CE 3rd/ Lib

Roll No. ..... Total Pages : 02

BT-3/D-25 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. Explain the importance and scope of Civil Engineering in nation building. Illustrate with suitable examples.

2. Explain the principles and techniques of Experimental Stress Analysis (ESA) used in Civil and Structural Engineering.

Unit II

3. How have the Five-Year Plans and recent infrastructure budgets influenced the development of roads, bridges, and housing sectors ?

4. Explain the working principles and applications of modern geomatic techniques such as GPS, LIDAR, and Total Stations. How have these technologies revolutionized surveying and mapping ?

Unit III

5. Compare the properties, advantages, and limitations of Plain, Reinforced and Prestressed Concrete.

6. Describe the role of automation and robotics in modern construction. How are Lean Construction principles improving efficiency and productivity in large-scale projects ?

Unit IV

7. Explain the treatment process of municipal water with the help of a neat flow diagram. Discuss the importance of effluent treatment systems in reducing environmental pollution.

8. Discuss the concept and importance of multipurpose reservoir projects in India.

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Roll No. ..... Total Pages : 04

BT-3/D-25 43156

HIGHER ENGINEERING MATHEMATICS

BS-204-A

Time : Three Hours] [Maximum Marks : 75

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

Unit I

1. (a) Find the Laplace transform of $\left[\frac{e^t - \cos 2t}{t}\right]$.

(b) Find the inverse Laplace transform of $s \log\left(\frac{s-1}{s+1}\right)$.

2. (a) Using Convolution theorem, find $L^{-1}\left\{\frac{1}{s(s^2+4)}\right\}$.

(b) Solve the differential equation by using Laplace transform $\frac{d^2x}{dt^2} + x = t\cos 2t$, where $x(0) = 0$, $x'(0) = 0$.

Unit II

3. (a) Solve the partial differential equation $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$.

   (b) Find the complete integral of the equation $p^2 + q^2 = x + y$.

4. (a) Solve :

$$(D^2 - 2DD' + D'^2)z = \sin x.$$

   (b) Solve :

$$(4D^2 - 4DD' + D'^2)z = 16 \log (x + 2y).$$

Unit III

5. (a) Find a real root of the equation $x \log_{10} x = 1.2$ by using the Regula-Falsi method correct to four decimal places.

   (b) Find the positive root of the equation $x^4 - x = 10$, by Newton's method correct to four decimal places.

6. (a) Find the cubic polynomial which takes the following values :

x	:	0	1	2	3
$f(x)$	:	1	2	1	10

(b) The function $y = f(x)$ is given at the points (7, 3), (8, 1), (9, 1) and (10, 9). Find the value of y for $x = 9.5$ using Lagrange's interpolation formula.

Unit IV

7. (a) Find $\int_0^6 \frac{e^x}{1+x} dx$ approximately using Simpson's $\frac{3}{8}$th rule on integration.

(b) The table given below reveals the velocity v of a body during the time t specified. Find its acceleration at $t = 1.1$.

t	:	1.0	1.1	1.2	1.3	1.4
v	:	43.1	47.7	52.1	56.4	60.8

8. (a) Using modified Euler's method, find an approximate value of y when $x = 0.02$ and $x = 0.04$, given that $\frac{dy}{dx} = x^2 + y$ and $y = 1$ when $x = 0$.

(b) Using Runge-Kutta method of order 4, compute $y(0.4)$ for the equation $\frac{dy}{dx} = 1 + y^2$, $y(0) = 0$, by taking $h = 0.2$.

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Roll No. ..... Total Pages : 05

BT-3/D-25 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.

Unit I

1. A load of 270 kN is carried by a short concrete column 250 mm × 250mm in size. The column is reinforced with 8 bars of 16mm diameter. Find the stresses in concrete and steel, if the modulus of elasticity for steel is 18 times that of concrete.

   If the stress in concrete is not to exceed 5MPA, Find the area of steel required, so that the column may carry a load of 500 kN. 15

2. Write assumptions made in Euler's column theory. Give expression for Euler's buckling load in case of column having both ends hinged. **15**

Unit II

3. A simply supported AB, 6m long is loaded as shown in figure.

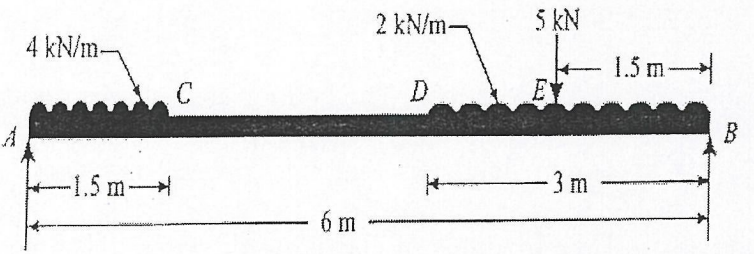

Fig.

