17964

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. Solve **any five**: **20**

a) Derive equation for limit of eccentricity for a circular section and draw sketch.

b) Define axial load, eccentric load.

c) A beam of span 3 m is simply supported and carries a udl 'w' per unit length. If the slope at end is not to exceed 1°, find the maximum deflection.

d) List out two advantages and two disadvantages of fixed beam.

e) A continuous beam ABC is such that AB = BC = 6 m. AB carries a point load of 40 KN at midspan and BC carries a point load of 40 KN at midspan. Calculate support moment, using Clapeyron's theorem and draw BMD.

f) Define portal frame. Enlist types of portal frame and define each of them with a sketch.

g) Draw any 4 types of trusses and state for which spans they are suitable.

2. Solve **any four**: **16**

a) A tie carries an eccentric load of 200 KN along the plane bisecting the thickness. The width of tie bar is 180 mm. The eccentricity is 10 mm. Calculate the minimum thickness of the tie bar if maximum stress is not to exceed 120 Mpa.

b) A cantilever beam of length 3 m carries a udl 2 KN/m spread over a length of 2 m from fixed end and a point load of 2 KN at free end. Calculate the deflection of free end. The c/s of beam is 120 mm wide and 240 mm deep. $E = 10^7$ KN/m^2.

c) A fixed beam of span 9 m is subjected to a point load W. Find out position of W if left hand support moment is twice that of right hand support moment.

P.T.O.

Marks

d) A continuous beam ABCD is supported at A, B and C such that AB = 4 m, BC = 3 m and overhang CD = 1 m. AB carries a point load of 40 KN at centre of AB. BC carries a udl of 20 KN/m. There is a point load of 30 KN at D. Using Clapeyron's theorem find the support moments and draw BMD.

e) A continuous beam ABCD is such that AB = 4 m, BC = 3 m and overhang CD = 1 m. AB carries a point load of 40 KN at 1 m from A. BC carries a udl of 20 KN/m. A load of 30 KN acts at D. EI is constant. Draw BMD and calculate support moments by using moment distribution method.

f) A truss of span 10 m is loaded as shown in Fig. 1. Find the reactions and forces in the members of the truss.

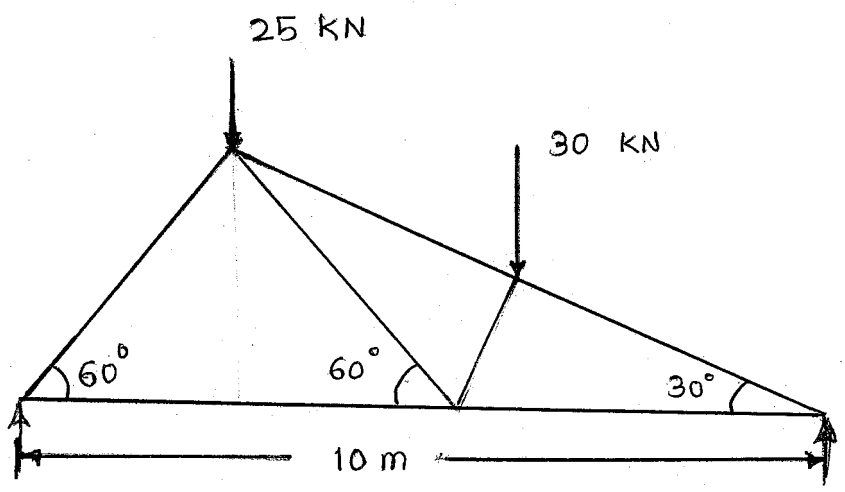

Fig. 1

3. Attempt **any two** : **16**

a) A masonry pillar 500 × 400 mm carries a point load at an eccentricity of 50 mm in a plane bisecting 400 mm side. If the maximum compressive stress is not to exceed 3 N/mm^2 find the maximum value of the load. Also calculate minimum stress and draw stress distribution diagram.

b) A beam ABC is supported at A and B such that AB = 6 m and overhang BC = 2m. It carries a udl of 20 KN/m spread over 2 m from centre towards right side and a point load of 20 KN at C. Calculate the deflection at centre and at point C by Mecauly's method.

c) A fixed beam of 8 m span carries udl of 1 KN/m and a point load of 16 KN at 3 m from left support. Calculate B.M. under the load and point of contraflexure. Also draw BMD.

