17422

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4 Hours / 100 Marks Seat No. | | | | | | | | |

Instructions : *(1)* ***All*** *questions are* ***compulsory****.*
(2) Illustrate your answers with ***neat*** *sketches* ***wherever*** *necessary.*
(3) Figures to the ***right*** *indicate* ***full*** *marks.*
(4) Assume suitable data, if ***necessary****.*
(5) 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**

i) Define "Eccentric load with neat sketch.

ii) Write the values of maximum slope and deflection in case of simply supported beam with u.d.L. over the entire span interms of EI.

iii) Write the differential equation for slope and deflection and state terms used in the equation.

iv) State values of maximum slope and deflection for cantilever beam of span L carrying a point load at free end with meaning of each term.

v) State any two disadvantage of fixed beam.

vi) With sketch state the different types of portal frame.

vii) Define carry over moment and carry over factor.

viii) List out different types of roof trusses any four.

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

i) Define core of a section and state middle third rule.

ii) Draw resultant stress diagram for $60 < 6b$, $60 = 6b$, $60 > 6b$.

iii) a) State the assumptions in the analysis of frame.

b) Define redundant frame and state its condition.

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

a) A solid circular column of diameter 250 mm carries an axial load 'W' kN and a load of 200 kN at an eccentricity of 150 mm. Calculate minimum value of 'W' so as to avoid the tensile stresses at base.

b) A rectangular column 300 mm wide and 200 mm thick carries an axial load of 250 kN and a clockwise moment of 5 kN m in plane bisecting 200 mm side, calculate resultant stresses induced at the base.

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c) A masonry wall 10 m high, 3 m wide and 1.5 m thick is subjected to a wind pressure of 1.2 kN/m^2. Find maximum and minimum intensity induced on the base if the unit weight of masonry is 22 kN/m^3.

d) A wooden cantilever beam of span 2.5 m has a cross section 130 mm wide and 240 mm deep. A load of 6 kN is acting at free end, calculate the deflection and slope at free end take E = 1 × 10^5 N/mm^2.

e) A simply supported beam of span 4 m carries a central point load of 20 kN and u.d.L. of 10 kN/m over entire span. Find maximum slope and maximum deflection of the beam I_{XX} = 2 × 10^8 mm^4 E = 2 × 10^5 N/mm^2.

f) State the effect of continuity on the continuous beam. Explain with sketch.

3. Attempt **any four** of the following : **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 constant and write Macaulay's slope and deflection equation.

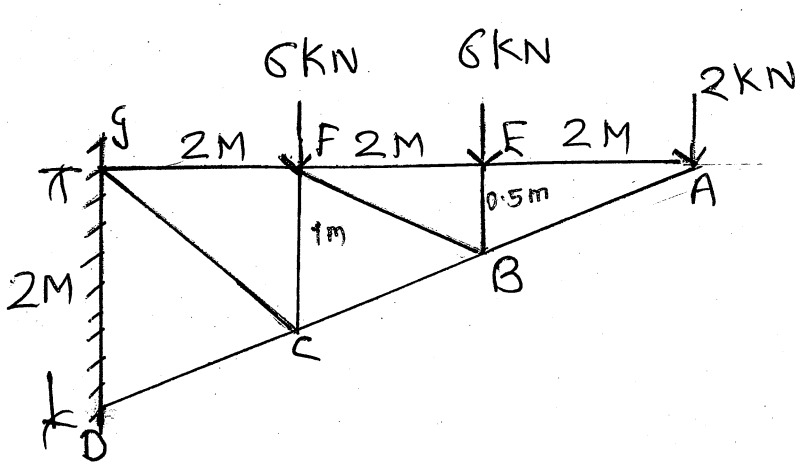
b) A simply supported beam of 6 m span carries a point load of 60 kN at 2m from left support. Calculate deflection below point load interms of EI use Macaulay's method.

c) State how net B. M. is find out for a fixed beam using super position theorem. Explain it with sketch.

d) Using first principle find fixed end moment for a fixed beam carrying point load at mid span.

e) Explain imperfect and perfect frame in detail.

f) Determine the forces along with nature in the members AB, AE, EB and EF for frame subjected to a load as shown is Fig. using method of joints.



Marks

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

a) State Clapeyron's theorem and also write the Clapeyron's three moment theorem for beam with different moment of inertial giving meaning of each term.