Construct the shear force and bending moment diagrams for the beam and find the position and value of maximum bending moment. **15**

4. A three hinged parabolic arch of 20 m span and 4 m central rise carries a point load of 4 kN at 4 m from the left-hand hinge. Calculate the normal thrust and shear force at the section under the load. Also, calculate the maximum Bending Moment. 15

Unit III

5. A cantilever beam of length 6 m, carries a concentrated load of 50 kN at a distance of 2 m from the fixed end. Calculate, the slope and deflection under the load and at the free end using conjugate beam method. 15

6. A simply supported beam AB of length L loaded with a uniformly distributed load as shown in figure. Determine the central deflection of the beam by moment area method. 15

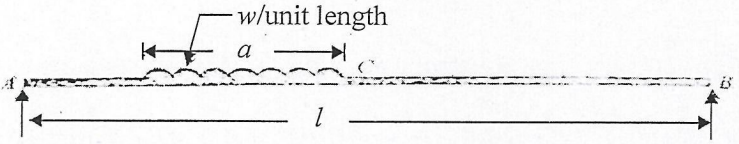

Fig.

Unit IV

7. A frame of 6 m span carries a load of 10 KN as show in figure. Find the magnitude and nature of forces in al. members of the structure by method of joints :

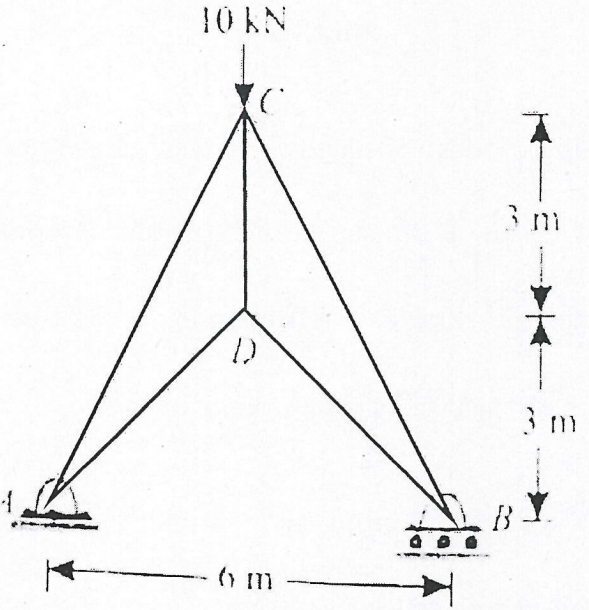

Fig.

8. Explain stability in case of plane trusses. With the help of neat sketches explain what is a perfect, redundant and a deficient frame/truss. Also explain, what is a determinate and an indeterminate structure ? Give examples of each type. 15

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Roll No. ..... Total Pages : 03

BT-3/D-25 **43158**

INTRODUCTION TO FLUID MECHANICS
CE-203A

Time : Three Hours] [Maximum Marks : 75

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

Unit I

1. (a) Differentiate between the following : **10**

(i) Stream line and stream tube

(ii) Real fluid and ideal fluids

(iii) Specific weight and specific volume

(iv) Dynamic viscosity and Kinematic viscosity.

(b) State the Newton's law of viscosity and give examples of its application. **5**

2. In a two-dimensional incompressible flow, the fluid velocity components are given by :

$$u = x - 4y \text{ and } v = -y - 4x.$$

Show that velocity potential exists and determine its form. Find also the stream function. **15**

Unit II

3. What are differential manometer and its types ? Give expression for pressure difference in case of U-tube differential manometer. **15**

4. (a) Find the volume of water displaced and position of centre of buoyancy for a wooden block of width 2.5 m and of depth 1.5 m, when it floats horizontally in water. The density of wooden block is 650 Kg/m^3 and its length is 6m. **10**

(b) With neat sketches, explain the conditions of equilibrium for floating and sub-merged bodies. **5**

Unit III

5. An orifice plate of diameter 12 cm is fitted in a pipe of 27 cm diameter that carries oil of specific gravity 0.85. Calculate the rate of flow of oil if pressure difference on two sides of orifice plate reads 90 cm of mercury column in manometer. **15**

6. A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of water. The pressure at inlet is 17.658 N/cm^2 and the vacuum pressure at the throat is 30 cm of mercury. Find the discharge of water through venturimeter. Take $C_d = 0.98$. **15**

Unit IV

7. Explain displacement thickness, momentum thickness and energy thickness. Also give the expression for Energy thickness in boundary layer theory. **15**

8. Explain Buckinghams–π theorem for obtaining relation between given set of variables influencing a phenomenon. **15**

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BT-3/D-25 43159

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. All questions carry equal marks.

