17422

11819

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 section. **2**

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

c) Write the value of max. slope and deflection in case of a simply supported beam loaded with udl over entire span. **2**

d) State the boundary conditions for a simply supported beam using deflected shape. **2**

e) Define fixing and fixed beam. **2**

f) Define distribution factor and carry over factor. **2**

g) Write the concept of carry over factor. **2**

h) Define with sketch : **2**

i) Deficient frame

ii) Redundant frame.

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

a) State middle third rule. **4**

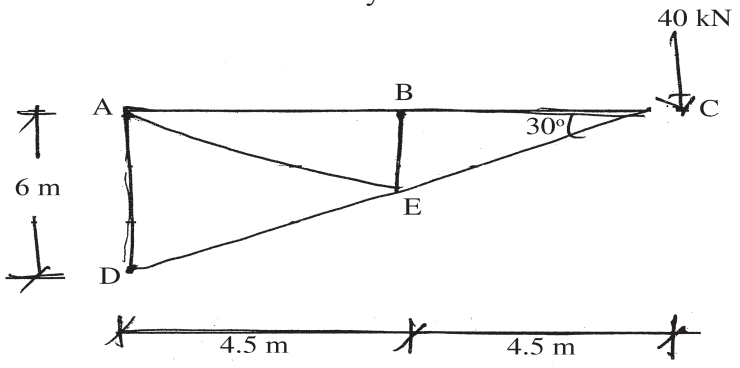
b) Sketch resultant stress distribution diagram if

i) Direct stress > bending stress

ii) Direct stress = bending stress

iii) Direct stress < bending stress. **4**

c) Using method of section only, determine nature and magnitude of axial forces in members AB and AE only. **4**



P.T.O.

Marks

2. Attempt **any four** of the following : **(4×4=16)**

a) A tie rod of rectangular section having 15 thickness it carries load of 200 kN acts at an eccentricity of 10 mm along a plane bisecting thickness. Calculate the width of section if max. tensile stress shall not exceed 100 MPa. **4**

b) A rectangular column of size 0.35 m × 0.25 m carries an eccentric load of 150 kN. The load acts at 0.15 m from e.g. of the section on axis bisecting shorter side. Determine resultant stress at the base and draw stress distribution dia. **4**

c) A hollow C.I. column of external diameter 300 mm and internal diameter 250 mm carries an axial load 'W' kN and a load of 100 kN at an eccentricity of 175 mm. Calculate minimum value of 'W' so as to avoid the tensile stresses. **4**

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

e) A beam of span 3 m is simply supported and carries udl of 'W' N/m if slope at the ends is not to exceed 1^0, find the max. deflection. **4**

f) State Clapeyron's theorem of three moments with neat sketch and give meaning of each term. **4**

3. Attempt **any four** of the following : **(4×4=16)**

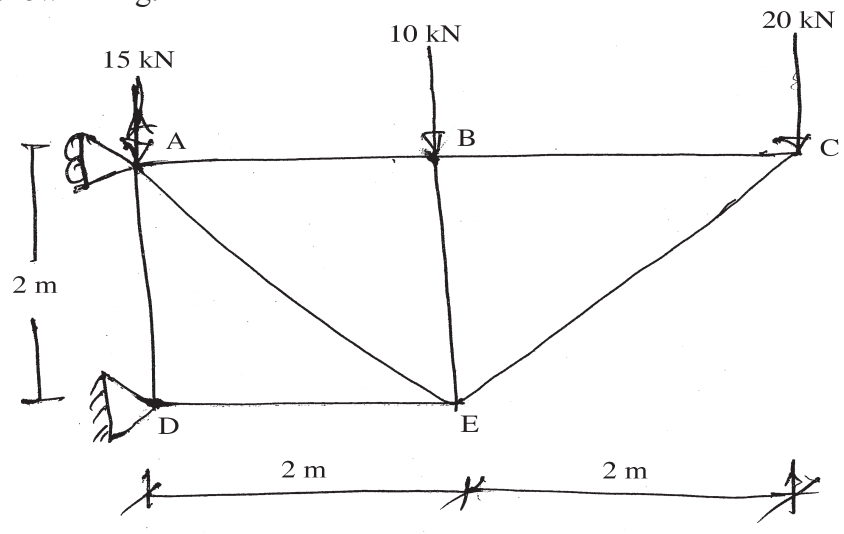
a) A cantilever beam 2 m long carrying udl of intensity 6 kN/m over full length. Calculate the depth of the beam if max. deflection is limited to 5 mm and depth to width ratio is 2. $E = 2 \times 10^5$ MPa. **4**

b) A simply supported beam carries udl of 4 kN/m over entire span of 4 m. Find deflection at midspan in terms of EI. **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 S.F. and B.M. diagrams. **4**

d) State any two advantages and disadvantages of fixed beam over simply supported beam. **4**

e) Using method of joints, find nature and magnitude of forces in AE and DE in frame shown in fig. **4**



