17422

21718

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**

a) Define direct stress and bending stress. **2**

b) Define slope and deflection of beam. **2**

c) A cantilever beam of span L carries point load W at free end state the slope and deflection at free end in terms of EI. **2**

d) State the situations where Macaulay's method is used to find slope and deflection. **2**

e) Define fixed beam with sketch. **2**

f) Define distribution factor. **2**

g) State types of portal frames. **2**

h) Define perfect and imperfect frames. **2**

B) Attempt **any two** of the following : **8**

a) Define core of the section and derive the equation for core of the section for circular section. **4**

b) State the condition of no tension at base and draw stress distribution for zero tension condition. **4**

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Marks

c) Find the forces in the members of BC, BE and FE of the frame shown in fig. 1 using method of section. **4**

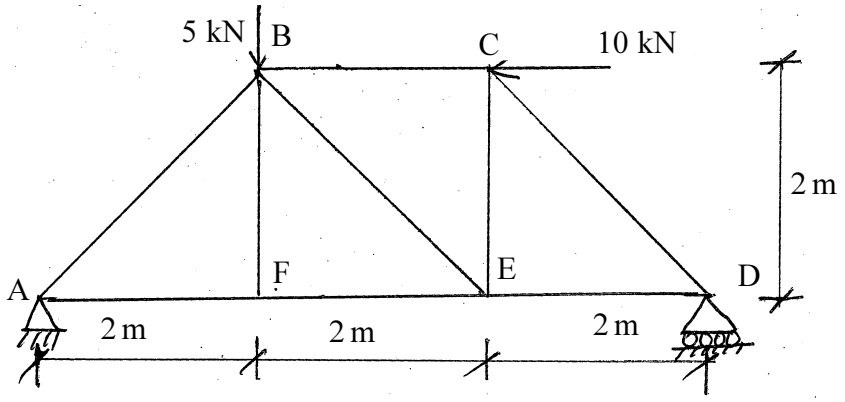

Figure 1

(Q. 1 B (c))

2. Attempt **any four** of the following : **16**

a) A rectangular column 350 mm wide and 250 mm thick carries an axial load of 225 kN and a clockwise moment of 3.5 kN. m in plane bisecting 250 mm side. Calculate the resultant stresses induced at the base. Draw stress distribution diagram. **4**

b) A cast iron column, 300 mm external diameter and 200 mm internal diagram carries a vertical compressive load of 250 kN. Find the maximum allowable eccentricity for this load for no tension condition. **4**

c) Find maximum and minimum stress intensities induced on the base of masonry wall 12 m high, 6 m wide and 1.5 m thick subjected to a horizontal wind pressure of 1.2 kN/m^2 acting on 6 m side. The density of wall material is 22 kN/m^3. **4**

d) A cantilever beam 150 mm wide and 225 mm deep projects 1.75 m out of wall and carries point load of 30 kN at a distance 1 m from the fixed end. Find the deflection of cantilever at the free end. Take E = 200 kN/m^2. **4**

e) A simply supported beam of span 4 m carries a UDL of 15 kN/m over entire span. Find the deflection at mid span and slope at the ends .

$I_{xx} = 2 \times 10^8 mm^4$, $E = 2 \times 10^5$ N/mm^2. **4**

f) State the Clapeyron's theorem of three moment. Write Clapeyron's equation for varying moment of inertia. **4**

Marks

3. Attempt **any four** of the following : **16**

a) i) A cantilever beam of span L carries UDL over entire span. Write the expression to find slope and deflection at free end. Draw deflected shape. **2**

ii) A simply supported beam of span L carries central point load. Write the expression to find slope at ends and deflection at centre. Draw deflected shape. **2**

b) A simply supported beam of span 5 m carries a point load of 30 kN at 1 m from left support. Calculate the deflection at mid span in terms of E I. Use Macaulay's Method. **4**

c) A fixed beam has span 10 m carries two point loads W_1 and W_2 at 3 m and 6 m from left hand support respectively. If fixed end moment at left hand support is 1.25 times that of right hand support. Find the ratio of W_1 and W_2. **4**

d) State the advantages and disadvantages of fixed beam. **4**

e) State the assumptions made in analysis of simple frames. **4**

f) A cantilever truss of 3 m span is loaded as shown in Figure 2. Find the forces in the members AB, BC, BD and AD using method of joints. **4**

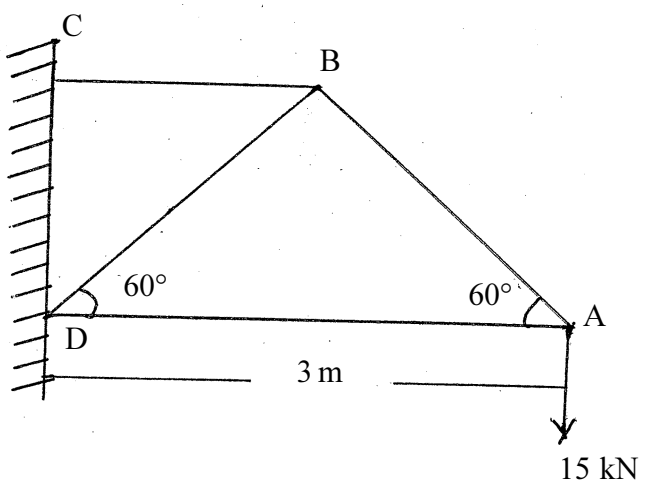

Figure 2

(Q. 3 (f))

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

a) Explain the concept of zero span in case of three moment theorem with sketch. **4**

b) Define continuous beam and state the effect of continuity in case of continuous beam. **4**