Unit I

1. (a) Define surveying and explain its fundamental principles.

(b) What are survey stations and survey lines ? Explain the methods of ranging a survey line with a suitable example.

2. (a) Discuss traversing in surveying. Explain the methods of measuring angles using a theodolite, including repetition and reiteration methods. Include the temporary adjustment procedure of theodolite.

(b) The following are the observed values of angles in a triangle of a triangulation survey. Adjust the angles.

(i) A = 87°35'11.1" weight 1

(ii) B = 43°15'17.0" weight 2

(iii) C = 49°09'34.1" weight 3

Unit II

3. (a) Define levelling. Explain the terms benchmark (B.M.), reduced level (R.L.), back sight (B.S.), fore sight (F.S.) and intermediate sight (I.S.).

(b) Describe the types of levels and leveling staffs commonly used in surveying.

(c) Explain the principles of leveling and the temporary adjustment of a leveling instrument.

4. A copper transmission line 12.7 mm in diameter is stretched between two points 300 m apart at the same level, with a tension of 5 kN when the temperature is 35°C. It is necessary to define its limiting positions when the temperature varies. Making use of the corrections for sag. temperature and Elasticity : normally applied to baseline measurements in catenary, find the tension at, temperature of $-15°C$, and the sag in the two cases. Young's modulus for copper is 68.950 M.N/m^2, its density 8890 kg/m^3 and its coefficient of linear expansion 15×10^{-6}.

Unit III

5. A 200 m length of straight connects two circular curves, both of which deflect to the right. The radius of the Ist curve is 250 m, and that of the 2nd is 200 m. The central angle for the second curve is 30°. The combined curve is to be replaced by a single circular curve between the same tangent points. Find the radius of the curve. Assume that the two tangent lengths of the earlier set are equal. Also determine (a) the central angle of the new curve (b) the central angle of 1st curve of radius 200 m.

6. (a) Explain the principle of Electronic Distance Measurement (EDM) and its importance in modern surveying.

   (b) Define modulation in EDM and describe its role in distance measurement.

Unit IV

7. (a) Define photogrammetry and explain its importance in surveying.

   (b) Differentiate between terrestrial photographs and aerial photographs.

   (c) Discuss the applications of photogrammetry in modern civil engineering projects.

8. (a) Define remote sensing and explain its importance in civil engineering and surveying.

(b) Describe the basic principles and components of a remote sensing system.

(c) Explain the different types of remote sensing (active and passive) with examples.

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45188

BT-5/D-25

PROFESSIONAL PRACTICE, LAW& ETHICS

Paper : HM-255A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt any *five* questions in all, selecting *one* question from each unit.

UNIT–I

1. Discuss the functions and importance of professional bodies such as the Institution of Engineers (India), Indian Roads Congress, IIA/COA, and ECI. 15

2. Write short notes on the following stakeholders:
   (i) Contractors.
   (ii) Manufacturers.
   (iii) Vendors.
   (iv) Service agencies. 15

UNIT–II

3. Define Ethics and explain the difference between Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, and Personal Ethics. 15

4. Explain common ethical issues in professional practice:

(i) Conflict of Interest.

(ii) Gift *vs* Bribery.

(iii) Environmental breaches.

(iv) Negligence and deficiencies in state-of-the-art. 15

UNIT–III

5. Explain the general principles of contracting as per the Indian Contract Act, 1972 and its amendments. 15

6. Write short notes on the following aspects of contract management :

(i) Wrong practices in contracting (bid shopping, bid fixing, cartels, reverse auction)

(ii) Public-Private Partnerships (PPP), Build-Own-operate (BOO), and International Commercial Terms (Incoterms) 15

UNIT–IV

7. Discuss the role of labour in civil engineering projects and the different methods of engaging labour. 15

8. Describe the key features of the following labour-related Acts :

(i) Industrial Employment (Standing Orders) Act, 1946.

(ii) Workmen's Compensation Act, 1923. 15

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45189

BT-5/D-25

STRUCTURAL ANALYSIS-II

Paper : CE-301A

Time : Three Hours] [Maximum Marks : 75

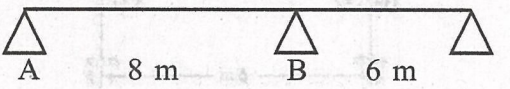
Note : Attempt any *five* questions selecting at least *one* question from each unit. All questions carrying equal marks.

