17422

16117

4 Hours / 100 Marks Seat No. | | | | | | | | |

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

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

(3) Illustrate your answers 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. a) **Attempt any SIX of the following:** **12**

(i) Define Eccentric load with sketch.

(ii) Write the differential equation for slope and deflection and state terms used in equation.

(iii) State values of maximum slope and deflection for cantilever beam of span L carrying a point load at free end with meaning of each term.

(iv) State the two situations where Macaullay's method is used for finding slope and deflection of beam.

(v) State the principle of superposition.

(vi) With sketch state the different types of portal frames.

(vii) Define stiffness factor and distribution factor.

(viii) Define perfect and imperfect frame.

Marks

b) **Attempt any <u>TWO</u> of the following:** **8**

(i) Calculate limit of eccentricity for rectangular section having Width 'b' and Depth 'd' and show it on sketch.

(ii) Write step by step procedure for determination of minimum and maximum stresses developed at the base of section.

(iii) Determine the forces in the members FE, FB and CB using method of section for the truss shown in Figure No. 1.

2. Attempt any <u>FOUR</u> of the following: **16**

a) A solid circular column of diameter 250 mm carries an axial load 'W' kN and a load of 200 kN at an eccentricity of 150 mm. Calculate minimum value of 'W' so as to avoid the tensile stresses at base.

b) A rectangular column 300 mm wide and 200 mm thick carries an axial load of 250 kN and a clockwise moment of 5 kN.m in plane bisecting 200 mm side. Calculate resultant stresses induced at the base.

c) Find the maximum and minimum stress intensities induced on the base of a masonry wall 8 m high, 4 m wide and 1.5 m thick subjected to a horizontal wind pressure of 2.5 kN/m^2 acting on 4 m side. The density of masonry is 24 kN/m^3.

d) A beam of span 2.5 m is simply supported and carries UDL w/unit length, if slope at the end is not to exceed 1.5°. Find the maximum deflection.

e) A cantilever beam has cross section 120 mm wide and 200 mm deep. If load of 6 kN acting at the free end, calculate the span of beam if slope at free end of beam is 1.5×10^{-3} radians. Take E = 100 kN/mm^2.

f) State Clapeyron's Theorem and also write the clapeyron's three moment theorem for beam with different M.I. giving meaning of each term.

Marks

3. Attempt any FOUR of the following: 16

a) A 3 m long cantilever beam is loaded with 30 kN/m over entire span. Calculate maximum values of slope and deflection. Take E1 = 40,000 kN.m^2.

b) A simply supported beam of span 6 m carries a point load 60 kN at 2 m from left support. Calculate deflection below point load in terms of E1 use Macaullay's method.

c) A fixed beam of span 7 m is subjected to a point load P. Find out position of load if left hand support moment is 2 times that of right hand support moment.

d) A fixed beam of span 8 m carries a UDL of 2 kN/m and a point load of 16 kN at 3 m from left support. Calculate fixed end moments.

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

f) Determine the forces alongwith nature in the members AB, AE, EB and EF for frame subjected to a load as shown in Figure No.1. Using method of joints.

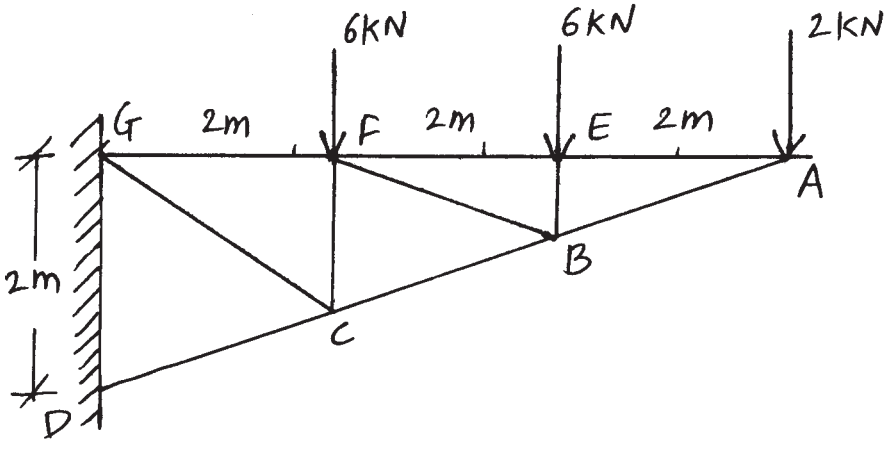

Fig. No. 1

Marks

4. Attempt any FOUR of the following: **16**

a) Explain the concept of imaginary zero span in case of Clapeyron's Theorem.

b) A beam ABC is simply supported at A, B and C. Spans AB and BC are of lengths 3m and 4m respectively. AB carries udl of 15 kN/m over entire span and BC carries central point load of 30 kN. Calculate support moment at B using three moment theorem.

c) A propped cantilever AB of span 4m is fixed at A and propped at B, carrying UDL of 20 kN/m. Using Clapeyron's. Theorem calculate support moment and Draw BMD.

d) Find support moment of Q.4 (b) using moment distribution method.

e) Find support moments for the beam shown in Figure No. 4 using moment distribution method.

f) Determine distribution factors at continuity for a continuous beam ABCD which is fixed at A and simply supported at B, C and D. Take AB = 6 m, BC = 3 m and CD = 2 m. If M.I. for spans is I_{AB} = 37, I_{BC} = 2I and I_{CD} = I.

