22402

24225

4 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions – (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answer with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any <u>FIVE</u> of the following: **10**

a) Draw stress distribution diagram for $\sigma_o = \sigma_b$, $\sigma_o > \sigma_b$.

b) Define carry over factor.

c) State the middle third rule.

d) State differential equation for slope and deflection.

e) Define continuous beam and draw sketch of it.

f) Define perfect frame by giving equation.

g) Write the value of stiffness factor for beam –

i) Simply supported at both ends

ii) Fixed at one end, simply supported at other end.

Marks

2. Attempt any THREE of the following: **12**

a) A rectangular column is 200 mm wide and 100 mm thick. It carries a load of 180 kN at an eccentricity of 100 mm in the plane bisecting thickness. Find the maximum and minimum intensities of stress in section.

b) Calculate core of section for following and draw neat sketches –

i) Circular section 400 mm in diameter.

ii) Rectangular c/s 250 × 500 mm in size.

c) A hollow C.I. column of external diameter 250 mm and internal diameter 200 mm carries an axial load 'W' kN and a load of 100 kN at an eccentricity of 175 mm. Calculate the maximum value of 'W' so as to avoid the tensile stresses.

d) A vertical chimney of hollow square section 2.5 m × 2.5 m outside is 50 cm thick. The height of the chimney is 25 meter. Find the greatest allowable uniform wind pressure perpendicular to one face so that no tension is developed at any edge. Assume density of chimney material is 20 kN/m^3.

3. Attempt any THREE of the following: **12**

a) A simply supported beam of span 5m carries an udl of 10 kN/m over entire span. Find the slopes at supports and deflection at mid span if EI = 4 × 10^{13} Nmm^2.

b) State any two advantages and two disadvantage of fixed beam over simply supported beam.

c) A fixed beam 6 m span carries a point load of 30kN at 2 m from left support. Draw BMD and locate the point of contraflexure.

d) A fixed beam 8 m span carries a udl of 1 kN/m over the entire span and a point load of 6 kN at 3 m from left support. Calculate fixed end moments and draw BMD.

Marks

4. Attempt any THREE of the following: **12**

a) Calculate support moment and draw BM diagram for a continuous beam as shown in Figure No. 1. Use three moments Theorem.

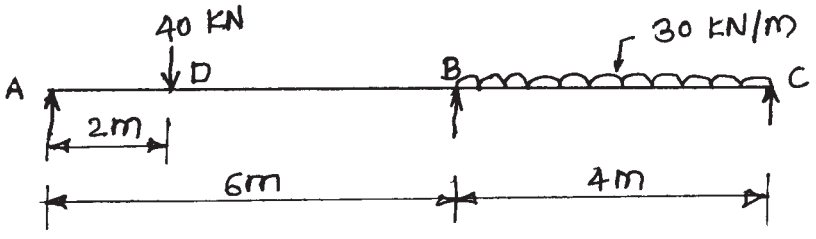

Fig. No. 1

b) Draw SFD for continuous beam as shown in Figure No. 2. Also calculate B.M. at support 'B'. Use three moments theorem.

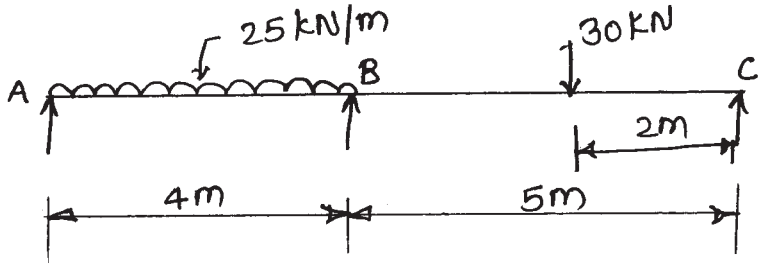

Fig. No. 2

c) Explain the procedure of moment distribution method.

d) A continuous beam of uniform section, ABCD is simply supported at A, B, C and D. AB = 6 m, BC = 8 m and CD = 4 m. Calculate the distribution factors at joint B and C.

e) State any four assumptions made in analysis of simple frame.

5. Attempt any TWO of the following: **12**

a) A simply supported beam of span 4 m carries a central point load of 19 kN. Find maximum slope and maximum deflection of the beam if $I_{xx} = 2 \times 10^8$ mm^4 and E = 200 GPa.

Marks

b) A simply supported beam of span 5 m carries a point load of 50 kN at 1 m from left end and a udl of 10 kN/m over right half span. Calculate the deflection at mid span and slope at left support. Take E = 2×10^3 kN/m^2, I = 0.5×10^{-4} m^4 use Macaulay's method Figure No. 3.