UNIT–I

1. A 2-Hinged parabolic arch has a span of 60 m and a rise of 15 m. Draw ILD for the following :
   (i) Horizontal thrust.
   (ii) B.M. at 16 m from left support.
   (iii) Normal thrust at above section.
   (iv) Radial shear at above section. 15

2. (a) State Miller–Breslau's Principle and explain how it is used to draw influence lines for statically indeterminate beams. 5

   (b) Compute the ordinates of I.L for reaction R_A for the beam shown in figure, at 2 m interval, and draw ILD. The moment of inertia is constant throughout. 10



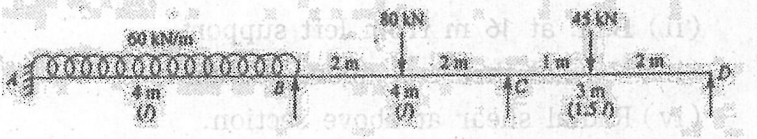
UNIT–II

3. Explain the concept of rolling loads and derive the conditions for maximum bending moment and shear force under a single moving load on a simply supported beam. 15

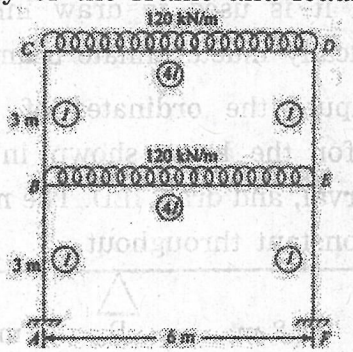
4. A fixed arch of span 60 m has its left springing 9 m below the crown and the right springing 3 m below the crown. Determine the reactions at the springing, if it is subjected to a 100 kN load at crown. Assume secant variation for the moment of inertia. 15

UNIT–III

5. Analyse the continuous beam as shown in figure by Kani's Method. 15

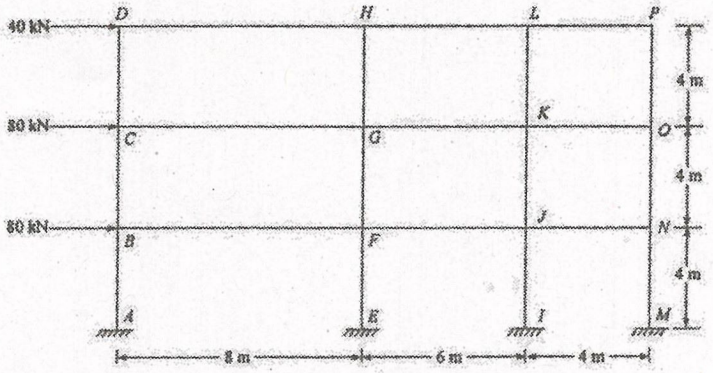


6. Analyse the frame shown in figure, taking advantage of symmetry of the frame and loading. 15

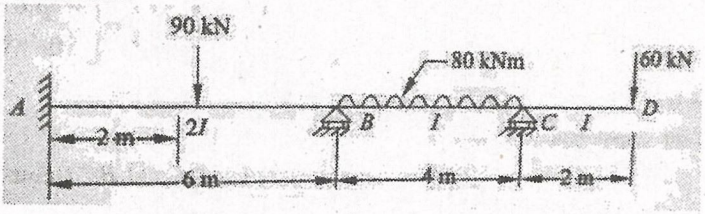


UNIT–IV

7. Analyse the frame as shown in figure by Portal method. 15



8. Analyse the given beam by stiffness matrix method. 15



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45190

BT-5/D-25

DESIGN OF CONCRETE STRUCTURE–I

Paper : CE-303A

Time : Three Hours] [Maximum Marks : 75

Note : (i) Attempt *five* questions only which carry equal marks by selecting at least one question from every unit.

(ii) Use of Indian Standards is allowed.

(iii) Any data if missing can be suitably assumed.

(iv) Use of scientific calculator is allowed.

UNIT–I

1. (a) Discuss the requirements of Indian Standards for suitability of cement and aggregates to be used in RCC. 7

(b) Discuss the following terms :

(i) Shrinkage of concrete.

(ii) Creep of concrete.

(iii) Target Strength.

(iv) Characteristic Strength. 8

2. (a) Explain the main differences in the design philosophies of working stress and limit state methods. What are the main advantages of limit state method? 7

(b) Draw normal distribution curve, show and define characteristic load, characteristic strength and target mean strength through the curve. 8

UNIT–II

3. A beam is to be provided to resist bending moment 150 kNm. However, its section has been restricted by the architect to 300 × 450 mm. Using M25 grade concrete and Fe500 grade of steel design the beam using working stress method. 15

4. Design a T beam section of 1500 mm flange width, 110 mm flange depth, 300 mm wide web and 550 mm effective depth subjected to ultimate moment 450 kNm using M20 grade concrete and Fe500 grade steel. 15

UNIT–III

5. A rectangular beam section 300 mm width and 500 mm effective depth is reinforced with 5-20 mm Φ Fe500 grade steel bars out of which 2 bars have been bent at 45°. Determine the shear reinforcement considering the contribution of bent up bars if the beam is subjected to collapse shear force 300 kN using M25 grade concrete and Fe415 grade steel. 15

6. Differentiate among the following in terms of structural behavior

(i) Short and slender columns.