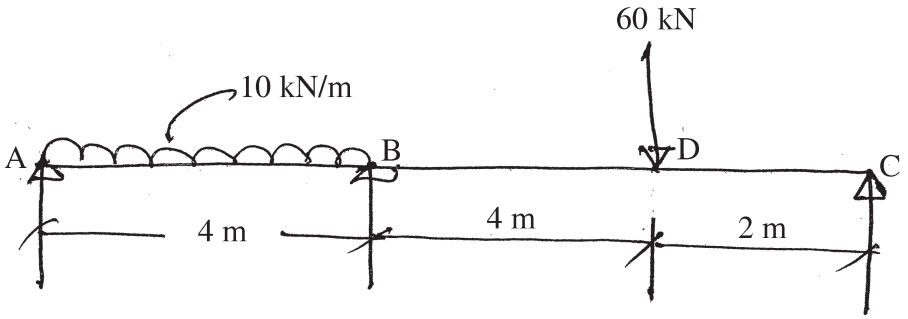
f) What is meant by analysis of frame ? Write the assumptions used for analysis. **4**

Marks

4. Attempt **any four** of the following : **(4×4=16)**

a) A beam ABC is simply supported at A, B and C. Span AB and BC are of length 4 m and 5 m respectively. AB carries a point load of 20 kN at centre. BC carries a udl of 10 kN/m over entire span. Calculate support moment at B using theorem of three moments. **4**

b) Using three moment method, find support moments for continuous beam shown in Fig. Draw B.M.D. **4**



c) A continuous beam ABC is fixed at A and simply supported at B and C. Only span BC is loaded with udl 2 kN/m, span AB = 6 m, span BC = 8 m. Draw B.M.D. for the beam. Use three moment theorem only. **4**

d) A continuous beam ABC is simply supported at A, B and C. Span AB and Span BC are of length 5 m. AB carries a udl of 30 kN/m over entire span. Calculate support moment by using moment distribution method. **4**

e) Using moment distribution method, determine the moment at fixed end of a proped cantilever of span 5 m carrying udl 25 kN/m over entire span. **4**

f) Determine distribution factors at continuity for a continuous beam ABCD which is fixed at A and supported over B, C and D. AB = BC = 4 m and CD = 5 m. Assume same M.I. for all span. **4**

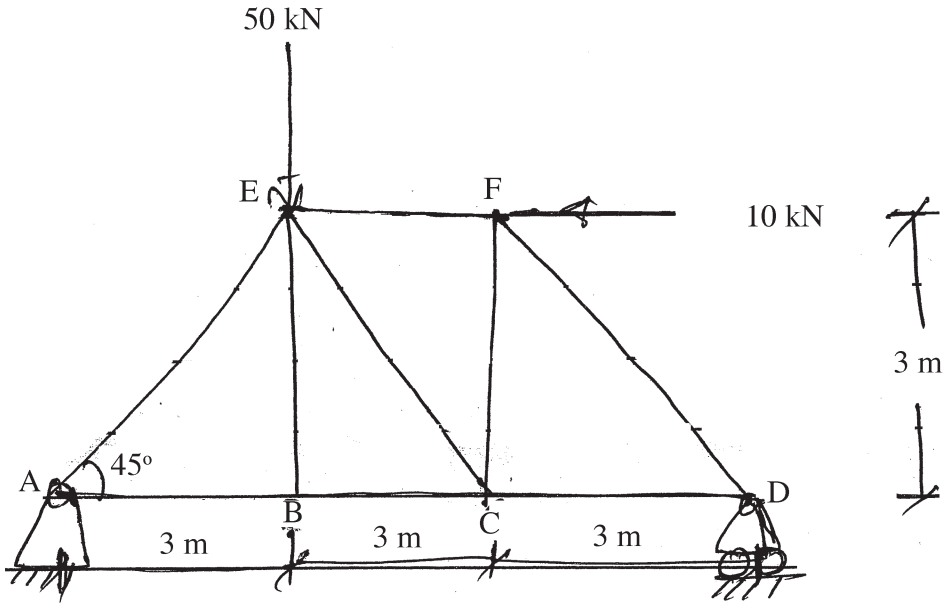
5. Attempt **any two** of the following : **(2×8=16)**

a) A masonry chimney of uniform hollow rectangular section has size 2 m × 1.4 m and has thickness 0.3 m. It is subjected to horizontal wind pressure of 1.5 KPa. Find maximum height of chimney if max. compressive stress at the base is limited to 280 kN/m^2. Also state nature of minimum stress. Take density of masonry = 22 kN/m^3. **8**

b) A continuous beam ABCD is 15 m long rests on supports A, B and C all at same level. AB = 6 m, BC = 5 m, CD = 4 m. It carries two concentrated loads 90 kN and 80 kN at 2 m and 8 m from A respectively and a udl of 30 kN/m over CD. Find support moment by using moment distribution method and draw BMD. **8**

Marks

c) Using method of section, find forces in members BC, BE, EF and EC for truss shown in Fig. State nature of forces. Tabulate result. **8**



6. Attempt **any two** of the following : **(2×8=16)**

a) A simply supported beam of span 8 m is subjected to point loads of 60 kN, 80 kN and 50 kN at 2 m, 4 m and 6 m from left support respectively. Determine slope at left support and deflection under 60 kN and 80 kN loads. $EI = 2.668 \times 10^9$ KNm^2. **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 S.F.D. and B.M.D. **8**

c) A continuous beam of uniform flexural rigidity is simply supported at A, B and C. AB = 6 m, BC = 4 m. The beam carries a central point load of 85 kN on span AB and a udl of 30 kN/m over entire span BC. Calculate support moments by using theorem of three moments. Draw S.F.D. and B.M.D. **8**