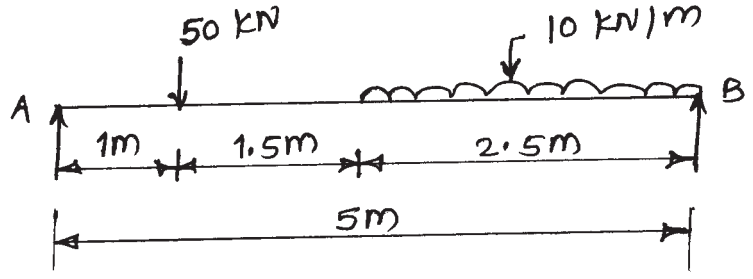

Fig. No. 3

c) A continuous beam ABC is fixed at A and supported at B and C such that AB = 6 m, BC = 5 m, BC carries a udl of 32 kN/m. Calculate support moments using Clapeyron's theorem and draw B.M. diagram Figure No. 4

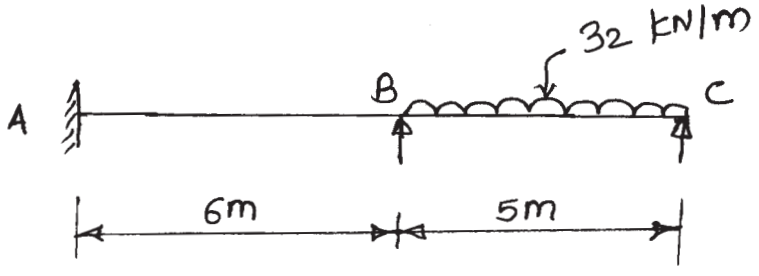

Fig. No. 4

6. Attempt any TWO of the following: **12**

a) Draw BMD by using moment distribution method for a beam as shown in Figure No. 5.

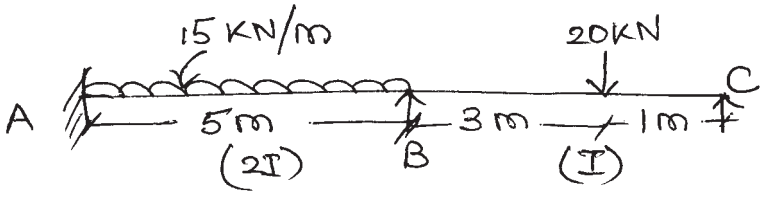

Fig. No. 5

Marks

b) Determine the forces in the members AB, AD and DE of the cantilever frame as shown in Figure No. 6 by method of section.

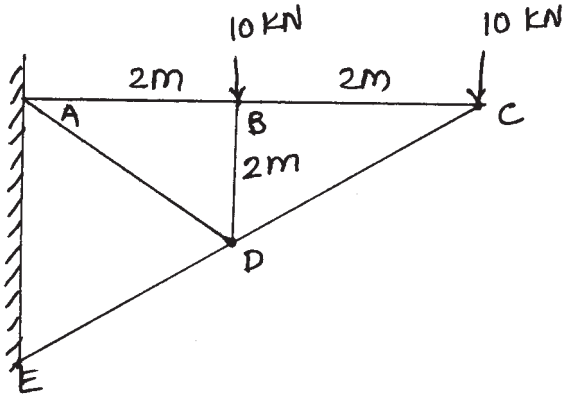

Fig. No. 6

c) Find forces in the members of BC, BE and FE of the frame as shown in Figure No. 07.

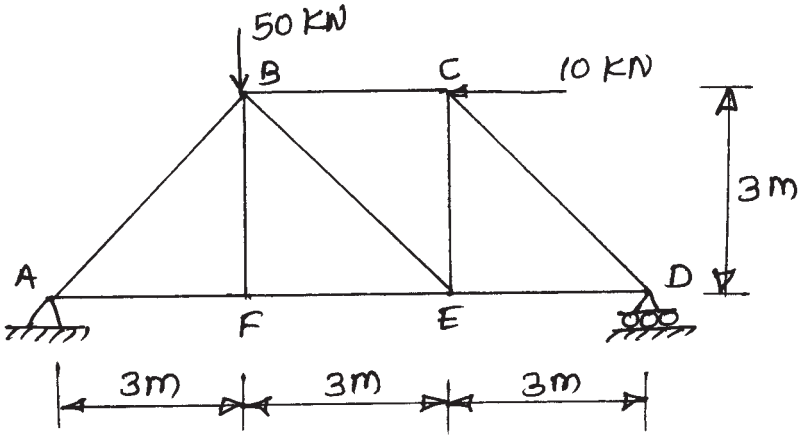

Fig. No. 7