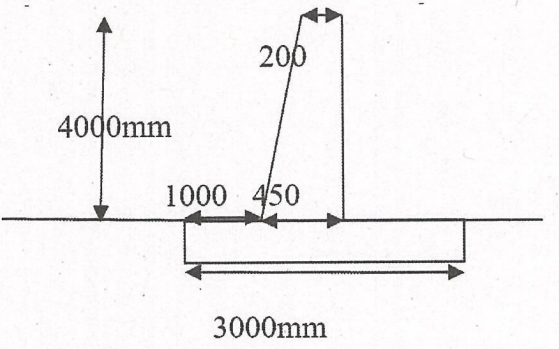
(ii) Tied and helical columns.

(iii) Axially loaded and eccentrically loaded columns. 15

UNIT–IV

7. A doubly reinforced beam has three equal spans and is fixed at the ends over column supports. Show the reinforcement details of the beam at supports, at mid span and mid span keeping in mind the maximum and minimum reinforcement, spacing of shear reinforcement. 15

8. A retaining wall shown in figure is to resist 4 m earth weighing 19 kN/m^3 with angle of internal friction 28°. If the allowable bearing capacity of the soil is 160 kN/m^2 below 1 m natural ground, design the base slab of the retaining wall. 15



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45191

BT-5/D-25

HYDROLOGY

Paper–CE-305A

Time : Three Hours] [Maximum Marks : 75

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

UNIT–I

1. Describe the hydrologic cycle with a neat diagram. Explain its importance in engineering applications. 15

2. (a) Explain different types of precipitation and methods of measuring rainfall. 7

   (b) The rainfall recorded for seven rain gauge stations is 131, 143, 118, 107, 166, 100, and 146 cm. For a 10% error, calculate the mean rainfall and the additional rain gauge station required. 8

UNIT–II

3. (a) Explain evaporation and discuss various methods to reduce evaporation losses from reservoirs. 7

   (b) List out the various empirical and theoretical equations used to estimate evapotranspiration. 8

4. (a) Define infiltration and infiltration capacity. (7)

(b) What are ϕ-index and W-index? How are they used in hydrological analysis? 8

UNIT–III

5. (a) Discuss the factors affecting runoff and explain rainfall-runoff relationship. 8

(b) Explain the auto stage recorder used to measure the stage in the river. 7

6. The 3-hour Unit Hydrograph ordinates for a catchment are 0, 30, 180, 320, 370, 320, 230, 170, 100, 65, 40, 20, 10, and 0. Determine the 9-hour Unit hydrograph for the catchment. 15

UNIT–IV

7. Describe different types of aquifers and explain Darcy's Law for groundwater flow. 15

8. (a) Explain major sources of groundwater pollution and their remedial measures. 8

(b) Define pH, and how do you determine the pH value of a sample of water in the laboratory? 7

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45192

BT-5/D-25

GEOTECHNICAL ENGINEERING

Paper : CE-307A

Time : Three Hours] [Maximum Marks : 75

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

UNIT–I

1. Explain the objectives and importance of sub-surface exploration. Describe in detail the various stages involved in soil exploration. (15)

2. Discuss various geophysical methods used for soil exploration. Compare seismic refraction and electrical resistivity methods. (15)

UNIT–II

3. Derive Terzaghi's bearing capacity equation for strip footing on c–ϕ soil assuming general shear failure. State all assumptions made in Terzaghi's theory. (15)

4. What are the factors affecting bearing capacity? Suggest remedial measures for weak soils with suitable examples. (15)

UNIT–III

5. What are pile foundations? Explain their necessity and classify piles based on material, function, and installation method. (15)

6. Discuss the design considerations for pile caps. Explain the factors influencing stress distribution and settlement in pile groups. (15)

UNIT–IV

7. Compare drilled piers, caissons, and well foundations based on construction methods, load transfer, and field applications. (15)

8. Explain the process of sinking of well foundations. Discuss the methods for rectification of tilts and shifts during construction. (15)

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45193

BT-5/D-25

CONCRETE TECHNOLOGY

Paper : CE-309A

Time : Three Hours] [Maximum Marks : 75

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

UNIT–I

1. Explain the manufacturing process of concrete. Discuss the various grades of concrete and their applications. 15

2. What are pozzolanic materials? Discuss fly ash and GGBS in detail with their properties, advantages, and limitations. 15

UNIT–II

3. Define workability of concrete. What are the factors affecting workability, and how is it measured in the field? 15

4. What is durability of concrete? Explain how sulphate attack and permeability affect the durability of concrete structures. 15

