CE/Lib

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

BT-3/D-22 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 the various broad disciplines of Civil Engineering ? Discuss the career prospects of a civil engineer. 8

   (b) Enlist various materials used in construction. State the advantages of concrete over other construction materials which make it a popular construction material. 7

2. Name any *one* monument having importance due to its state of the art kind of construction. Discuss its unique features with emphasis on construction techniques used in its construction. 15

Unit II

3. Is construction an industry ? Justify your answer. How is construction industry different from manufacturing industry ? **15**

4. (a) State the principle of serveying. Explain the use of GPS devices in the field of surveying. **9**

   (b) Explain the working of Total-station. **6**

Unit III

5. Write short notes on the following : **15**

   (a) Use of plastics in construction

   (b) Construction chemicals.

6. What do you mean by Automation ? Discuss the significance of automation in construction industry. What modernized automated equipments are in use in construction industry ? Discuss. **15**

Unit IV

7. What do you mean by Solid Waste Management ? Discuss the methods adopted for solid waste management. **15**

8. State the basics of water supply systems. What factors are considered to design an effective water supply scheme for a small township ? Elaborate. **15**

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

BT-3/D-22 43156

CIVIL ENGINEERING

BS-204A

Higher Engineering Mathematics

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) Find the Laplace transform of :

$$e^{-3t}(2\cos 5t - 3\sin 5t)$$

(b) Find the Laplace transform of the function :

$$f(t) = \begin{cases} \sin \omega t & 0 < t < \dfrac{\pi}{\omega} \\ 0 & \dfrac{\pi}{\omega} < t < \dfrac{2\pi}{\omega} \end{cases}$$

2. (a) Find the inverse Laplace transform of $\dfrac{s+3}{s^2-4s+13}$.

(b) Solve the following equation by Laplace transform method :

$$y'' + 4y' + 3y = e^{-t},\ y(0) = y'(0) = 1$$

Unit II

3. (a) Form a partial differential equation (by eliminating the arbitrary constants) from the equation :

$$z = ax + by + a^2 + b^2$$

(b) Solve :

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

4. (a) Solve :

$$(p^2 + q^2)y = qz$$ by Charpit's method.

(b) Solve :

$$(D^2 + 4DD' - 5D'^2)z = \sin(2x + 3y)$$

Unit III

5. (a) Find a real root of the equation $x^3 - 2x + 5 = 0$ by Regula-Falsi method correct to four decimal places.

(b) Evaluate $\sqrt{5}$ (correct to four decimal places) by Newton's iterative methods.

6. (a) Using Newton's forward formula, find the value of $f(1.6)$, if :

x	$f(x)$
1	3.49
1.4	4.82
1.8	5.96
2.2	6.5

(b) Find the polynomial $f(x)$ by using Lagrange's formula :

x	$f(x)$
0	2
1	3
2	12
5	147

Unit IV

7. (a) Find first derivative of $f(x)$ at $x = 1.5$ if :

x	$f(x)$
1.5	3.375
2.0	7.000
2.5	13.625
3	24.000
3.5	38.875
4	59.000

(b) Evaluate $\int_0^1 \frac{dx}{1+x}$, by using :

(i) Trapezoidal rule

(ii) Simpson's 1/3rd rule.

8. (a) Find by Taylor's series method the value of y at $x = 0.1$ and $x = 0.2$ to five places of decimals from $\frac{dy}{dx} = x^2y - 1,\ y(0) = 1.$

(b) Apply Runge-Kutta fourth order method, to find approximate value of y when $x = 0.2$, given that $\frac{dy}{dx} = x + y$ and $y = 1$ when $x = 0$.

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

BT-3/D-22 43157

INTRODUCTION TO SOLID MECHANICS

CE-201A

Time : Three Hours] [Maximum Marks : 75

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

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 load of 315 kN when tested as a strut with rounded ends,

2 m 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^2. 15

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 meter 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 5 m 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 4 m. 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

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 = 20×10^6 N/cm^2, I = 1500 cm^2. 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 = 4×10^{12} Nmm^2. **15**

7. Determine the forces in a member of truss as shown figure (a) by method of Joint. **15**

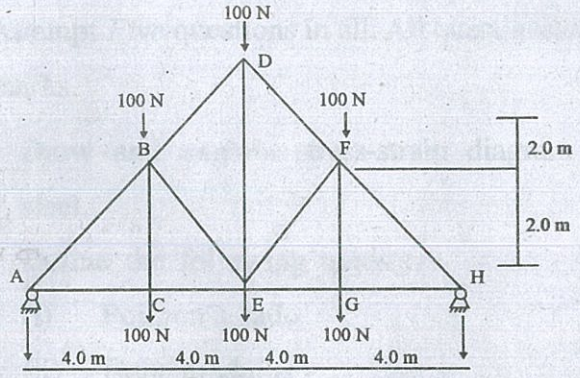


Fig. (a)

8. Explain Tension Coefficient method for analysis of truss. **15**

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

BT-3/D-22 **43158**

CIVIL ENGINEERING

CE-203A

Introduction to Fluid Mechanics

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 is the difference between Dynamic Viscosity and Kinematic Viscosity ? State their units of measurements. 8

