

FULL MARKS: 70

TIME : 3 HOURS

SUBJECT: Structural Analysis 1 (CE 401)

*Use separate answer scripts for each half. All notations and abbreviations used have their usual meanings- Assume reasonable data, if not given.*

FIRST Half

Answer Question 1 and any two from the rest

1. Answer any Three from the following

3x3=9

- (i) What is distribution factor and carry over factor?
- (ii) Explain modified stiffness factor.
- (iii) Write three moment equation mentioning the notations clearly.
- (iv) How you will get fixed end moments for support settlement?
- (v) How you will find member stiffness factor?

2. Draw the influence line diagram for shear force and bending moment at section C of the simply supported beam shown in Figure Q2. Assume AB=23m and AC=8m. Hence, find the maximum bending moment at C, if it is subjected to load as shown in the figure. Also find the absolute maximum bending moment in the beam.



Figure Q2

13

2. Draw the influence line for forces in member  $U_1U_2$  and  $U_1L_1$  of the truss as shown in Fig. Q3. Also determine the maximum forces in those two members when a load of intensity 8 kN/m and length 5m passes the span.

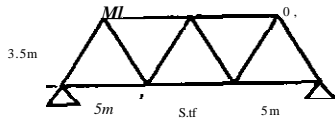


Figure Q3

13

4. A continuous beam ABCDE is subjected to load as shown in Figure Q3. The rigidities of the spans are also shown in the figure. Find the support moments and draw the bending moment diagram. Apply moment distribution method.

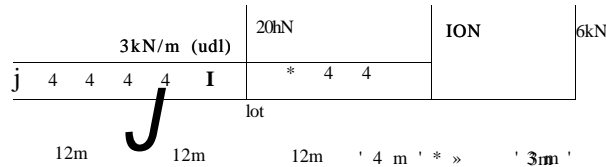


Figure Q4

13

5. Find the support moments and draw the bending moment diagram of the beam shown in Figure Q5. Apply three moment equation.

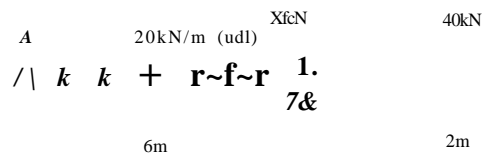


Figure Q5

13

**SECOND Half**

**Answer Question 6 and any two from the rest**

6. Answer the following (any THREE):

3x3=9

- (i) Explain superposition and reciprocal theorem.
- (ii) Explain the steps to solve statically indeterminate problems,
- (ii) What is virtual work? Explain the principle of virtual work,
- (iv) Explain the difference between bending moment diagram and influence line for bending moment at any point,
- (v) Explain MULLER Breslaue's principle.

7. (a) A propped cantilever beam of span 8 m, is subjected to a uniformly distributed load 20 kN/m. Find the reaction at the propped support and draw the bending moment diagram.

(b) A continuous beam ABC (AB=BC= 4 m) simply supported over A, B and C is subjected to a uniformly distributed load of 25 kN/m throughout its spans. Calculate support reactions and draw bending moment diagram.

6+7=13

8. (a) Explain moment area theorems.

(b) The beam ABC is simply supported on A and B. The overhang portion BC is subjected to a concentrated load of 30 kN. AB=7 m. BC=4 m. Given,  $E=200 \text{ GPa}$  and  $I=450 \times 10^6 \text{ mm}^4$ . Find the slope at B and deflection at C by moment area theorem.

5+8=13

9. Find the slope at both the supports and deflections at load point and center for the beam of figure Q9, using conjugate beam method.  $E=200 \text{ GPa}$  and  $I=250 \times 10^6 \text{ mm}^4$

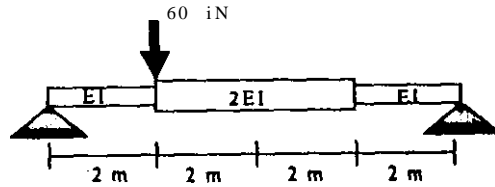


Figure Q9

13

10. Find the vertical deflection of joint E for the truss of figure Q.10. Area of truss members,  $A=300 \text{ mm}^2$  and  $E=200 \text{ GPa}$ .

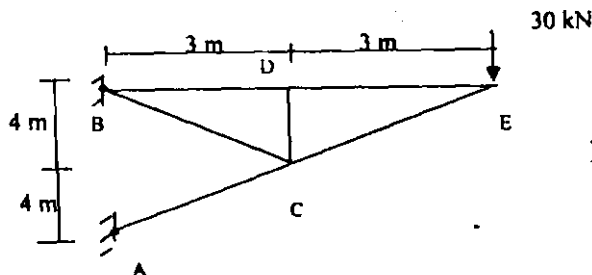


Figure Q10

13