UNIT–III

5. Describe the following techniques :
   (a) Rebound hammer test.
   (b) Ultrasonic pulse velocity.
   (c) Pullout test. (3×5=15)

6. Explain the cause of concrete deterioration by chemical reaction, frost action and sulphate attack. Also explain their preventive measures. 15

UNIT–IV

7. Define and compare the properties and uses of high strength concrete, lightweight concrete, and fiber reinforced concrete. 15

8. Discuss various types of cracks in concrete and explain suitable methods for their repair. 15

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47262

BT-7/D-25

DESIGN OF CONCRETE STRUCTURE–II

Paper : CE-401A

Time : Three Hours] [Maximum Marks : 75

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

UNIT–I

1. Design a continuous reinforced beam of rectangular section to support a D.L. of 10 kN/m and L.L. of 12 kN/mover 3 span of 6 m each. The ends are simply supported. Adopt grade M20 and Fe 415. Sketch the details of reinforcements in the beam.

2. A concrete beam 150 mm × 300 mm is pre-tensioned by 7 wires of 7 mm diameter at an initial stress of 1000 N/mm^2, with their centroid located at any eccentricity of 50 mm. Find loss of prestressed due to elastic shortening of concrete, creep, and shrinkage of concrete if there is relaxation of 4% of steel. Use M 40 concrete and a creep coefficient of 1.6.

UNIT–II

3. Design a dog-legged stair for a building in which the vertical distance between floors is 3.6 m. Assume any relevant data.

4. Design an isolated square footing for a column 500mm × 500 m transmitting a load of 600 kN and a moment of 30 kN-m. The SBC of soil is 1230 kN/m^2. Use M20 grade concrete and M.S. grade–I bars. Draw the reinforcement details.

UNIT–III

5. Design an open circular water tank resting on firm ground with a flexible base for a 350 kl capacity.

6. Design a rectangular bunker 16 m in length and 8 m in width supported on ten columns. It stores maize. Height of vertical portion = 4 m. Height of hopper = 4 m.

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 22.5 kN/m, SBC of soil 2 = 200 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. Find the collapse load for a 6.0 m × 4.5 m rectangular slab fixed at all edges for which the mid-span moment is 80% of the support moment in the corresponding direction. The moment in the longer direction is 40% of that in the shorter direction.

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47263

BT-7/D-25

ENERGY SCIENCE & ENGINEERING

Paper : ES-212A

Time : Three Hours] [Maximum Marks : 75

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

UNIT–I

1. Explain the concept of energy science and discuss its role in sustainable development. 15

2. Explain how energy systems impact climate change and suggest mitigation strategies. 15

UNIT–II

3. Compare and differentiate between various renewable energy sources, focusing on biomass, solar, and wind energy. 15

4. Write short notes on :
   (a) Wave and tidal energy systems. 8
   (b) Hydrogen as a clean fuel for the future. 7

UNIT–III

5. Discuss clean energy technologies and their significance in sustainable development. 15

6. Write short notes on :
   (a) Sustainable energy policies. 7
   (b) Life-cycle assessment of energy systems. 8

UNIT–IV

7. Explain the structural design and functioning of solar chimney projects and windmill towers. 15

8. Discuss the major civil engineering projects related to coal mining and their environmental impacts. 15

Roll No. ..... Total Pages : 2

47264

BT-7/D-25

WATER RESOURCES ENGINEERING

Paper : CE-405A

Time : Three Hours] [Maximum Marks : 75

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

UNIT–I

1. Explain the role of water in national development. Discuss the steps involved in the water resources planning process. (15)

2. What is basin-wise planning? Explain long-term planning and discuss common problems encountered during water resources project planning. (15)

UNIT–II

3. What is the meaning and nature of economic theory? Explain the concepts of microeconomics and macroeconomics. (15)

4. What do you mean by cost allocation in water resources engineering? Discuss separable and non-separable costs along with discounting factors and techniques. (15)

UNIT–III

5. Solve the following LP problem using the simplex method :

Maximize $Z = x_1 + 3x_2 + 3x_3$

Subjected to :

$x_1 + 2x_2 + 2x_3 \leq 4$

$2x_1 + 3x_2 + 5x_3 \leq 7$

$x_1, x_2 > 0$ (15)

6. What is meant by the optimality condition and the objective function? Explain the applications of linear and dynamic programming in water resources systems. (15)

UNIT–IV

7. Discuss the applications of the system approach in hydrology, irrigation, and drainage engineering with suitable examples. (15)

8. What are mathematical models in water resources? Describe their role in forecasting and distribution network analysis. (15)

Roll No. ..... Total Pages : 2

47265

BT-7/D-25

METRO SYSTEMS AND ENGINEERING

Paper : OE-407A

Time : Three Hours] [Maximum Marks : 75

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

UNIT–I

1. Explain the importance of metro systems in urban transportation and discuss the factors that justify the need for metro projects in major cities.