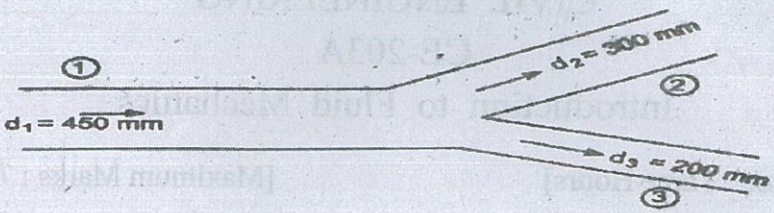
   (b) Calculate the capillary rise in a glass tube of 2.5 mm dia. when immersed vertically in (i) Water and (ii) Mercury. Take surface tension σ = 0.0725 N/m for water and σ = 0.52 N/m for mercury in contact with air. The specific gravity for mercury is given as 13.6 and angle of contact = 130°. 7

2. (a) A pipe (1) 450 mm in diameter branches into two pipes (2) and (3) of diameter 300 mm and 200 mm respectively as shown in figure. If the average

velocity in 450 mm dia. pipe is 3m/s, find :

(i) Discharge through 450 mm dia. pipe

(ii) Velocity in 200 mm dia. pipe if the average velocity in 300 mm pipe is 2.5 m/s. **10**



(b) Define the terms :

(i) Velocity potential function

(ii) Stream function. **5**

Unit II

3. What is a differential manometer ? Discuss types of Differential manometer with neat and clean sketches. **15**

4. (a) A rectangular plane surface 3 m wide and 4 m deep lies in water in such a way that its plane makes an angle of 30° with the free surface of water. Determine the total pressure force and position of centre of pressure, when the upper edge is 2 m below the free surface. **7**

(b) A rectangular pontoon is 5 m long, 3 m wide and 1.2 m high. The depth of immersion of pontoon is 0.80 m in sea water. If the centre of gravity is

0.6 m above the bottom of pontoon, determine the metacentric height. The density for sea water = 1025 kg/m^3. 8

Unit III

5. Write an expression for Euler's equation of motion. Also derive Bernoulli's equation from Euler's equation, giving its limitations and assumptions. 15

6. (a) Classify the orifices, and write down the formulas for various hydraulic coefficients. 7

   (b) Explain the following :

   (i) Effect of end contraction in rectangular notches. 4

   (ii) Velocity of approach and its effect on discharge computation. 4

Unit IV

7. (a) What do you mean by separation of boundary layer ? Discuss the various methods of controlling the boundary layer. 10

   (b) Explain displacement thickness and momentum thickness. 5

8. Explain the geometric kinematics and dynamic similarity with reference to physical modeling. 15

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

BT-3/D-22 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. Assume any missing data.

Unit I

1. Differentiate between whole circle bearing and quadrantal bearing system. Convert the following whole circle bearing into quadrantal bearing and quadrantal bearing into whole circle bearing : **15**

   (i) 290°

   (ii) 135°

   (iii) 185°

   (iv) N 45°30′ W

   (v) N 30°30′ W

2. (a) Write down the classification of surveying on the basis of instrument use and purpose. **10**

(b) What do you understand by local attraction ? Explain. 5

Unit II

3. (a) The following reading were taken on a continuous sloping ground with 4 metre staff 0.780, 1.535, 1.955, 2.985, 3.480, 1.155, 2.365, 3.640, 0.935, 1.630, 2.545. The R.L of first A was 100. Determine R.L. of all the other points by any *one* of the methods. 7

(b) Define temporary adjustment of theodolite. 8

4. (a) Write the classification of direct levelling. 8

(b) Write down the characteristics of contours. 7

Unit III

5. (a) Write down the methods which is generally used for the measurement of the angles in a theodolite traverse. 8

(b) What do you understand by vertical curve and also write down the necessity and types of vertical curves. 7

6. Explain all the elements of simple circular curve with neat and clean sketch. 15

Unit IV

7. (a) The scale of an aerial photograph is 1 cm = 100 m. The photograph size is 20 cm × 20 cm. Determine the number of photographs required to cover an area of 100 sq. km if the longitudinal lap is 60% and the side lap is 30%. **8**

   (b) Write the types of aerial photographs. **7**

8. What do you understand by GIS and GPS and also write down its use in civil engineering. **15**

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

BT-3/D-22 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.

Unit I

1. (a) Draw the plan of alternate course in English bond for cross-junction of two walls of 1½ brick thickness. 8

   (b) Classify the stone masonry and explain any *one* with neat sketch. 7

2. (a) Write the types of non-bearing partition walls. 3

   (b) Give the advantages and disadvantages of cavity wall. 4

   (c) Differentiate the combined trapezoidal footing and strap footing with neat sketches. 8

Unit II

3. What are the various materials used for prevention of Dampness ? Explain their use in brief. 15

4. Describe the difference between King post truss and Queen post truss with diagram. 15

Unit III

5. (a) List out the various test to be performed on Bricks. Explain any *two* in detail. 8

   (b) State advantages, disadvantages and use of terra-cotta. 7

6. What is ordinary Portland cement ? Explain the manufacturing of ordinary Portland cement. 15

Unit IV

7. Explain the structure of Timber and Seasoning of timber in detail. 15

8. (a) Explain the characteristics and types of Varnish. 10

   (b) Write short notes on dressing and seasoning of stones. 5

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

BT-5/D-22 **45188**

PROFESSIONAL PRACTICE, LAW AND ETHICS

Paper–HM-255A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all, selecting atleast *one* question from each Unit.

