mix design.

(3-52/2) L-45193

P.T.O.

4. (a) Explain high performance concrete and what are the advantages of high-performance concrete over conventional concrete.
- (b) Explain Creep of concrete and relation between creep and time.

#### Unit III

5. Explain what the different types of destructive and non-destructive test of concrete.
6. (a) What do you mean by freezing and thawing ?
- (b) Write a short note on efflorescence ?

#### Unit IV

7. Explain in detail what are the different types of special concrete with their advantages and uses.
8. (a) What are the various methods of prestressing ?
- (b) Differentiate between fiber reinforced concrete and steel reinforced concrete.

Roll No. ....

Total Pages : 3

BT-7/D-23

47262

**DESIGN OF CONCRETE STRUCTURE-II**

Paper-CE-401A

Time Allowed : 3 Hours]

[Maximum Marks : 75

**Note** : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks. If necessary, assume suitable data and specify the same. Use of IS : 456-2000 is allowed.

**UNIT-I**

1. Derive the expression for shear force, bending moment and twisting moment for the curved beam (in plan) which is simply supported at the ends and continuous over equally spaced two intermediate supports.
2. (a) Explain various system of prestressing with diagram.  
(b) Calculate the percentage loss of prestress due to shrinkage of concrete in a beam prestressed by a cable carrying an initial prestress of  $600\text{N/mm}^2$ . The prestress is transferred at the age of 7 days. Assume beam as both pretension as well as post tensioned.

47262/K/474/650

P. T. O.

## UNIT-II

3. Design an interior panel of a flat slab with following data : (use M20 and Fe415)

Size of floor =  $20 \times 20$ m, size of panel =  $5 \times 5$ m, live load =  $4\text{KN/m}^2$ , size of column =  $500\text{mm}$ .

4. Design a combined footing for two columns  $C_1$  ( $400\text{ mm} \times 400\text{ mm}$  with 4-25  $\phi$  bars) and  $C_2$  ( $500\text{ mm} \times 500\text{ mm}$  with 4-28  $\phi$  bars) supporting axial loads  $900\text{ kN}$  and  $1600\text{ kN}$  respectively. The column  $C_1$  is an exterior column whose exterior face is flush with the property line. The center to center distance between  $C_1$  and  $C_2$  is  $4.5\text{ m}$ . the allowable soil pressure at the base of the footing  $1.5\text{ m}$  below the ground level is  $240\text{ kN/m}^2$ . Assume Fe500 steel and M30 grade of concrete for columns whereas M20 grade of concrete for footing.

## UNIT-III

5. (a) Design a circular water tank wall having capacity of  $2,00,000$  litres of water using IS code method. Assume concrete of grade M25 and steel of Fe 500.
- (b) Describe the analysis and design of supporting structure of overhead water tank in detail.

6. Discuss the analysis procedure for all the structural parts of bunker with sloping bottom.

#### UNIT-IV

7. The roof of 8 m wide hall is supported on a portal frames spaced at 4 m intervals. The height of the portal frame is 4 m. The slab thickness is 100 mm. Live load on roof is  $2.25 \text{ kN/m}$ , SBC of Soil  $2 = 200 \text{ kN/m}$ . The column is hinged at base. Design the column and hinge of the portal frame. Use M 20 grade concrete and Fe 415 grade steel.
8. (a) Design a simply supported square slab of 4.5m side length to support a service live load of  $4 \text{ kN/m}^2$ . Adopt M20 grade concrete and Fe415 steel. Assume load factor according to IS : 456-2000.  
  
(b) List the assumptions made in yield line analysis of slabs.

1. The analysis procedure for the structural part  
of the structure is as follows:

### 2.1.1.1

The total of 8 m wide slab is supported on 4 columns  
spaced at 4 m intervals. The weight of the slab is  
1.4 kN/m<sup>2</sup>. The slab thickness is 100 mm. The load on the  
slab is 2.5 kN/m<sup>2</sup>. The slab is supported on 4 columns  
spaced at 4 m intervals. The weight of the slab is  
1.4 kN/m<sup>2</sup>. The slab thickness is 100 mm. The load on the  
slab is 2.5 kN/m<sup>2</sup>.

