CE 181402

Roll No. of candidate

3/6/24

Girijana.... ....ry University
Hatkhowapara, Azara, Ghy-17

2024

B.Tech. 4th Semester End-Term Examination

STRUCTURAL ANALYSIS – II

New Regulation (w.e.f. 2017-18) & New Syllabus (w.e.f. 2018-19)

Full Marks – 70   Time – Three hours

The figures in the margin indicate full marks
for the questions.

Answer question No. 1 and any *four* from the rest.

1.   Pick up the correct answer :   (10 × 1 = 10)

   (i)   The ratio of central deflection for the fixed beam to Simply supported beam with uniformly distributed load over the whole span is

   (a)   1/5   (b)   1/4

   (c)   1/3   (d)   1/2

   (ii) The relative stiffness of a member at a joint, whose farther end is hinged or simply supported is

   (a) $4/3 \times (I/L)$ (b) $3/4 \times (I/L)$

   (c) $1 \times (I/L)$ (d)   None of the above

   (iii) A fixed beam of length L, carrying a symmetrical triangular load, the intensity of the load varying from zero at each end to w at the center. The points of contraflexure occurs

   (a)   0.223 L from the supports

   (b)   0.223 L from the mid-point of the beam

   (c)   0.332 L from the supports

   (d)   0.332 L from the mid-point of the beam

[Turn over

(iv) Plastic analysis is a method used to determine

    (a) The maximum deflection of a structure under load

    (b) The ultimate load-carrying capacity of a structure

    (c) The elastic deformation of a structure

    (d) The distribution of moments in a structure

(v) Which method is used to analyze continuous beams and frames by considering the slope and deflection at each joint?

    (a) Slope deflection method

    (b) Moment distribution method

    (c) Cantilever method

    (d) Portal frame method

(vi) Influence line diagrams are used to represent

    (a) The distribution of internal forces within a structure

    (b) The deflection of a structure under different loads

    (c) The support reactions of a structure

    (d) The variation of a response (such as bending moment or shear force) at a specific point due to a unit load moving along the structure

(vii) The shape factor of a rectangular section is

    (a) 1.2

    (b) 1.3

    (c) 1.4

    (d) 1.5

(viii) The height of the Influence line diagram (ILD) for a moving load for the bending moment at a given section C of a beam AB of length L is

    (a) $\dfrac{L}{a(L-a)}$

    (b) $\dfrac{a(L-a)}{L}$

    (c) $\dfrac{a}{a(L-a)}$

    (d) None of the above

Where AD = a

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(ix) The sum of the distribution factor at a joint is

    (a)   0

    (b)   0.5

    (c)   1

    (d)   None of the above

(x) Pick-up the correct answer.

    (a)   The load factor is the ratio of the collapse load to working load

    (b)   The load factor is the product of factor of safety and shape factor

    (c)   The shape is the ratio of the plastic modulus to the section modulus of a section

    (d)   All the above

2. (a) A fixed beam AB of span 6 m carries a uniformly distributed load of 15 kN/m run over the left half and a concentrated load of 30 kN at a distance of 1.5 m from the right support. Calculate fixed end moments and hence draw the Bending Moment Diagram (BMD). (10)

(b) Prove that the centroidal distance of free BMD is equal to the centroidal distance of the fixed BMD from the left support. (5)

3. (a) Write the statement of the Clapeyron's theorem for the continuous beam. (3)

(b) Using Clapeyron's theorem determine the support moments of the continuous beam shown in Figure 1. Also, determine the reactions at the supports. Draw the BMD. (12)
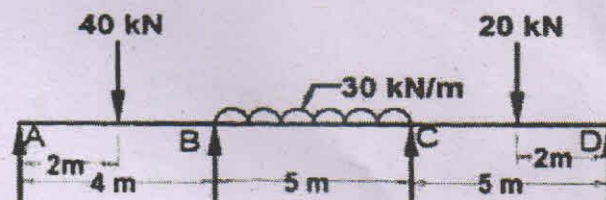

Figure 1

4. Analyse the portal frame shown in Figure 2 using moment distribution method. Draw the bending moment diagram (BMD). (15)
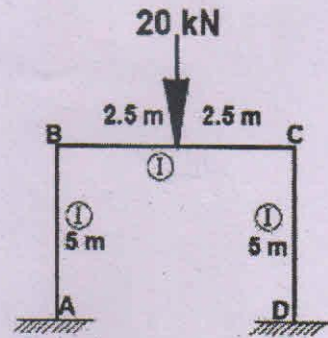

Figure 2

5. Determine the moments and the reactions at the supports of the beam shown in Figure 3. Draw also BMD and SFD for the beam. Use slope deflection methods. (15)

