17422

14115

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 with expression. **2**

(b) Write the value of maximum slope and maximum deflection in case of simply supported beam with u.d.l. load over entire span in terms of EI. **2**

(c) State the relation between slope, deflection and radius of curvature. **2**

(d) A cantilever of span 'L' carries a point load W at L from fixed end. State deflection at free end in terms of EI. **2**

(e) Write the principle of super position. **2**

(f) Define carry over moment. **2**

(g) Define stiffness factor. **2**

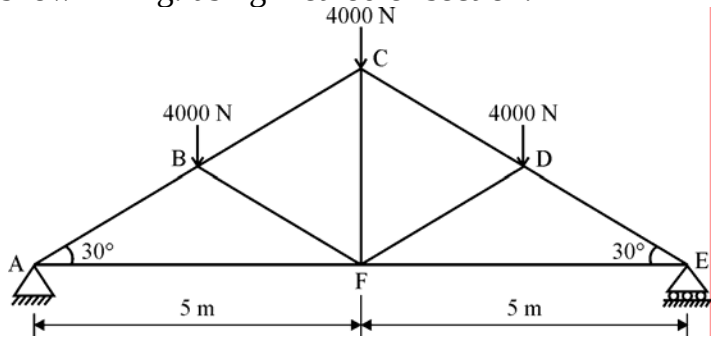
(h) State the condition of redundant and non redundant frames. **2**

(B) Attempt any TWO of the following : **8**

(a) Describe middle third rule with neat diagram. **4**

(b) Draw stress distribution diagram for
(i) $6a > 6b$ (ii) $6a = 6b$ (iii) $6a < 6b$ **4**

(c) Calculate the forces in the members AB, BD & DC for the truss shown in fig. using method of section. **4**



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

(a) A rectangular section of 300 mm × 150 mm is subjected to an axial compressive force of 60 kN at an eccentricity of 40 mm in a place bisecting the thickness. Calculate the resultant stresses at the base and draw stress distribution diagram. **4**

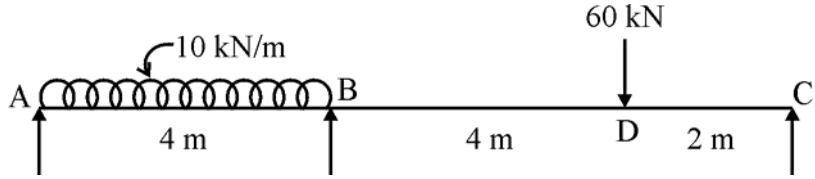
(b) A short column of hollow circular section having external diameter 300 mm and thickness 20 mm is subjected to a load of 40 kN applied off the axis by 180 mm. Find the maximum and minimum stresses, specify the nature of stress also. **4**

(c) A tie member 150 mm wide carries an eccentric load of 150 kN at an eccentricity of 5 mm in a plane bisecting the thickness. Find out the minimum value of stress induced. **4**

(d) A simply supported beam ABCD is supported at A and D. AB = BC = 1 m, CD = 2 m. It is subjected to a point load of 8 kN at B and a u.d.l. of 10 kN/m over CD. Using Macaulay's method, calculate deflection at B and slope at D. **4**

(e) A cantilever beam of span 1.8 m carries 30 kN/m u.d.l. over full length. If deflection at the free end is limited to 25 mm, determine elastic modulus of material. Take $I = 1.3 \times 10^8$ mm^4. **4**

(f) Using three moments method, find support moments and support reaction for continuous beam given in fig. Draw SFD and BMD. **4**



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

(a) A beam of span 3 m is simply supported and carries u.d.l. of w N/m. If the slope at the ends is not to exceed 1°, find the maximum deflection. **4**

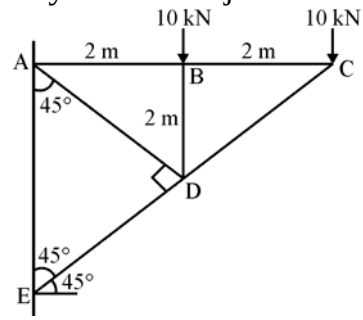
(b) A cast iron beam 40 mm wide × 80 mm deep is simply supported over a span of 1 m. It carries a central point load of 25 kN. Modulus of elasticity of member 100 kN/mm^2. Calculate maximum deflection under the load and the slopes at support. **4**

(c) A fixed beam AB of span 4 m carries a point load of 80 kN at its centre. Find fixed end moments by using the first principle and draw SF and BM diagram. **4**

