17422

15162

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 : **6 × 2 = 12**

(a) Define "Core of a Section." Sketch resultant stress diagram if load acts on the boundary of core of section.

(b) Write values of slope and deflection at free end of a cantilever that carries point load at free end.

(c) State boundary conditions for a simply supported beam using deflect shape.

(d) A cantilever of span L carries point load W at L/2 from fixed end. State value of slope at free end.

(e) Define "fixing" and "fixed beam."

(f) Giving diagram, state two types of portal frames.

(g) At a continuity, adjoining spans have their distribution factors as 0.43 and 0.57. What is the meaning of these values ?

(h) Define "Perfect Frame" and draw sketches of any two perfect frames.

(B) Attempt any TWO of the following : **2 × 4 = 8**

(a) A pillar is square in section and has side 1 m. Values of axial and bending stress are 300 kN/m^2 and 287 kN/m^2 respectively. Determine resultant stresses. Draw resultant stress distribution diagram. Also state whether the load line is within the core or not.

(b) State middle third rule. Draw sketch of core of rectangular and solid circular sections. State dimensions of core also.

(c) Using method of sections only, determine nature and magnitude of axial forces in members AB and AE only; for the truss shown in fig. 1.

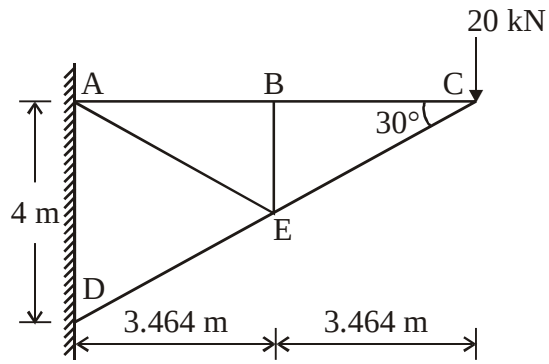

Fig. – 1

2. Attempt any FOUR of the following : **4 × 4 = 16**

(a) A rectangular column has size 0.6 m × 0.4 m. A load of 120 kN acts at an eccentricity of 0.14 m on the axis bisecting shorter side. Determine resultant stresses developed at base. Draw stress distribution diagram also.

(b) A hollow circular column having external diameter 2 m, carries load of 460 kN at an eccentricity of 0.8 m. Draw resultant stress diagram. (For this column Area = 2.356 m^2 and $I_{xx} = I_{yy} = 0.7363$ m^4)

(c) A retaining wall 6 m high has uniform thickness 2 m. It retains water upto top. Determine total water pressure and net stresses at base. Draw stress diagram.

Use unit wt. of water 10 kN/m^3 and unit wt. of wall motored is 18 kN/m^3.

(d) A cantilever of span 3 m carries point load of 30 kN at 2 m from fixed end. Determine slope and deflection at free end. Take EI = 11000 kN/m^2.

(e) Determine intensity of uniformly distributed load "W" for a simply supported beam of span 6 m, if maximum deflection allowed is 12.6 mm. Also state value of slope at mid span. Take E = 2×10^5 MPa, I = 47.5×10^6 mm^4.

(f) Define "Continuity" and state its effect on span moment and span deflection, as compared to simply supported spans. State nature of support moment.

3. Attempt any FOUR of the following : 4 × 4 = 16

(a) A simply supported beam of span 9 m carries two point loads of equal magnitude 36 kN at 3 m from both ends. Calculate values of integration constants and write Macaulay's slope and deflection equation.

(b) For the beam in (a) above, determine slope at support and deflection under point load in terms of EI.

(c) A fixed beam of span 6 m carries two point loads 22 kN and W kN at 1.8 m and 3.4 m from left support. If fixed end moments at both supports are equal, calculate "W".

(d) A point load of 50 kN acts at centre on a fixed beam of span 3 m. Using first principle, determine fixed end moments. Draw net BMD indicating important values.

(e) What is meant by analysis of Frame ? Write any 3 assumptions used for analysis.

(f) For the truss shown in fig. 1, determine nature and magnitude of forces in members BC, CE, AE and DE. Use method of joints.

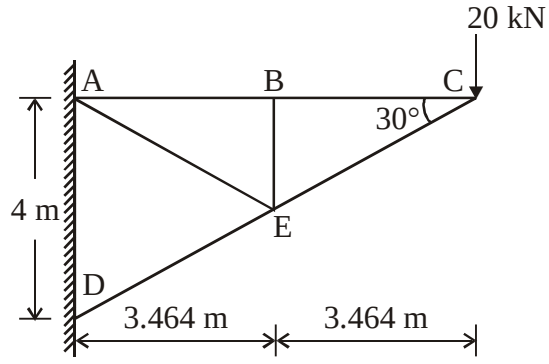

Fig. – 1

4. Attempt any FOUR of the following : 4 × 4 = 16

(a) State Clapeyron's theorem for a continuous beam having same MI. State meaning of each term with sketch.