Figure 3

6. (a) Two-wheel loads 200 kN and 80 kN spaced 3 m apart move on the span of the girder of 20 meters. Using influence Line Diagram (ILD), find the maximum bending moment that can occur at a section 8 meters from the left end. Any wheel load can lead the other. (4)

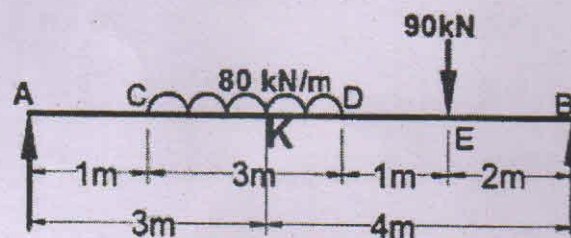   (b) Using ILD, find the shear force at the section K for the loaded girder shown in Figure 4. (4)

Figure 4

(c) Draw the influence line diagram for the forces in the members U_2U_3 and U_3L_3 of the through type bridge truss shown in Figure 5. (3 + 4)
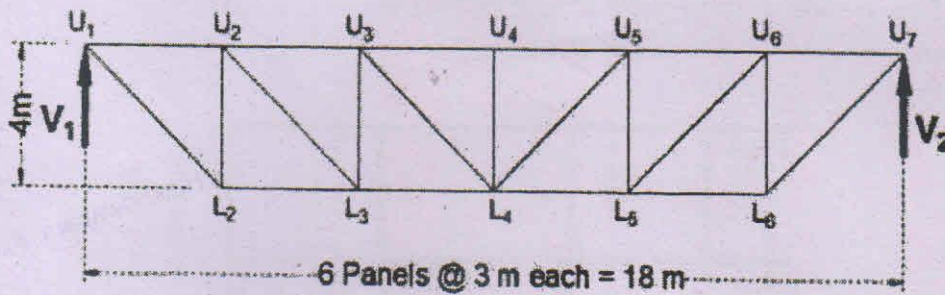

Figure 5

7. (a) Determine the shape factor of a thin hollow circular section. Consider D is the external diameter and t is the thickness of the section. (4)

(b) Calculate the shape factor of a T-section showing in Figure 6. (all dimensions are in mm). (5)
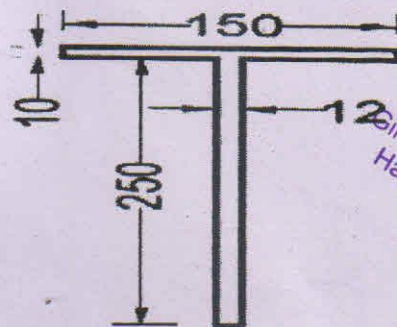
Figure 6

(c) Calculate the collapse load for the beam shown in Figure 7. Assume the section to be of constant section, the full plastic moment being M_p. Take AC = CD = DB = a. (6)
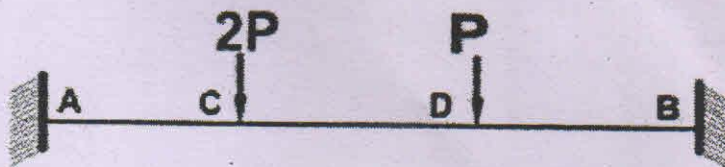

Figure 7

8. Consider the multi-storey frame subjected to lateral loads as shown in Figure 8. The frame is to be analysed using the portal method. Assume the frame is statically determinate and present your calculations and diagrams neatly. Also draw the bending moment diagram, shear force diagram, and axial thrust diagram. (15)
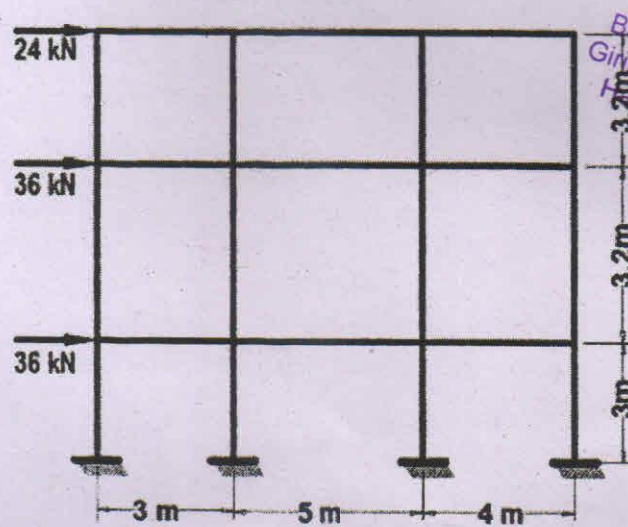
Figure 8