UNIT–I

1. Write short notes on the following :

(a) IRC.

(b) BIS.

(c) IIA.

(d) ECI.

(e) RERA. (15)

2. Explain the respective roles of the following stakeholders :

(a) Civil Engineer.

(b) Clients.

(c) Developers.

(d) Vendors.

(e) Contractors. (15)

UNIT–II

3. What do you mean by Ethics? Explain all the types of Ethics in detail. (15)

4. (a) Differentiate the gift with Bribery. (7)

   (b) What do you mean by Conflict of interest? Explain with a suitable example. (8)

UNIT–III

5. (a) Explain various types of contract and their features. (8)

   (b) What is the difference between Valid and Voidable contracts? (7)

6. (a) Differentiate the Bids with proposals. (7)

   (b) What are the conditions and specifications of contract according to Bid evaluation? (8)

UNIT–IV

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

   (b) What are the various roles of labor in Civil engineering. (7)

8. (a) Explain the Workman's Compensation Act, 1923. (8)

   (b) What do you understand by RERA Act, 2017? (7)

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

BT-5/D-22 **45189**

STRUCTURAL ANALYSIS-II

Paper–CE-301A

Time : Three Hours] [Maximum Marks : 75

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

UNIT–I

1. (a) How are arches classified based on shape and end conditions?

(b) State and prove Eddy's theorem.

2. A three hinged parabolic arch has a span of 10 m. The central rise of the arch is 2 m. It is loaded with a uniformly distributed load of intensity 1 kN/m at the left 4 m length.

(a) Calculate the maximum positive and negative bending moments.

(b) Calculate the bending moment, normal thrust and shear at 2 m and 7.5 m form left end.

UNIT–II

3. Analyze the portal frame by moment distribution method. Draw the bending moment diagram and sketch the deflected shape of the structure. The two columns of AB and CD of 4 m height with I, Beam BC of span 4 m, with 2I. The beam BC carries an udl of 10 kN/m. The supports at A and D are fixed.

4. Using moment distribution method analyze the two span continuous beam. The moment of inertia of AB = I while that of BC = 2I. The ends A and C are Fixed. Sketch the B.M. and S.F. diagram. Span AB carries a concentric load of 36 kN with a span of 6 m and span BC carries an udl of 20 kN/m over a span of 8 m.

UNIT–III

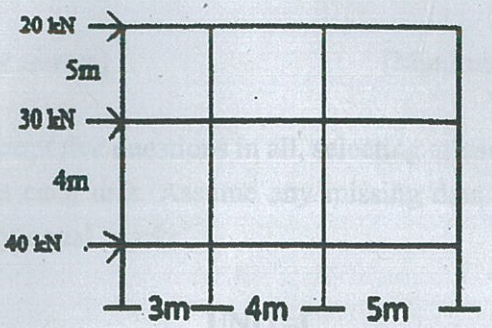
5. Analyze the portal frame using Kani's procedure. The two columns of AB and CD of 6 m height, Beam BC of span 10 m, with EI constant. The column CD carries an udl of 20 kN/m. The supports at A and D are fixed.

6. Using Kani's method, determine the support moments for the three-span continuous beam with fixed end supports, having spans AB, BC and CD. Span AB carries an eccentric point load of 80 kN, 4 m span and a load at 1 m from point A. Span BC carries an udl of 20 kN/m of 6 m span and span CD carries a concentric point load of 60 kN having a span of 4 m (EI constant). Sketch the B.M. and S.F.D.

UNIT–IV

7. Discuss the difference between Portal method and Cantilever method with an example.

8. Analyse the portal frame by Portal method.



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

BT-5/D-22 **45190**

DESIGN OF CONCRETE STRUCTURES-I

Paper–CE-303A

Time : Three Hours] [Maximum Marks : 75

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

UNIT–I

1. Discuss the chemical composition of cement and the contribution of different cement compounds to setting of cement. Also explain the various tests on physical properties of cement. 15

2. Discuss stepwise the IS code Method of Mix Design of Concrete. What are the Various Design Philosophies followed for Reinforced Concrete? 15

UNIT–II

3. A singly reinforced rectangular beam with width 230 mm and effective depth 450 mm is reinforced with 5 bars of 16 mm diameter. Calculate the ultimate moment of resistance of the section using limit state method Grade of concrete M20 and steel Fe500. 15

4. Calculate the moment of resistance and uniformly distributed load which a Simply Supported beam of effective span 5 meters can carry if the cross-section details are 250 × 550

effective depth and 600 mm overall depth. It is reinforced with three bars of 20 mm diameter in the compression zone and 4 bars of 25 mm diameter in the tension zone. Use the effective cover to compression reinforcement as 50 mm. Use M20 concrete and Fe415 steel. 15