Marks

c) Calculate the support moment of continuous beam simply supported at A, B and C. Span AB = 4 m and span BC = 5 m (i) Span AB carries point load of 75 kN at 1.5 m from support A (ii) Span BC carries a UDL of 25 kN/m. Use three moment theorem. **4**

d) Explain the concept of stiffness factor and carry over moment. **4**

e) Calculate the distribution factor at joint O for joint as shown in figure 3. **4**

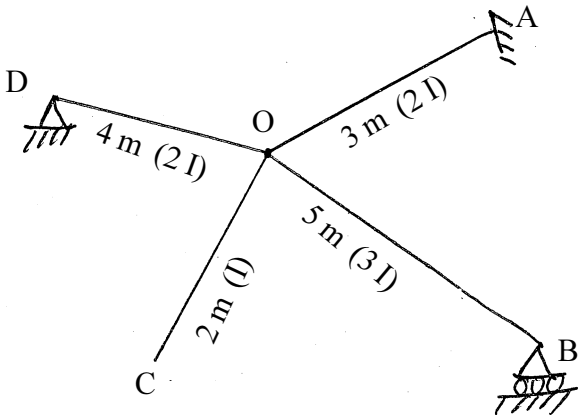

Figure 3

(Q. 4 (e))

f) Calculate the support moment using moment distribution method for question 4 (c) having same M.I. **4**

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

a) A square chimney having external dimensions 1.5 m × 1.5 m with wall thickness 250 mm is subjected to wind pressure 1.5 kN/m^2. Find the maximum height of the chimney which can be allowed so that maximum stress in masonry is not to exceed 250 kN/m^2 compressive check whether masonry is safe if no tension is allowed. Consider weight of masonry 24 kN/m^3. **8**

b) Draw SFD and BMD for beam as shown in figure 4 using moment distribution method. (Figure 4). **8**

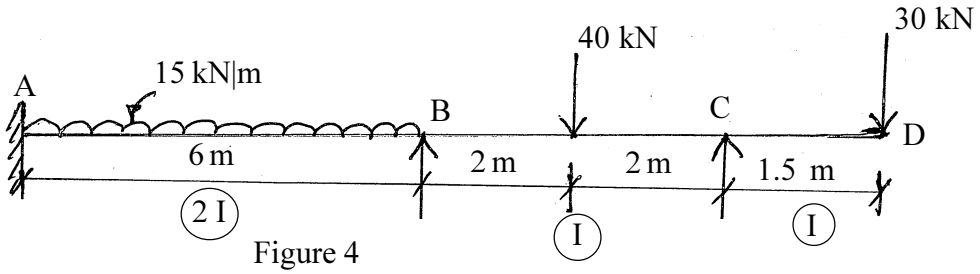

Figure 4

Q. 5 (b))

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c) Determine the nature and magnitude of forces in the members AC, CE, DE, DB of frame as shown in figure 5. Also find support reactions. Use method of joints. **8**

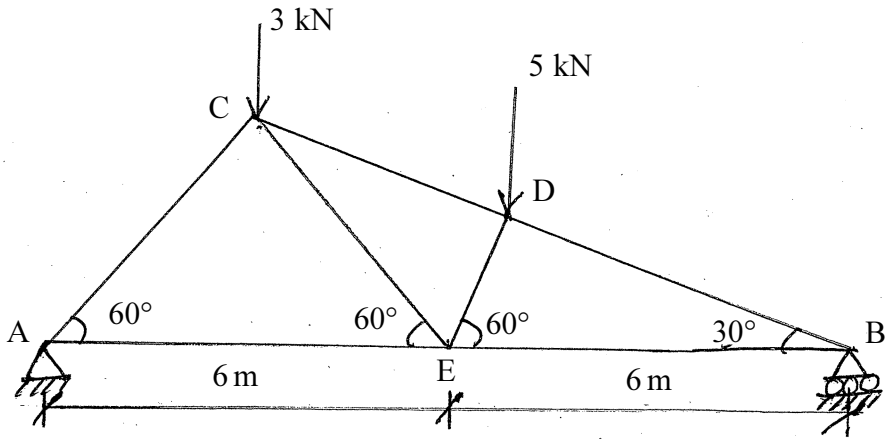

Figure 5

(Q. 5 (c))

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

a) Find the slope and deflection at the centre of a simply supported beam as shown in figure 6 take EI = 4000 kN.m^2. Use Macaulay's method. **8**

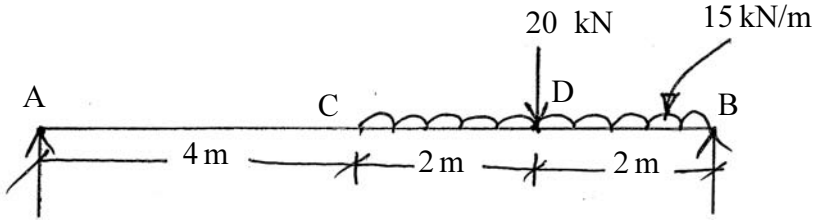

Figure 6

(Q. 6 (a))

b) A continuous beam ABCD 15 m long rests on supports A, B, C and D all at same level. Span AB = 6m, BC = 5 m and CD = 4 m. It carries two concentrated loads 50 kN and 60 kN at 2 m and 8 m from support A and UDL of 40 kN/m over span CD. Find the moments and reactions at the supports. Draw BMD using three moment theorem. **8**

c) A fixed beam 8 m span is subjected to UDL of 30 kN/m over entire span along with point load of 35 kN acting 3 m from left hand support. Calculate the net maximum sagging bending moment. Also draw SFD and BMD. **8**