(a) Design a simply supported slab of 4 m span  
length to support a service live load of 4 kN/m<sup>2</sup>.  
Adopt M20 grade concrete and Fe415 steel. Assume  
load factor according to IS 456:2000.

(b) List the assumptions made in solving the above  
slab.

Roll No. ....

Total Pages : 2

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47263

## ENERGY SCIENCE & ENGINEERING

Paper-ES-212A

Time Allowed : 3 Hours] [Maximum Marks : 75

**Note** : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

### UNIT-I

1. Explain different energy situation in the world and Indian energy scenario in detail. 15
2. What is Green energy? What are the benefits of Green energy? 15

### UNIT-II

3. Discuss the application and economic aspects of fuel cells. 15
4. Outline the working principle of tidal power plant. Discuss their advantages and Limitations. Also give present status of tidal power in India. 15

### UNIT-III

5. Define Energy Consumption, its objectives and also explain the process of recycling of Waste with diagram. 15

47263/K/567/600

P. T. O.

6. Summarize the Global warming feature and focus the impacts of this phenomenon on the disturbance to sustainability of environment. 15

#### UNIT-IV

7. Explain Penstocks and its uses in various civil engineering projects in detail with diagram. 15
8. Explain the topic "Solar Chimney" and how it works? Explain this in detail with diagram. 15

Roll No. ....

Total Pages : 2

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47264

## WATER RESOURCES ENGINEERING

Paper-CE-405A

Time Allowed : 3 Hours]

[Maximum Marks : 75

**Note** : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

### UNIT-I

1. (a) Prepare a list of data required for proper planning of a water resources project in India. 10
- (b) What is long term and basin wise planning ? 5
2. Explain empirical area reduction method in detail giving example for a problem. 15

### UNIT-II

3. (a) Explain micro and macro economics by giving examples. 8
- (b) Briefly explain the concept of equilibrium. 7

47264/K/574/600

P. T. O.

4. (a) Explain the following with respect to cost allocation to a water resource project
- (i) Separable and non-separable cost
  - (ii) Need for cost allocation 8
- (b) Discuss the profitability analysis briefly. 7

### UNIT-III

5. Explain the following : 15
- (a) Optimality conditions
  - (b) Simulation modeling
  - (c) Analog simulation.
6. Solve the following LP problem: 15
- Maximize  $Z = x_1 + 3x_2 + 3x_3$
- Subjected to  $x_1 + 2x_2 + 3x_3 < 4,$
- $2x_1 + 3x_2 + 5x_3 \leq 7$
- $x_1, x_2 > 0.$

### UNIT-IV

7. Define systems approach and give reasons for adopting this approach in the analysis of water development projects. 15
8. Prepare a mathematical model for forecasting flood. 15

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47265

**METRO SYSTEMS & ENGINEERING**

Paper-OE-407A

Time allowed : 3 Hours]

[Maximum Marks : 75

**Note :** Attempt **five** questions in all, selecting at least **one** question from each unit. All questions carry equal marks.

**UNIT-I**

1. Write down the overview of metro system. Also explain its needs and routing studies in detail. 15
2. Explain basic planning and financials for metro system. 15

**UNIT-II**

3. Write short notes on the following:
  - (a) Construction of viaduct spans & bridges. 7½
  - (b) Construction of underground tunnel. 7½
4. Explain any three from the following:
  - (a) Construction quality and safety system. 5
  - (b) Multimodal transfers. 5
  - (c) Environmental & social safeguards. 5
  - (d) Construction planning and managements. 5

47265/K/665/600

P.T.O.