UNIT–III

5. Determine the area of longitudinal steel to be provided in a short column of size 600 mm × 600 mm subjected to a factored load of 1500 kN. Use M20 concrete and Fe415 steel. 15

6. Define Slenderness ratio & its implications on the design of RC members. Also define how deflection serviceability is ensured on the beams. 15

UNIT–IV

7. Differentiate between one-way slabs and two-way slabs. Also draw the reinforcement detailing of a simply supported one way slab. 15

8. A cantilever retaining wall is designed to retain earth for a height of 4.5 m. The safe bearing capacity of soil is 180 kN/m^2 and unit weight of soil is 17.8 kN/m^3. Coefficient of friction between soil and concrete is 0.6. Proportion the retaining wall and check for stability. Also design and detail the stem slab of the retaining wall. 15

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

BT-5/D-22 **45191**

HYDROLOGY

Paper–CE–305-A

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 "Hydrological cycle" with neat sketch, divisions of hydrological cycle and application of hydrology to engineering problems. (15)

2. Explain the following :

(i) Precipitation and its measurement.

(ii) SIMON'S non-recording rain gauge.

(iii) Frequency of point rainfall. (15)

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)

4. (a) Explain the following terms in brief :

(i) Infiltration capacity.

(ii) Infiltration rate.

(iii) Infiltration indices (w-index and Φ-index). (10)

(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 :
   (i) Aquifer.
   (ii) Artisan well.
   (iii) Perched Aquifer.
   (iv) Darcy's law.
   (v) 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 aquifer 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)

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

BT-5/D-22 **45192**

GEOTECHNICAL ENGINEERING

Paper – CE-307A

Time : Three Hours] [Maximum Marks : 75

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

UNIT–I

1. What are the different purposes of conducting soil exploration? Describe with a neat sketch how will you carry out the wash boring method of soil exploration. (15)

2. Give a detailed account on how Standard Penetration Test is conducted. What are the relevant corrections applied to SPT number? (15)

UNIT–II

3. (a) Give salient points on general, local and punching shear failures with neat sketches. State the assumptions of Terzaghi bearing Capacity theory.

(b) A square footing of 2m×2m is provided at a depth of 1m, in a sandy soil with an angle of internal friction of 30°. Compute the net safe bearing capacity of the soil with a factor of safety of 3, when the water table is at a depth of 0.5m & 1.5m below the ground level. Given G = 2.65, e = 0.7, Degree of saturation above water table = 80%, Nc=95, Nq=80.4, $N\gamma$=100.2. (15)

4. (a) What are the types of Shallow foundation and its relative merits?

(b) State causes of differential settlement. What remedial measures can be taken to control the differential settlement of foundations?

(c) Calculate the ultimate bearing capacity of a footing of size 1.5 m × 1.5 m from the Plate load test. If ultimate bearing capacity of plate of size 0.3 m × 0.3 m on sand deposit is observed to be 200 kN/m^2. (15)

UNIT–III

5. Differentiate between long piles and short piles. List the different types of sheet pile walls with sketches. (15)

6. A square concrete pile [400mm×400mm] is proposed to be installed in a homogeneous clay stratum [unconfined compression strength = 100kPa; unit weight of soil = 18kN/m^3; adhesion factor = 0.4] to carry a safe load of 233 kN, with a factor of safety of 2.5 against shear failure. Design the required length of pile. (15)

UNIT–IV

7. Differentiate between Caisson and pier foundation. Explain Caisson foundation mechanism its types & construction. (15)

8. What are the factors affecting lateral stability of well foundation? Explain precautions to avoid shifting & tilting of well foundation as per IS 3955. (15)

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

BT-5/D-22 **45193**

CONCRETE TECHNOLOGY

Paper–CE-309A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all, selecting atleast *one* question from each Unit.

UNIT-I

1. (a) What is quality control of concrete? What are the common tests used to check the quality of concrete, explain any *two* in detail? (10)

(b) Discuss how to choose suitable grade of concrete? (5)

2. (a) Explain the following :

(i) Hydrophobic cement.

(ii) Portland flyash cement.

(iii) Bulking of fine aggregates.

(iv) Fineness modulus.

(v) Classification of aggregates. (10)

(b) What are the various laboratory tests used on cement? Explain soundness of cement test in brief. (5)

UNIT-II

3. Explain in detail various properties of concrete. Also brief the stress strain characteristics of concrete and durability of concrete against sulphate attack. (15)

4. (a) What is ready mixed concrete and also explain various types of mixers used for mixing of concrete. (7)

   (b) Write short notes on :

   (i) Creep and shrinkage of concrete.