2. What are the major components of a metro project's cost structure, and how do financial planning and funding models influence its successful implementation?

UNIT–II

3. Discuss the importance of initial surveys, investigations, and construction planning in metro infrastructure projects.

4. Describe the systems and measures adopted for ensuring construction quality, safety, and environmental safeguards in metro projects.

UNIT–III

5. Explain the various types of signalling systems used in metro rail operations and their importance in ensuring safety and efficiency.

6. Discuss the functions and significance of the Operation Control Centre (OCC) and Backup Control Centre (BCC) in metro operations.

UNIT–IV

7. Explain the components and functioning of rolling stock in metro systems, including aspects of vehicle dynamics and structural design.

8. Discuss the importance of Overhead Equipment (OHE), traction power supply, and substations (TSS and ASS) in metro operations.

Roll No. ..... Total Pages : 2

47268

BT-7/D-25

ENVIRONMENTAL IMPACT ASSESSMENT

Paper–EL-419-A

Time : Three Hours] [Maximum Marks : 75

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

UNIT–I

1. Explain different types and sources of water pollution. (7+8=15)

2. Write detail notes on the following :
   (i) Surface water resources in India.
   (ii) Water quality control.
   (iii) Drainage basin activities. (3×5=15)

UNIT–II

3. Describe the importance, composition and structure of atmosphere. (4+4+7=15)

4. Mention how air quality is affected by human activities and various methods of air quality management? (7+8=15)

UNIT–III

5. Explain three methods of solid waste disposal along with their advantages and disadvantages. (5+5+5=15)

6. Describe any two hazards in land use and the strategies to control them? (7+8=15)

UNIT–IV

7. Write down methods of environmental prediction and assessment of a project. What are the advantages of incorporating environmental assessment in design process? (4+4+7=15)

8. Explain the principles on which National Environmental Policy-2006 is based. (15)

Roll No. ..... Total Pages : 2

47272

BT-7/D-25

RAILWAY ENGINEERING

Paper–EL-427A

Time : Three Hours] [Maximum Marks : 75

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

UNIT–I

1. Explain the importance of rail transportation in India. Illustrate the components and requirements of a permanent way with the help of a neat sketch. (15)

2. (a) Explain the functions of rails. (6)
   (b) Explain the different types of rail sections and the requirements of an ideal rail section. (9)

UNIT–II

3. Explain in detail the types of Sleepers used in railways. (15)

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4. Write short notes on :

(a) Fish plates.

(b) Bearing plates.

(c) Tie bars. (3×5=15)

UNIT–III

5. Explain the components of a Right Hand Turnout with the help of a neat sketch. (15)

6. Write short notes on :

(a) Absolute Block System.

(b) Automatic Block System.

(c) Centralized Train Control System. (3×5=15)

UNIT–IV

7. (a) Explain functions and types of yards. (7)

(b) Describe Gradients, Super elevation and Negative super elevation in detail. (8)

8. A railway track is laid on a Broad Gauge line with a ruling gradient of 1 in 200. A horizontal curve of 5 degrees is located on this gradient. Calculate the compensated gradient that should be provided on the curve. Also, explain the concept of grade compensation. (15)

Roll No. ..... Total Pages : 3

BT-8/D-25 **48321**

ENGINEERING ECONOMICS, ESTIMATION & COSTING

Paper–CE-402A

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 short notes on the following :

   (a) Lump sum items.

   (b) Estimate for R.C.C. works.

   (c) Estimate for Road or Canal work.

   (d) Units of measurement for different items of work.

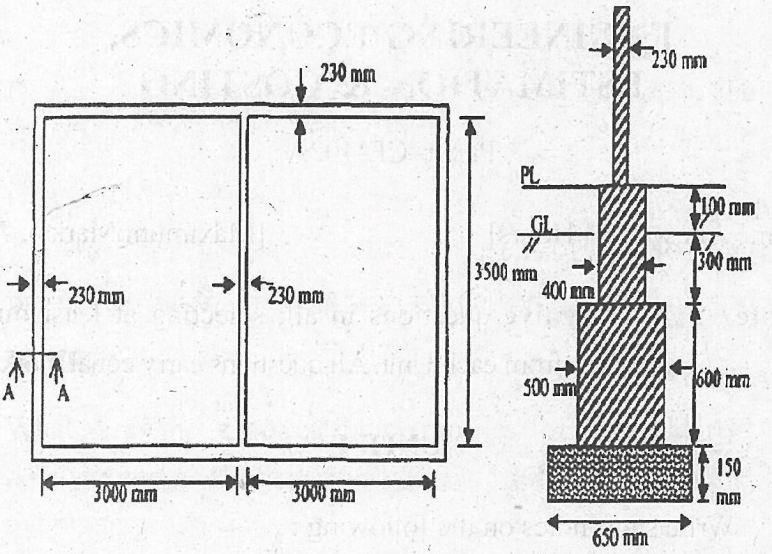
2. The plan and sectional elevation of the building are given in Fig. 1. Find the estimate the quantities for the following items of works.