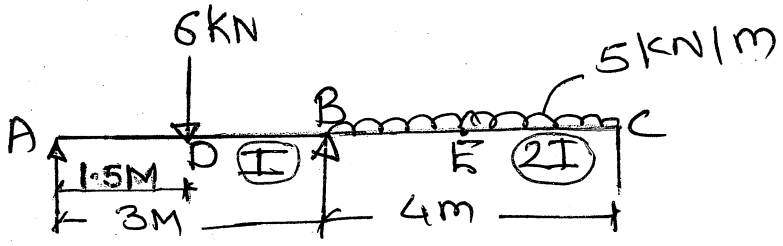
b) Explain the concept of imaginary zero span in case of Clapeyron's theorem.

c) A beam ABC is supported at A, B and C span AB and BC are of lengths 3 m and 4 m respectively. AB carries a u.d.L. of 15 kN/m over entire span and BC carries central point load of 30 kN. Calculate support moment at B using three moment theorem.

d) Define stiffness of beam and state stiffness factor for beam with far end fixed and simply supported end.

e) Determine distribution factors at continuity for a continuous beam ABCD which is fixed at A and supported at B, C and D. Take AB = 4 m, BC = 3 m and CD = 5 m if M.I. for the spans is $I_{AB} = 2I$, $I_{BC} = I$, $I_{CD} = 3I$.

f) Calculate support moments by moment distribution method for given continuous as shown in fig.



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

a) A circular chimney has external diameter 60% more than internal diameter. The height of chimney is 32 m and is subjected to a horizontal wind pressure of 1.75 kN/m^2. Find out the diameter of the chimney so as to avoid tension at the base of chimney and also draw stress distribution diagram unit wt. of chimney material is 18 kN/m^3 and C = 0.6.

b) A beam ABCD is supported at A, B and C span CD is having overhang AB = 6 m BC = 4 m and CD = 1.5 m span AB carries UDL of 15 kN/m over entire span and BC carries point load of 30 kN at 1 m from support B and a point load of 15 kN acts at free end at D. Determine support moments using moment distribution method and draw BMD.

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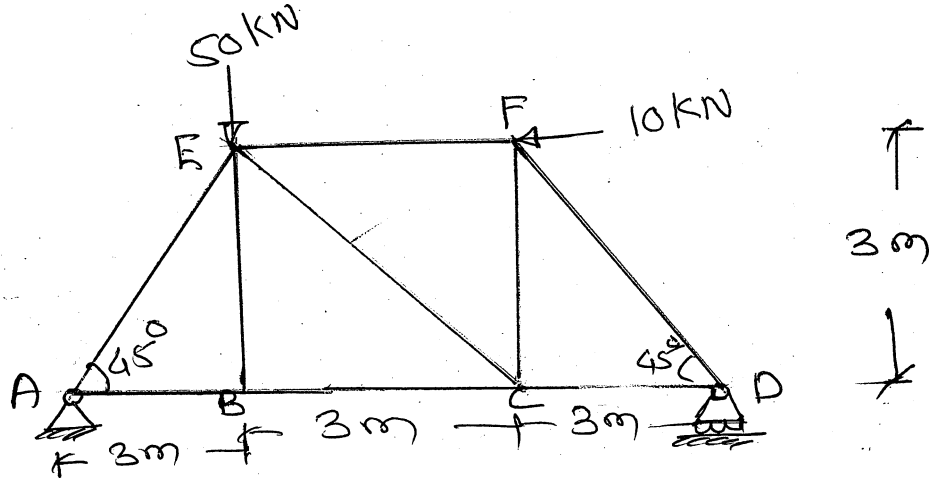
c) Using method of section find forces in members BC, BE and EF and EC for truss shown in Fig. State nature of forces tabulate results.



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

a) A simply supported beam of 6 m span carries an u.d.l. of 20 kN/m over entire beam and a point load of 60 kN at 2 m from right hand support using Macaulay's method, locate the point of maximum deflection and find its value in terms of EI.

b) A fixed beam of span 8 m carries 5 kN/m udl over entire length along with a point load of 40 kN at 2m from left hand support. Find net BM at point load and draw BMD and SFD.

c) A beam ABCD is supported at A, B and C, CD being overhang AB = 4 m, BC = 5 m and CD = 1m AB and BC carries a central point of 15 kN and 12 kN respectively and a point load of 6 kN at D. Calculate support moments using three moment theorem and draw SFD and BMD giving net BM.