   (ii) Expansion and contraction joints. (8)

UNIT-III

5. What are the non-destructive tests for concrete? Define radioactive techniques and ultrasonic pulse velocity techniques. (15)

6. Explain deterioration due to corrosion of embedded steel in concrete and alkali-aggregate reaction. (15)

UNIT-IV

7. What are the different repair methods of various types of cracks? Explain in detail underwater repair. (15)

8. Explain properties and application of the high strength concrete and Fiber reinforced concrete. (15)

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

BT–7/D-22 **47047**

SEWERAGE & SEWAGE TREATMENT

Paper–CE-407E

Time Allowed : 3 Hours] [Maximum Marks : 100

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 systems of sewerage? State their relative merits and demerits. 15

   (b) Why is circular shaped sewer preferred over egg shaped? 5

2. (a) Explain various stages involved in construction and testing of sewers. 15

   (b) What are various sewer materials? Discuss. 5

Unit–II

3. Write short notes on the following : 20

   (a) BOD.

   (b) Oil & Grease removal

   (c) Joints and appurtenances in sewers.

4. What are the important parameters to be assessed for sewage characterization? 20

Unit–III

5. What do you mean by sludge digestion? State and explain the factors affecting the procedure. 20

6. (a) Write the working of aerated lagoon. 10

   (b) Explain the principal and procedure of working of Inhoff tank. 10

Unit–IV

7. Write an explanatory note on self-purification characteristics of streams. Also explain oxygen sag curve. 20

8. Compare dilution method with land disposal method for sewage disposal. Explain the applicability of each method. 20

Roll No. ..... Total Pages : 4

BT–7/D-22 **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 : 1343-1980 and steel IS : 456 are allowed. Use M20 concrete and Fe415 steel if not specified in question.

Unit–I

1. A continuous beam has three spans each of 5 m. the characteristics dead and live loads are 10 kN/m and 15 kN/m respectively. Design the critical section of the beam and sketch the reinforcement details. Use M20 grade concrete and Fe 415 HYSD bar. 15

2. A prestressed concrete beam supports a live load of 5000 kN/m over a simply supported span of 10 m. The beam has an overall depth of 500 mm. the thickness of each flange and Web are 80 mm and 100 mm respectively. The width of each flange is 250 mm. The beam is to be prestressed by an effective prestressing force of 250 kN applied at a suitable eccentricity such that the resultant stress at the bottom of beam at centre of span is zero. 15

(a) Find the eccentricity required for the force.

(b) If the tendon is concentric, what should be the magnitude of the prestressing force for the resultant stress to be zero at the bottom fibre of the central section.

Unit–II

3. Fig. 1 shows the general arrangement of stair case for an office building. The tread is 300 mm and rise is 150 mm. The Stairs in buil-in the side wall along the fights for a distance of 120 mm. Design the stair case for a live load of 3000 N/mm^2, taking the span in the direction of the flight. Use M20 concrete and Fe 415 steel. 15

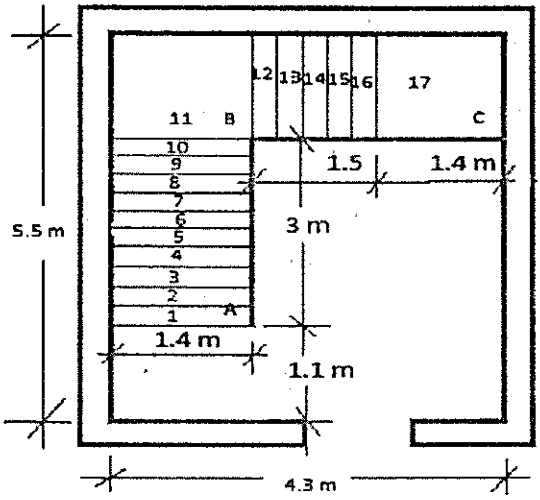


Fig.1

4. Design a combined rectangular footing for two columns A and B, carrying loads of 500 and 700 kN respectively. Column A is 300 mm × 300 mm in size and Column B is 400 mm × 400 mm in size. The centre to centre spacing of the columns is 3.4 m. The safe bearing capacity of soil may be taken as 150 N/m^2. Use M 20 concrete and Fe 415 steel. 15

Unit–III

5. Design a bunker to store 600 kN of coal for the following data : 15

   Unit weight of coal = 8500 N/m^3

   Angle of repose = 30°

   The stored coal is to be surcharged at its angle of repose. Take permissible stress in steel as 140 N/mm^2.

6. An open rectangular tank 4 m × 6 m × 3 m deep rest on firm ground. Design the tank. Use M20 Mix and Fe 415 steel. 15

Unit–IV

7. Analyse the building frame, subjected to horizontal forces, as shown in Fig. 2. Use portal method. 15

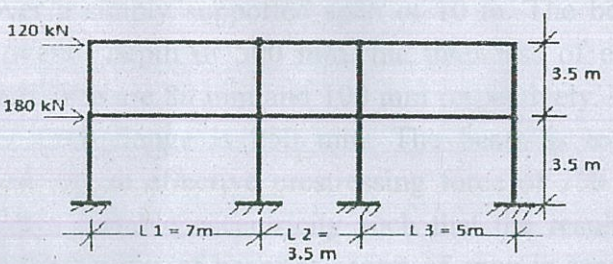


Fig. 2

8. A rectangular slab 4 m × 6 m in size simply supported at the edges. The slab is expected to carry a service live load of 4 kN/m^2 and floor finishing load of 2 kN/m^2. Use M20 concrete and Fe 415 steel. Design the slab if : 15

(a) It is isotropically reinforced with $\mu = 1.0$.