   (a) Earthwork's in Excavation.

   (b) Plain Cement Concrete for Foundation.

(c) Ist Class Brickwork for Foundation.

Concrete for roof slab (thickness of slab = 100 mm).



PLAN SECTION AT AA

UNIT–II

3. Write detailed specifications for finishing works such as :

   (a) Cement plastering.

   (b) Whitewashing and Colour washing.

   (c) Painting and Distempering.

4. What is the necessity of specifications in Civil Engineering works ? Explain the types of specifications with suitable examples.

UNIT–III

5. (a) Describe the procedure for preparing a rate analysis of any construction item.

   (b) Calculate the rate per cu. m for providing and laying plain cement concrete (M10) nominal mix in foundation trenches including compacting and curing.

6. Prepare analysis of rate for centering and shuttering for a RCC beam of 60 cm × 30 cm for a span of 8 m. Assume 4.5 m as the height of room.

UNIT–IV

7. (a) What is contract document and mention the documents to be attached to the contract agreement.

   (b) What is the difference between Scrap value and Salvage value ?

8. (a) Demonstrate the processes "Opening and Scrutiny of tender".

   (b) Show the general details in Muster roll and rules for preparation of Muster roll.

Roll No. ..... Total Pages : 2

BT–8/D-25 **48322**

BRIDGE ENGINEERING

Paper–CE–404A

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 in detail the classification of Bridges based on their function, materials and span. Discuss with suitable examples. 15

2. Describe the factors affecting the selection of a suitable site and economical span for a Bridge. 15

UNIT–II

3. Discuss the various types of R.C.C. bridges and their suitability under different site conditions. 15

4. Design the critical components of an R.C.C. T-beam bridge for a given span and load conditions (assume suitable data). 15

UNIT–III

5. Explain the different types of Steel bridges with neat sketches and discuss their relative merits and demerits. 15

6. Describe the Design procedure of a Truss bridge. Include the forces acting on members and methods of analysis. 15

UNIT–IV

7. Explain the Hydraulic design considerations for Bridge piers and Abutments. Discuss the factors affecting scour depth. 15

8. Describe the different types of Bridge foundations and explain the Design criteria of a well foundation. 15

Roll No. ..... Total Pages : 2

BT–8/D-25 **48328**

EARTHQUAKE ENGINEERING

Paper–EL–422A

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. What is Seismology? Explain earthquake distribution and mechanism in detail. 15

2. Write short notes on the following : 5×3=15

   (a) Seismic wave.

   (b) Seismic zoning.

   (c) Seismometer.

UNIT–II

3. Explain with difference seismic coefficient method and response spectrum method. 15

4. Explain design criterion for structures with design examples. 15

UNIT–III

5. Define any two methods for assessing seismic performance influence of Design ductility and Masonry infills. 15

6. Explain various techniques and their applications used for strengthening the damaged RCC building due to Earthquake. 15

UNIT–IV

7. Using IS : 1893, design earthquake resistance. 15

8. Explain the following : $2 \times 7\frac{1}{2} = 15$

   (a) Base isolation.

   (b) Control system.

Roll No. ..... Total Pages : 2

BT–8/D-25 **48331**

WASTE WATER TREATMENT

Paper–EL–428A

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 in details the system of Sewerage. Also define ventilation and characteristics of Sewage. 15

2. (a) What are the Chemical characteristics of Sewage? 7

   (b) Explain the types of Water carriage system of Sewage. 8

UNIT–II

3. (a) Explain Oxygen sag curve with diagram. 5

   (b) Write the types and functions of Screens. Write the design steps also. 10

4. Design a Grit chamber with proportional flow weir for the following data : 15

Maximum flow 10 mld, size of grit to be removed - 0.18mm, avg. temp = 25 C specific gravity of grit particles = 2.65.

UNIT–III

5. Explain in detail the Design of up flow anaerobic sludge blanket reactor. Also explain any one method of Sludge disposal. 15

6. Explain the process of Design of Septic tank and Imhoff tank. 15

UNIT–IV

7. (a) Give two examples of Process change for conservation of Water. 7

(b) Mention the effects of Industrial effluent on Waste water treatment plant. 8

8. Write short notes on the following :

(a) Sludge drying beds. 5

(b) Proportioning of Sewage. 5

(c) Reuse of Waste water. 5