### UNIT-III

5. Explain the following:
- (a) SCADA. 5
  - (b) Automatic fare Collection. 5
  - (c) Platform screen doors. 5
6. Explain the Operation Control Centre (OCC & BCC) in detail. 15

### UNIT-IV

7. Explain air conditioning for stations and buildings in detail. Also explain fire control systems. 15
8. Write short notes on the following:
- (a) Substations TSS and ASS. 7½
  - (b) Standby and backup systems. 7½

Roll No. ....

Total Pages : 2

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47268

**ENVIRONMENTAL IMPACT  
ASSESSMENT**

Paper-EL-419A

Time Allowed : 3 Hours] [Maximum Marks : 75

**Note** : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

**UNIT-I**

1. Describe various types and sources of Water pollution. 3,12
2. Write descriptive notes on the following:
  - (a) Environmental management strategies 7
  - (b) Natural resources and their benefits. 8

**UNIT-II**

3. Describe the structure, gaseous composition and importance of atmosphere. 6,6,3
4. Based upon waste generation and composition data how we can plan Waste disposal in a city? Explain by using suitable examples. 15

47268/K/760/500

P. T. O.

### UNIT-III

5. Explain different Environmental and Anthropogenic activities that cause changes in land use? 15
6. Describe landfilling, incineration and composting methods of Waste disposal. 15

### UNIT-IV

7. Explain the importance, process and quantification of Environment assessment during designing. 15
8. Write detail notes on the following:  $2 \times 7\frac{1}{2} = 15$ 
  - (a) National Environmental Policy-2006.
  - (b) Need of environmental standards.

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Total Pages : 2

BT-7/D-23

47272

## RAILWAY ENGINEERING

Paper-EL427A

Time Allowed : 3 Hours]

[Maximum Marks : 75

**Note** : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks. Assume any missing data.

### UNIT-I

1. Write down the Rail transportation and its importance in India. 15
2. (a) What are the defects in Rails? Explain. 8  
(b) What do you understand by selection of Gauge? Explain in detail. 7

### UNIT-II

3. Write down the type of sleepers with its advantages and disadvantages. 15
4. Write short notes on the following : 5×3=15
  - (a) Sleepers. (b) Fastenings.
  - (c) Ballast. (d) Tie bars.
  - (e) Jaws.

47272/K/759/600

P. T. O.

### UNIT-III

5. (a) Write down the necessity of turnout and its components and types. 8
- (b) Explain the Design of a simple turnout. 7
6. (a) Write down the requirement and Principle of a good interlocking system. 8
- (b) Write down the methods of control of Train movements. 7

### UNIT-IV

7. Explain the Geometric design of the track with neat and clean diagram. 15
8. (a) Write down the type of Marshalling yard. 7
- (b) Write down the functions and classification of Stations. 8

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Total Pages : 3

**48322****BT-8/D-23****BRIDGE ENGINEERING**

Paper : CE-404A

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt any *five* questions, selecting at least *one* question from each unit.

**UNIT-I**

1. Write short notes on :
  - (a) Width of carriageway.
  - (b) Loads to be considered for bridges.
  - (c) Site investigation for bridges.
  - (d) Economical span.
  
2.
  - (a) Write the IRC specifications for Road bridges.
  - (b) Explain the design principles of box culvert.

**UNIT-II**

3. A reinforced concrete simply supported slab forms the deck of a road bridge, having the following data:
  - (i) Clear span = 6 m.
  - (ii) Carriage way – 2 Lane.
  - (iii) Width of kerb = 500 mm on either side
  - (iv) Width of bearing = 400 mm.

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- (v) Materials = M25 grade concrete and Fe 415 steel.  
(vi) Type of loading IRC class AA tracked vehicle.  
Design the deck slab. Show the reinforcement details.
4. Design the interior deck slab panel of a T-beam and slab bridge for the following data. Effective span - 18 m, Carriage way width - 7.5 m, Kerb - 600 mm on either side. Provide three longitudinal beams and five cross beams. Loading IRC class AA tracked vehicle. Adopt M20 concrete and Fe415 bars. Sketch the reinforcement details.