(b) If it is orthotropically reinforced with $\mu = 0.75$.

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

BT-7/D-22 **47263**

ENERGY SCIENCE & ENGINEERING

Paper–ES–212 A

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) Discuss in brief about - Energy, Sustainability and Environment? 7

   (b) State the Scientific principles of energy? 8

2. (a) Describe the historical interpretation of energy use in critical societal? 8

   (b) Write in brief about climatic issues due to energy utilization? 7

UNIT-II

3. Discuss the Past, Present and Future of following fuels :

   (i) Coal

   (ii) Oil

   (iii) Coal gasification. 15

4. Discuss the origin and benefits of Solar energy, Wind energy and Hydrogen as an alternative fuel? 5,5,5

UNIT-III

5. What do you mean by : (i) Energy Efficiency (ii) Energy Conservation? Discuss their importance also? 5,5,5

6. (a) What is Carbon footprint? Discuss. 7

   (b) Discuss the relationship between energy consumption and sustainability? 8

UNIT-IV

7. Write short notes on following projects as energy sources :

   (i) Oil Exploration

   (ii) Coal mining technologies

   (iii) Underground pipelines. 15

8. Write short notes on following projects as energy sources :

   (i) Wind mill tower

   (ii) Hydro power station

   (iii) Tunnels. 15

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

BT–7/D-22 **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) What is the role of Water in national development? How you will do assessment of Water resources in a country? 10

   (b) What are the functional requirements in Multipurpose project planning? 5

2. Define Storage Capacity of a reservoir. What is long term and basin wise planning. 15

Unit–II

3. What is the meaning and nature of economic theory, also explain micro macro economics? 15

4. Explain discounting factors and techniques in detail. 15

Unit–III

5. What are optimal policy analysis explain all methods used for this analysis? 15

6. Solve graphically the following LP problem : 15

Maximise $V = 500x_1 + 450x_2$

Subjected to $6x_1 + 5x_2 \leq 60$

$10x_1 + 20x_2 \leq 150$

$x_1, x_2 \geq 0.$

Unit–IV

7. What are the applications of system engineering in Irrigation and drainage engineering? 15

8. Define distribution network and explain what are mathematical models for forecasting water resources related problems? 15

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

BT-7/D-22 **47265**

METRO SYSTEM & ENGINEERING

Paper–OE–407 A

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 basic Planning and Financials for Metro Systems in detail. 15

2. Explain the need of routing studies for Metro System in detail. 15

UNIT-II

3. Explain all the construction methods which are used for elevated and underground stations. 15

4. Write down short notes on following : 3×5 = 15

   (i) Traffic Integration

   (ii) Viaduct spans and bridges

   (iii) Facilities Management.

UNIT-III

5. Explain the Operation Control Centre (OCC and BCC) in details. 15

6. Explain the Signaling System in detail. 15

UNIT-IV

7. Write down short notes on following : $3 \times 5 = 15$

   (i) Rolling Stock

   (ii) Tunnel Ventilation System

   (iii) Power SCADA.

8. What do you understand by Standby and Backup system, explain in detail? 15

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

BT-7/D-22 **47268**

ENVIRONMENTAL IMPACT ASSESSMENT

Paper–EL–419 A

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 regional planning in detail.
2. Explain the following in detail :
   (i) Drainage basin activity
   (ii) Water pollution.

UNIT-II

3. Explain effect of human activity on air quality with suitable data.
4. Describe optimization planning of waste disposal.

UNIT-III

5. What are the methods for assessing seismic performance.
6. Explain the following in detail :
   (i) Land use management
   (ii) Control
   (iii) Management of land use.

UNIT-IV

7. Explain National Environmental Policy and its implication of environment assessment in design process in detail.

8. What is general requirement of environmental standard and technique of setting standard in detail.

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

BT-7/D-22 **47272**

RAILWAY ENGINEERING

Paper–EL–427 A

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) Discuss the role of Railways in industrial progress of a nation. 7

   (b) Classify the different types of defects in rails and briefly explain them. 8

2. (a) What are the considerations in the choice of gauge for a new railway track? 7

   (b) What are the possible causes of creep? What are the effects of creep? 8

UNIT-II

3. (a) Explain sleeper density. What sleeper density is recommended for a broad gauge track with fast traffic? 7

   (b) Write short notes on the following : 8

   (i) Fish plates

   (ii) Dog spike and screw spike.

4. (a) What are the requirements of a good ballast material? Describe a good material for permanent ballasting? 7

(b) What are the advantages of timber sleepers? How are wooden sleepers treated to enhance their service life? 8

UNIT-III

5. (a) Calculate the crossing angle for a 1 in 12 crossing using :

(i) The centre line method

(ii) The isosceles triangle method

(iii) The right angle method. 7

(b) Draw a neat diagram of simple right-hand or left-hand turnout and show its various component parts. Explain the working principle of the turnout. 8

6. (a) Briefly discuss the major features of absolute block system. 7

(b) Define interlocking and explain the principle of interlocking. 8

UNIT-IV

7. (a) Write short notes on the followings : 5

(i) Cant deficiency

(ii) Negative super-elevation.