Marks

4. Attempt **any two**: **16**

a) A continuous beam ABCDE is supported at B, C and D such that BC = 6 m, CD = 4 m and overhangs AB and DE, each is equal to 1.5 m. BC carries a point load of 80 KN at midspan. CD carries a udl of 30 KN/m. There is a point load of 20 KN at A and DE carries a udl of 20 KN/m. Calculate the support moments by Clapeyron's theorem and draw SFD and BMD.

b) A continuous beam ABCD is supported at A, B, C and D such that AB = CD = 6 m and BC = 8 m. AB carries a point load of 80 KN at midspan. BC carries a udl of 30 KN/m and CD carries a point load of 90 KN at 2 m from D. Calculate support moments by MDM and draw BMD.

c) Find by the method of joints the magnitude and nature of forces in all the members of the truss with loadings as shown in Fig. 2.

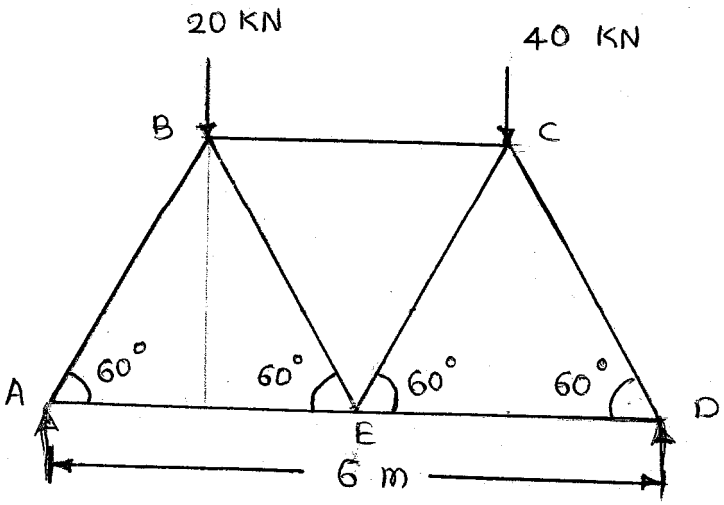

Fig. 2

5. Attempt **any two**: **16**

a) A cylindrical masonry chimney having external diameter 2 m and internal diameter 1 m is subjected to wind pressure of 150 N/m^2. The density of masonry is 20 KN/m^3. Find the safe height to which it can be constructed without causing stress (tensile) at base. The coefficient of wind resistance is 0.8. Also calculate maximum stress at the base.

b) A fixed beam of span 8 m carries loads of 60 KN, 120 KN and 80 KN at 2 m, 4 m and 6 m respectively from left support. Calculate fixed end moments and draw SFD and BMD.

c) A continuous beam ABCD is fixed at A and D, supported at B, C and AB = BC = CD = 6 m. AB carries a point load of 40 KN at centre. BC carries a point load of 30 KN at 2 m from B and CD carries a udl of 10 KN/m. Calculate support moments by MDM and draw BMD.

Marks

6. Attempt **any two** : **16**

a) A beam ABCD is supported at B and C such that BC = 4 m and overhang AB = CD = 2 m. It carries point loads of 20 KN each at A and D. Calculate deflection at free ends and at centre of span.

b) A continuous beam ABCD is fixed at A and supported at B and C such that AB = 6 m, BC = 4 m and overhang CD = 2 m. AB carries a point load of 60 KN at centre. BC carries a udl of 30 KN/m. There is a point load of 30 KN at D. $I_{AB} = 2I$ and $I_{BC} = I_{CD} = I$. Calculate support moments by Clapeyron's theorem and draw SFD and BMD.

c) Find the forces in the members of the truss shown in Fig. 3 due to loads indicated theorem.

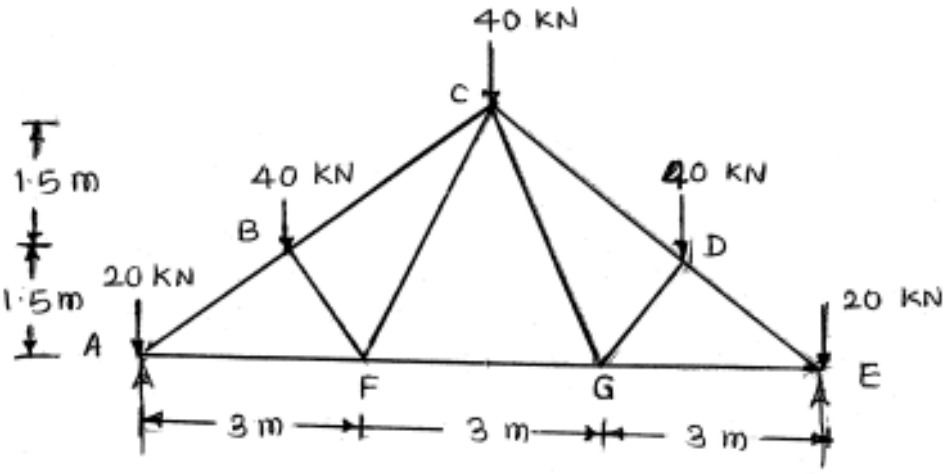

Fig. 3