(d) A uniform beam AB of span 6 m is fixed at A and B. It is loaded with u.d.l. of 4 kN/m over the entire span in addition to a concentrated load of 12 kN at 4 m from support A. Calculate the fixed end moments. **4**

(e) State any four assumptions made in the analysis of sample frame. **4**

(f) A cantilever truss is loaded as shown in fig. Find the forces in members AB, AD, DE & BC by method of joints. **4**



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

(a) Calculate the support moments MA, MB and MC in case of continuous beam simply supported at A and B & C. AB = 5 m and BC = 5 m. Loads → (i) AB carries a u.d.l. of 20 kN/m. (ii) BC carries a point load of 100 kN at centre of BC. Use three moment theorem. **4**

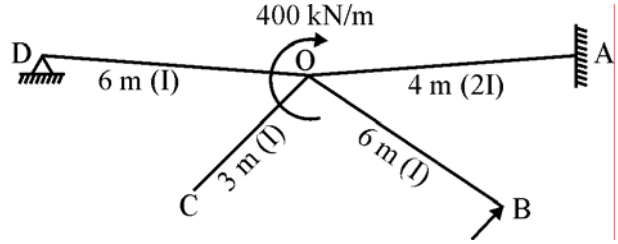
(b) What is meant by continuous beam & draw deflected shape of three span continuous beam. **4**

(c) State with diagram & expression the three moment theorem for equal and different MI giving meaning of each term used. **4**

(d) A continuous beam of ABCD is supported at A, B, C and D. AB = 5 m, BC = 8 m and CD = 4 m. Calculate the distribution factors at joints B and C. Support A is fixed end. **4**

(e) Using moment distribution method, determine the moment at fixed end of a propped cantilever of span 5 m carrying uniformly distributed load 25 kN/m over entire span. **4**

(f) Calculate the moment sheared by beams OA, OB, OC & OD carrying moment of 400 kN/m at joint O shown in fig. **4**

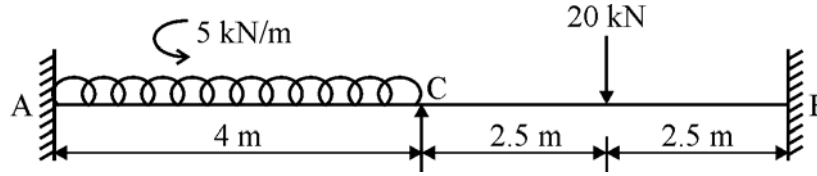


5. Attempt any TWO of the following : **16**

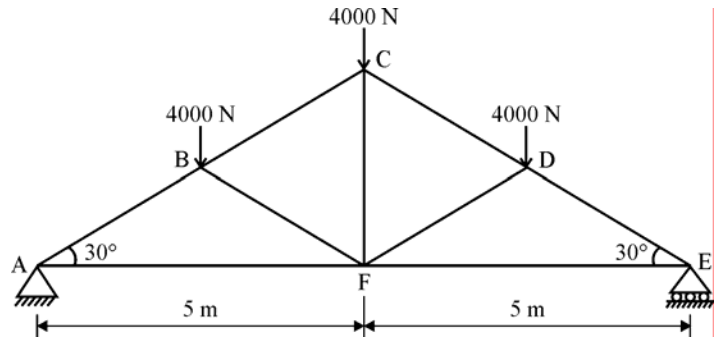
(a) A masonary wall 6 m high of solid rectangular section 3 m wide 1 m thick. A horizontal wind pressure of 960 N/m^2 acts on 3 m side, find the maximum and minimum stresses induced at base, if the density on masonary is 19.2 kN/m^3. Draw stress diagram. **8**

P.T.O.

(b) A continuous beam in supported and loaded as shown in fig. Find support moments by using moment distribution method. Also draw SFD & BMD. **8**



(c) Determine the nature and magnitude of forces in the members (AB, BC, FD & CF) of frame as shown in fig. Also find support reaction using method of joints. **8**



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

(a) A simply supported beam AB of 8 m span carry load 80 kN at Pt. C, 2 m from left hand support and A u.d.l of 25 kN/m from point load to right hand support. If $E = 2 \times 10^5$ N/mm^2 and $I = 12 \times 10^6$ mm^4. Find deflection below the load and end slopes. **8**

(b) A fixed beam AB of span 6 m carries point loads of 120 kN and 90 kN at 2 m and 4 m from left hand support. Find fixed end moments and support reactions, draw SFD & BMD. **8**

(c) A continuous beam as shown in fig. Determine reactions and support moment using three moment theorem. **8**