(b) Enumerate the principal types of marshalling yards and the basic facilities that should be provided with each one of them. 10

8. (a) Describe the factors that influence the selection of site for a Railway station. How the railway stations are classified? 7

(b) If a 8° curve track diverges from a main curve of 5° in an opposite direction in the layout of a B.G. yard, calculate the super-elevation and the speed on the branch line, if the maximum speed permitted on the main line is 45 kmph. 8

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

BT-8/D-22 **48044**

INDUSTRIAL WASTE WATER TREATMENT

Paper–CE–406E

Time : Three Hours] [Maximum Marks : 100

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

UNIT–I

1. (a) Explain the problem engaged with industrial sewage discharge in water stream. (10)

   (b) Discuss the term industrial waste and write about its effects when not properly disposed. (10)

2. (a) Name the effects of industrial work discharge on waste water treatment plans. (10)

   (b) Differentiate between industrial sewage and municipal sewage and explain the effects if industrial sewage enters municipal sewage system. (10)

UNIT–II

3. Explain the effects of industrial effluents on wastewater treatment plants. How can we minimize these effects? (20)

4. Write short notes on :
   (a) Volume Reduction.
   (b) Strength Reduction.
   (c) Neuralization.
   (d) Equalization. (20)

UNIT–III

5. (a) What do you mean by population equivalent? Discuss the method of calculating the population equivalent. (10)
   (b) What is industrial waste? Discuss its unit in SI system. (10)

6. Write the industrial effluent standard for disposal into inland surface water :
   (a) Alkalinity.
   (b) pH.
   (c) Hardness.
   (d) Iron.
   (e) Lead. (20)

UNIT–IV

7. Discuss the manufacturing process of textile industiy with the help of flowsheet and neat diagram. (20)

8. Explain the process used in the distillery and its manufacturing process with the help of flowsheet and neat diagram. (20)

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

BT-8/D-22 **48321**

ENGINEERING ECONOMICS, ESTIMATION AND COSTING

Paper–CE-402A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all; select at least *one* question from each unit. Assume any missing data appropriately.

UNIT–I

1. (a) What do you mean by estimate? Also explain the different methods of estimate in details. (7.5)

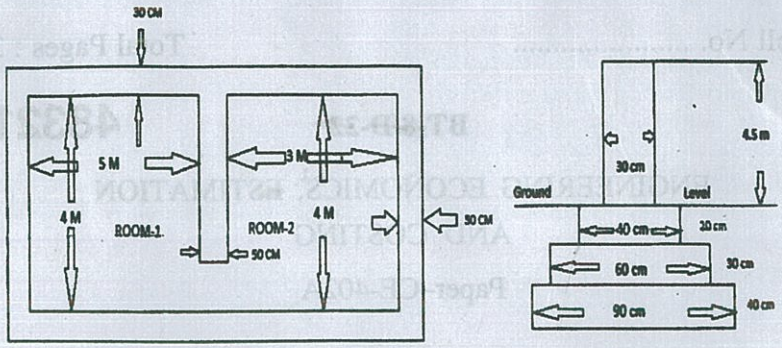
(b) What are the factors to be considered for the preparation of a detailed estimate? (7.5)

2. Estimate the quantity of following items for double room as per the plan and elevation given below. Door size 0.75 m × 1.0 m.

(a) Earthwork.

(b) Lime concrete in foundation.

(c) Brickwork in superstructure. (15)



UNIT–II

3. What is specification? What is the necessity of specification, explain its type's ? (15)

4. A wall having thickness of 30 cm, length 80 m and height 15 m. Find out the total number of bags of cement concrete having mortar ratio 1:5 and give details specifications about cement bags. (15)

UNIT–III

5. What do you understand by rate analysis? Write down the purpose, Important and requirement of rate analysis. (15)

6. Find the rate analysis for 10 cu. m RCC work of M25 grade. (15)

UNIT–IV

7. Write short notes on the following :

   (a) Earnest Money.

   (b) Security Money.

(e) Tender.

(d) Floor Area Ratio.

(f) Scrap Value. (5×3=15)

8. What do you mean by Tender and its acceptance? Describe in detail various terms and conditions of contract which are to be formulated while inviting tender for a work? (15)

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

BT-8/D-22 **48322**

BRIDGE ENGINEERING

Paper–CE-404-A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all; Select at least one question from each unit. Use of IS 456-2000 and IRC codes are allowed.