5. Attempt any TWO of the following: **16**

a) A circular chimney has external diameter 60% more than internal diameter. The height of chimney is 32 m and is subjected to a horizontal wind pressure of 1.75 kN/m^2. Find out the diameter of chimney so as to avoid tension at the base of chimney and also draw stress distribution diagram unit wt of chimney material is 18 kN/m^3 and c = 0.60.

b) A beam ABCD is supported at A, B and C span CD is having overhang, span AB = 6 m, BC = 4 m and CD = 1.5 m. Span AB carries UDL of 15 kN/m over entire span and BC carries point load of 30 kN at 1 m from point B and a point load of 15 kN acts at free end D. Determine support moments using moment distribution method and draw BMD.

Marks

c) Using method of section, find forces in members BC, BE and EF and EC for truss shown in Figure No. 2 State nature of forces tabulate results.

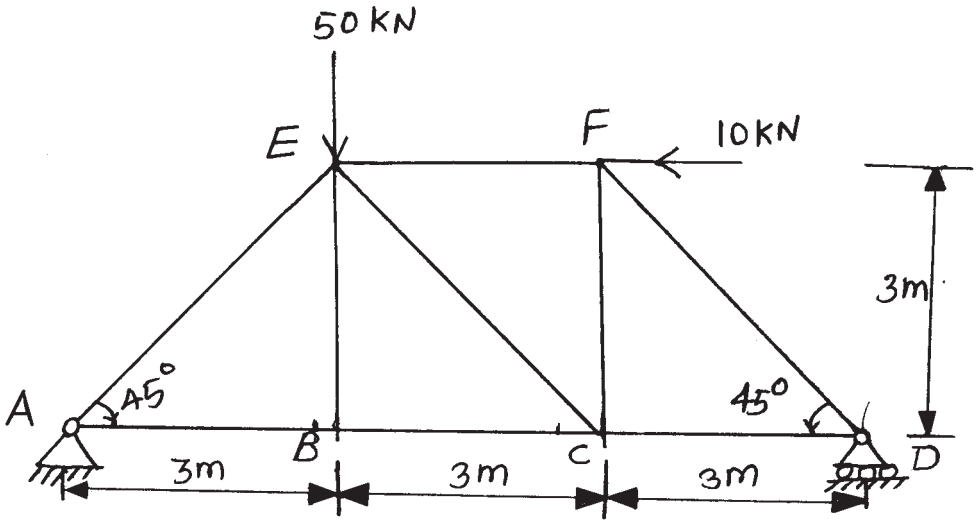

Fig. No. 2

6. Attempt any TWO of the following: **16**

a) A simply supported beam AB of span 4 m is loaded as shown in Figure No. 3. Determine the slope at A and deflection at midspan of beam. Consider EI = 40,000 kN.m^2 Use Macaullay's method.

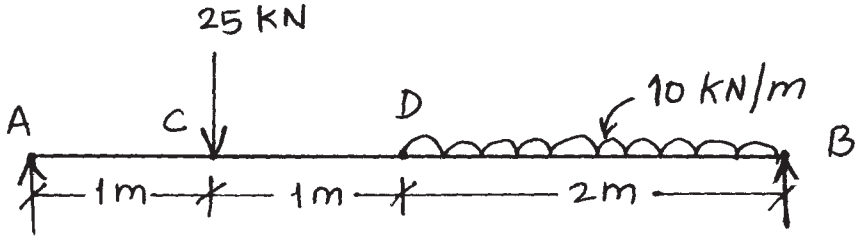

Fig. No. 3

b) A fixed beam of 6 m span carries two point loads of 50 kN each acting at 2 m and 4 m from left hand support and UDL of 25 kN/m spread over entire span. Calculate support moments Draw SFD and BMD.

Marks

c) A continuous beam is loaded as shown in Figure No. 4. Find support moments and support reactions. Solve by three moment theorem only.

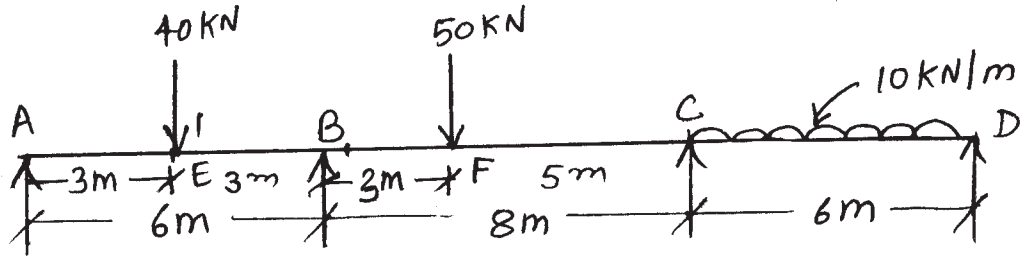

Fig. No. 4