Paper–V

CIVIL ENGINEERING (Paper-I)
(Section-II)

Time Allowed : 2 Hours (Subjective) Maximum Marks : 100

Note :

(i) Candidate should attempt five questions in all. Question No. 1 is compulsory.

(ii) The number of marks allocated for each question or part thereof, is indicated at the end of each question.

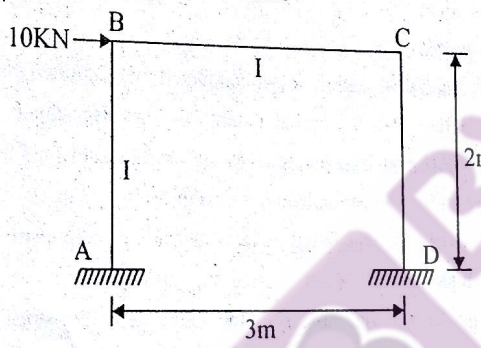
(iii) Parts of the same question must be answered together and must not be interposed between answer to a=other question.

(iv) Notation/terms used have their usual meanings.

(v) If any data is considered insufficient, assumed suitable values and mention the same.

1. Answer any Two of the followings :

(a) Analyse the portal frame ABCD as shown and draw bending moment and shear force diagrams. All members have identical cross-section



(b) A T-beam of flange width 1300 mm, flange thickness 100 mm, rib width 275 mm has an effective depth of 50 mm. The beam is reinforced with 5 bars of 25 mm diameter.

Find the ultimate moment of resistance by the Limit State Method.

Use M 15 grade concrete and Fe 415 steel

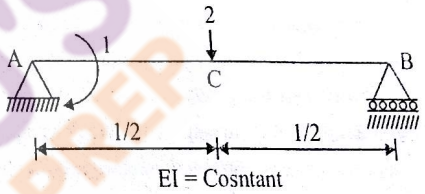
(c) A mass of soil coated with thin layer of paraffin wax weights 690.6 gm and the soil alone weights 683 gm. when the sample is immersed in water, it displaces 150 ml of water. The specific gravity of soil is 2.73 and that of wax is 0.89.

Find out the Void ratio and degree of saturation if it has got water content of 17%. Unit weight of water may be taken as 1000 kg/cum

SECTION-A

2. (a) (i) differentiate between the flexibility and stiffness approach of analyzing a structure

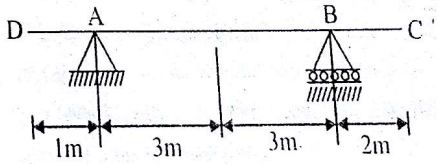
(ii) Set up the flexibility matrix for the beam shown



(b) for the beam shown, draw the Influwene Liner diagrams for

(i) Reactions R_A and R_B

(ii) B.M. at E



3. (a) Design a suitable welded joint between two plates of size 160 mm x 8 mm and 200 mm x 8 mm to develop the full strength of the smaller plate in tension. Assume permissible tensile stress in plate as 1500 kg/cm^2. Take permissible shear stress in weld = 1025kgm/cvm^2.

(b) Calculate the safe load for a bridge compression member of two channels ISMC 400 @ 49.5 kg/m. Placed toe to toe. The effectivelength of member is 8 m. The width over the backs of the channels is 40 cmand the section is properly connected by lacings. Theallowable stress may be obtained from the table.

l/r Slenderness Ratio	Permissible Stress (N/mm)^2
40	145

50	136
60	126
70	115
80	105
90	94
100	82
110	73
120	64

Properties of ISMC 400 are :

Cross-sectional area A = 63.04 cm^2; Ixx = 15, 123.4 cm^4;

Iyy = 506.3 cm^4 C.G. frons web = 2.42 cm.

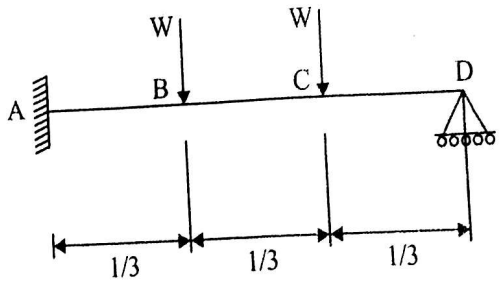
SECTION-B

4. (a) A rectangular R.C. section of breadth 300 mm and effective depth 550 mm is balanced reinforced withHYSD bars. Determine the following using Limit StateMethod :
   (i) the position of Neutral axis
   (ii) area of reinforcement
   (iii) moment of resistance of the section

   (b) Design a square R.C. footing of uniform thickness fora R.C. Column of 500 mm x 500 mm size, carryingan axial total load of 2000 KN, using M20 grade ofconcrete and mild steel reinforcement. The safe bearing capacity of the soil is 150 KN/m^2. Give a neatsketch of the footing with reinforcement details.

5. (a) Discuss various losses of pre-stress in Pre-tensioned and Post-tensioned beams.

   (b) A-uniform beam of plastic moment capacity Mp fixed at one end and simply supported at the other end as shown. Two concentrated loads each of 'W' are acting at one third points. Determine the ultinate Load 'We'.



SECTION-C

6. (a) Discuss the factors which affect the personability of soil.

   (b) During a compaction test, a soil-attains the maximum dry density of 18.6 kN/m^3, at a water content of 15%. The specific density of soil is 2.7. Determine the degree of saturation, air content and percentage of air voids at the maximum dry density.

   (c) A loading of 50 KN/m^2 is acting on an annular foundation of width 5 m and inside diameter of 10 m. Find the vertical stress intensity at a depth of 10 m below the centre of foundation.

7. (a) A standard penetration test conducted in a saturated coarse silty with γ_{sat}= 1.8 g/cc., at a depth of 5 m hasyielded a N-value of 12. Find the correct N-value for design of foundation if the depth of water table at the time of test was 2 m.

   (b) a particular soil failed under a measure principle stress of 300 KN/m^2 with the corresponding principle stress of 100 KN/m^2. If for the same soil, the minor principle stress had been 200 KN/m^2, determine the major principle stress for □ = 30°.