UNIT-I

1. (a) Define Bridge and its components. Explain its classification also. (7)

(b) What do you understand by economical span? Derive the expression for the same. (8)

2. (a) List the preliminary data to be collected by an engineer conducting investigation for a major bridge? Why it is required? (8)

(b) Discuss the concept of effective width. Also discuss its effect in dispersion of load. (7)

UNIT-II

3. A R.C.C culvert is required for an NH crossing. The clear vent way of the box culvert is 8 m by 8 m. Design Box culvert assuming a superimposed dead load of 27 KN/M² and live load of 67 KN/M². The density of the earth is 16 KN/M². Angle of repose of soil is 30. Adopt M-30 and Fe 415. Sketch the detail of R/F in the box culvert. (15)

4. Design RCC Culvert over NH for the following data :
   (i) Loading - IRC Class A Loading.
   (ii) Span = 6 m.
   (iii) Carriageway width = 7.6 m.
   (iv) Width of kerb = 500 mm on both side
   Use M 30 concrete and Fe 415 steel. (15)

UNIT-III

5. (a) What are the advantages and disadvantages of steel bridge over RCC bridges? (8)
   (b) List the various type of steel bridges. Explain any two. (7)

6. Design a steel trussed bridge to suit the following data :
   (i) Effective spam = 25 m.
   (ii) Road ways = 7.5 m (two lane)
   (iii) Kerb = 600 mm.
   (iv) Loading = IRC Class AA Tracked vehicle.

(v) Material = M25 grade concrete and FE 415 HYSD bar for deck slab.

(vi) Rolled steel section wth an yield stress = 236 N/mm^2. (15)

UNIT-IV

7. (a) Enumerate the various type of forces to be considered for design of abutment. (8)

(b) Explain in detail the followings and Draw the neat sketch for all? (7)

(i) Wing Walls.

(ii) Piers.

(iii) Approaches.

8. What are the types of bridge foundation? Explain any *two* with neat sketches. (15)

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

BT-8/D-22 **48324**

COMPARATIVE STUDY OF LITERATURE

Paper : OE-408-A

Time : Three Hours] [Maximum Marks : 75

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

1. Discuss Comparative Literature as an interdisciplinary study across national borders, time periods, languages, genres and other arts. Also state the challenges of Comparative Literature. (15)

2. Elucidate with illustrations the Theories of Interpretation with reference to Comparative Literature. (15)

3. Write a note on the history of Comparative Literature of French, German and Tel Aviv Schools. (15)

4. Ornate the progress of World Literature from Goethe to the present portraying its contribution to Comparative Literature. (15)

5. Explain the concepts of 'Untranslatability' and 'Silence' in the Politics of Translation. (15)

6. Write an essay on the problems and promises of Translation in Multilingual situations with reference to Comparative Literature. Suggest ways to overcome these challenges. (15)

7. Critically examine the Indian Literary Theory and Western Classical Literary Theory, pointing out the similarities and differences between the two. (15)

8. Give a comparative study of Indian Poetics-Sanskrit and Tamil. Also write a note on the Perso-Arabic Traditions in Theories. (15)

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

BT-8/D-22 **48328**

EARTHQUAKE ENGINEERING

Paper-EL-422A

Time : Three Hours] [Maximum Marks : 75

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

UNIT-I

1. Define earthquake, focus, epicenter, P wave, S wave and explain the theory behind the vibrations measuring instrument. (15)

2. Explain theory of earthquake magnitude and intensity, seismic zoning and plate tectonics. (15)

UNIT-II

3. Explain earthquake design philosophy and design criteria for building. (15)

4. Design criteria as per codal provisions of shear walls and also explain seismic coefficient method. (15)

UNIT-III

5. Explain briefly the criterion for repair and strengthening techniques and their applications. (15)

6. What are the various methods for assessing the seismic performance? Explain *one* in detail. (15)

UNIT-IV

7. Define vibration control and general features of structural control, active and passive control system. (15)

8. What are the various methods for assessing the seismic performance, explain any *one* in detail. (15)

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

BT-8/D-22 **48331**

WASTE WATER TREATMENT

Paper–EL-428A

Time : Three Hours] [Maximum Marks : 75

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

UNIT-I

1. (a) Discuss the merits and demerits of Separate system and Combined system. (8)

(b) Mention the sources of sanitary sewage. Write the factors affect the quantity of sanitary sewage. (7)

2. (a) Explain the terms :

(i) Time of concentration.

(ii) Time of flow.

(iii) Inlet time. (9)

(b) Give a list of physical characteristics of waste water. Write their significant also. (6)

UNIT-II

3. (a) Write the various conditions, which directly affect the Self-purification of stream? (7)

   (b) What is 'Oxygen sag curve' in stream pollution? (8)

4. (a) Write the design steps of screening and elaborate the types of screens? (7)

   (b) What do you understand by Flow equalization tank? (8)

UNIT-III

5. (a) Do comparison between LRTF and HRTF. (7)

   (b) Describe the working of Oxidation ditch and Oxidation lagoons? (8)

6. (a) Calculate the effluent BOD of a two-stage tricking filter with the following data :

   Flow = 3.30 m^3/min,

   BOD = 300 mg/l,

   Volume of Filter No. 1 = 900 m^3,

   Volume of Filter No. 2 = 900 m^3,

   Filter Depth = 2 m,

   Recirculation ratio for both the filter is = 1.5.

   Use NRC formula. (8)

   (b) Discuss the working of Sludge Drying Beads. (7)

UNIT-IV

7. (a) Write the effects of Industrial waste on Sewage system? (8)

   (b) Describe the methods to minimize the Industrial waste? (7)

8. Explain the following :

   (i) Strength reduction of waste.

   (ii) Reuse of waste water.

   (iii) Proportioning. (15)