### UNIT-III

5. (a) Explain the different type of forces and their combinations in the design of box culverts.  
(b) What are the load distribution theories used in girders of Tee beam and slab bridge. Explain Courbon's theory.
6. Determine the minimum section modulus, prestressing force and eccentricity of a prestressed concrete slab bridge having the following data:  
(i) Clear span-10 m, Width of bearing-400 mm, Carriageway width-2 lane, Footpath on either side-1 m.  
(ii) Live load-IRC Class AA tracked vehicle.  
(iii) Materials- M40 concrete, Ultimate tensile strength of steel-1500 N/mm<sup>2</sup>.

- (iv) Compressive stress of concrete at transfer,  
 $f_{ci} = 35 \text{ N/mm}^2$ .
- (v)  $f_{ct} = 15 \text{ N/mm}^2$ ,  $f_{cw} = 12 \text{ N/mm}^2$ ,  $f_{tt} = f_{tw} = 0$ .
- (vi) Loss ratio = 0.8.

#### UNIT-IV

- 7.
    - (a) Write brief note on elastomeric bearings.
    - (b) Discuss about the stability analysis of abutments.
  
  - 8. Write short notes on :
    - (i) Types of foundation.
    - (ii) Type of Bearings.
    - (iii) Sinking of Well.
    - (iv) Hendry Jaegar method.
-

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Total Pages : 2

**BT-8/D-23**

**48324**

**COMPARATIVE STUDY OF LITERATURE**

Paper-OE-408A

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt any *five* questions in all. All questions carry equal marks

1. In what ways has the emergence of Comparative Literature enriched our understanding of Cross-Cultural Literary Traditions and fostered Interdisciplinary Approaches in the study of literature? (15)
2. How does the concept of Alterity challenge conventional notions of identity and cultural understanding, and what impact does it have on interactions between different societies and cultures? (15)
3. In what ways does world literature address universal themes such as love, conflict, identity, and human nature, and how do authors from various cultures incorporate their unique cultural perspectives into these shared themes? (15)
4. How has Comparative Literature evolved in India from the time of Tagore to the present day, and what significant literary movements, authors, or works have shaped the landscape of this discipline in the country? (15)

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16/1

5. What role has translation literature played in shaping historical and political narratives across cultures, and how has it influenced the understanding of different societies and their political contexts? (15)
  6. Considering the digital age and globalization, how has the politics of translation literature changed, and what new challenges and opportunities arise in the digital realm concerning the dissemination of political ideas and historical narratives through translation? (15)
  7. In multicultural societies, how do Persian-Arabic literary trends promote intercultural dialogue and understanding among diverse communities? Are there literary initiatives or movements aimed at bridging cultural gaps and fostering mutual respect and appreciation? (15)
  8. Can you elaborate on the concept of "rasa" in Indian poetics, discussing its significance in classical and contemporary poetry? How do poets evoke different emotions and aesthetic experiences through their works? (15)
-

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Total Pages : 2

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48331

WASTE WATER TREATMENT

Paper-EL-428A

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

UNIT-I

1. Explain in details the system of sewerage. Also define ventilation and characteristics of sewage. 15
2. Write short notes on :
  - (a) First stage BOD.
  - (b) Biological parameters of sewage.
  - (c) Inverted siphon. (5×3=15)

UNIT-II

3. Define Streeter Phelp's equation and treatment of sewage. 15
4. Differentiate the following :
  - (a) Grit chamber and Dechlorination chamber. 7.5
  - (b) Flow equalization tank and sedimentation tank. 7.5

### UNIT-III

5. Explain the process of design of septic tank and imhoff tank. 15
6. (a) Design up flow anaerobic sludge blanket reactor. 8  
(b) Briefly explain the method of sludge disposal. 7

### UNIT-IV

7. How you can minimize the effects of industrial effluents on waste water treatment plant? Explain the process/method of reuse of waste water. 15
8. Write short notes on the following
- (a) Equalization and proportioning. 7.5  
(b) Volume and strength reduction. 7.5
-