(b) A beam ABC is simply supported at A, B & C such that *l* (AB) = 4 m and *l* (BC) = 6 m. Point loads 48 kN and 38 kN act at centres of AB and BC. Taking same MI, find support moment at B. Draw BMD showing net BM. Use three moments theorem.

(c) For the beam shown in Fig. 2, calculate moment at B using three moments theorem.

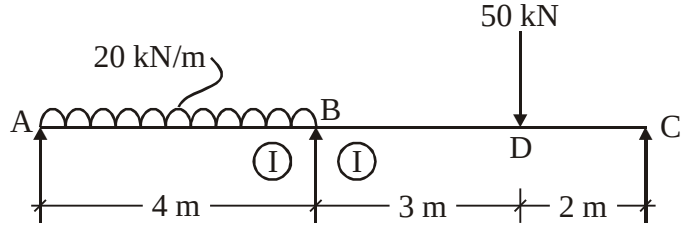

Fig. – 2

(d) Beam ABCD is simply supported at A & D and is continuous over B & C. Determine distribution factors. (AB = BC = CD = 6 m) (I_{AB} = I, I_{BC} = 2I, I_{CD} = 1.5 I).

(e) A beam ABC is fixed at A and is supported at B and C. 20 kN/m u.d. load acts on AB and 40 kN point load acts at centre of BC. If DF_{BA} = 0.57 and DF_{BC} = 0.43. Determine support moment using moment distribution method. *l* (AB) = 6 m and *l* (BC) = 4 m.

(f) Determine support moment for beam in Q. 4 (b) above by moment distribution method.

5. Attempt any TWO of the following : 2 × 8 = 16

(a) A hollow circular chimney has external diameter 2 m and thickness 0.25 m. It is subjected to uniform wind pressure of 1.11 kPa. Determine maximum height for no tension condition. Take coefficient of wind pressure as 0.6 and unit weight of concrete as 21 kN/m^3. Also find maximum stress at base.

(b) Using moment distribution method, determine support moments at B and C. Draw BMD. Refer beam as shown in fig. 3.

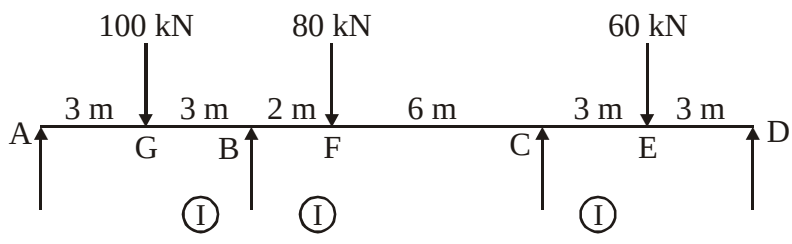

Fig. – 3

(c) Determine forces in all the members of the truss as shown in fig. 4. Prepare force table also.

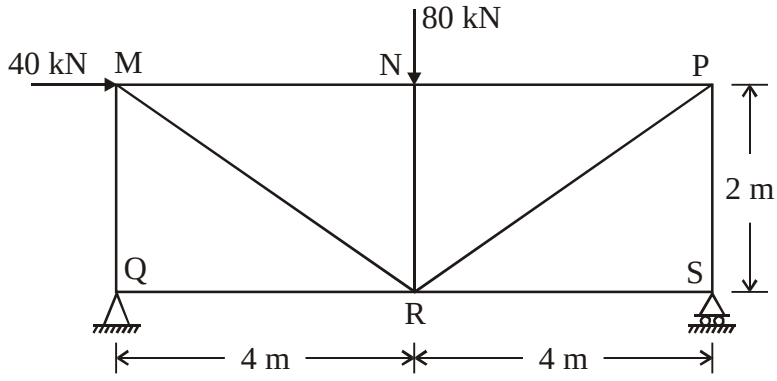

Fig. 4

6. Attempt any TWO of the following : **2 × 8 = 16**

(a) A cantilever ABC is fixed at A, and has length 1.5 m (such that AB = 1 m, BC = 0.5 m). 16 kN/m u.d. load acts on part AB while 10 kN point load acts at free and i.e. C. Using Macaulay's method, determine slope at C and deflections at B and C in terms of EI.

(b) A fixed beam has span 8 m. Two point loads 40 kN and 80 kN act at 3 m and 5 m from left support. Determine fixed end moments and draw BMD. Also find net BM under 40 kN load.

(c) Using theorem of three moments determine support moments, for the beam as shown in fig. 5. Find final reactions and draw SFD.

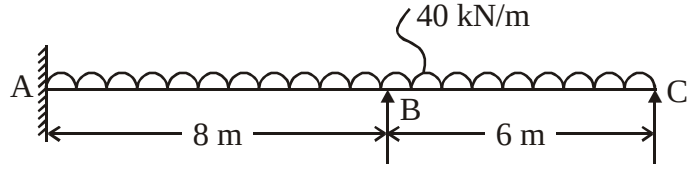

Fig. – 5