CIVIL ENGINEERING

Time Allowed : 3 hours Full Marks : 100

The figures in the margin indicate full marks for the questions.
Answer any 10 (ten) questions taking 5 (five) questions from each section.
Assume any missing data.

SECTION A

Building Materials

1. (a) Discuss the operations involved in the manufacture of Bricks. (6)

(b) Explain briefly the following two tests for bricks:
   (i) Compressive Strength test.
   (ii) Water absorption test. (2×2=4)

2. (a) Write a note on important properties of various types of cement. (6)

(b) Explain briefly the following two tests for cements:
   (i) Consistency test of cement.
   (ii) Test for setting time of cement. (2×2=4)
Solid Mechanics

3. (a) Define the following: \(3+3=6\)
   (i) Modulus of elasticity, modulus of rigidity.
   (ii) Mohr’s circle of stress, strains, plane strain.

(b) Draw shear force and bending moment diagrams for following beams: \(2\times2=4\)
   (i) A cantilever having a point load at the free end.
   (ii) A simply supported beam carrying uniformly distributed load on the entire span.

Structural Analysis

4. (a) Discuss briefly the different steps of analysis of a continuous beam by slope deflection method. \(6\)

(b) Discuss the Principle of Plastic Analysis. \(4\)

Design Of Steel Structures

5. (a) Define the following technical terms used in riveting: \(5\times1=5\)
   (i) Lap Joint
   (ii) Butt Joint
   (iii) Nominal diameter
   (iv) Pitch
   (v) Gauge Distance

Contd. 3
(b) Design a suitable fillet welded joint between two plates of size 160mm × 8mm and 200mm × 8mm to develop the full strength of the smaller plate in tension. Assume permissible tensile stress in plate = 1500 kg/cm². (5)

Design of Concrete and Masonry Structures

6. Explain the following: (2+3+5=10)
   (a) Doubly reinforced Section.
   (b) Advantages of R.C.C.
   (c) Design of simply supported slabs.

7. What is Pre-stressed Concrete? Explain different methods of pre-stressing. (2+8=10)

Construction Practice, Planning and Management and Concreting Equipment:

8. (a) Define the following technical terms used in CPM analysis: (5×1=5)
   (i) Event
   (ii) Activity
   (iii) Dummy Activity
   (iv) Early finish time
   (v) Late start time

   (b) What are the main differences between PERT and CPM networks? (5)

   (Contd. 4)
9. Draw the network representing the following activity relationships using the minimum number of dummies: (10)

A, B and C are the initial activities; Q, M and R the finishing activities.

H precedes N but follows D, E follows D but precedes N.
F follows K and L follows B, F precedes M.
Q follows P, L and N; L precedes R but follows C.
D precedes G, K and D follow A.
F precedes P but follows G.

SECTION - B

Fluid Mechanics, Open Channel Flow, Pipe Flow

10. (a) A body of dimension 2m × 1m × 3m weighs 3924N in water. Find its weight in air. (4)

(b) Define the following: (3+3=6)
   (i) Specific energy and characteristic of specific energy curve.
   (ii) Practical applications of hydraulic jumps

Hydraulic Machines and Hydropower

11. (a) Classify turbines based on head water and specific speed. (2×3=6)

(b) Write a note on the powerhouse of a hydroelectric project. (4)
Hydrology

12. (a) Define unit hydrograph. State the assumptions of the unit hydrograph theory. (4)

(b) Define the following and discuss how one differs from the other: (2+2+2=6)
   (i) Flood routing through reservoirs
   (ii) Flood routing through Channel

Water Resources Engineering

13. (a) What is waterlogging? What are the causes of waterlogging? (4)

(b) What are the different forces that may act on a gravity dam? Discuss with a sketch and write down the expressions of the forces. (6)

Environmental Engineering

14. (a) Explain various processes involved in sludge treatment and disposal. (5)

(b) Define water-born Diseases. Write down the classification of water-born Diseases. (5)

(Contd. 6)
15. (a) Define the following terms: \( (4 \times 1 = 4) \)
   (i) Porosity of soil mass
   (ii) Permeability
   (iii) Flow net
   (iv) Bearing capacity

(b) Write down the assumptions of Terzaghi’s one dimensional Consolidation Theory. \( (6) \)

Surveying

16. (a) Draw neat sketches of the pattern of contours that show \( (3 \times 2 = 6) \)
   (i) Area having flat slop
   (ii) Area having uniform steep slop
   (iii) A valley

(b) How do you perform the following operations by a theodolite? \( (2 \times 2 = 4) \)
   (i) Measurement of direct angles.
   (ii) Measurement of deflection angles.

(Contd. 7)
17.  (a) Fill up the blanks: (5×1=5)

(i) In levelling, measurements are made in ______ plane.
(ii) A level surface to which elevations of different points are referred is called ______.
(iii) A relatively permanent point of reference, whose elevation with respect to any assumed datum is considered, is known as ______.
(iv) The point at which both back sight and foresight readings are taken, is called ______.
(v) Levelling should always commence from a ______.

(b) Define the following: (5×1=5)

(i) The zenith
(ii) The nadir
(iii) The celestial equator
(iv) The observer’s meridian
(v) The ecliptic

Transportation Engineering

18. Write notes on: (5+5=10)

(a) Geometric Design of roads.
(b) Maintenance of Railway tracks.