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. **Answer any three Questions from each half.** All question carry equal marks. Two marks are kept for neatness in each half.*

FIRST Half

1. Write the governing differential equation of deflected profile of a beam subjected to transvers load. Find the deflection under the load point of the beam shown in Figure Q1 starting from the fundamental differential equation.
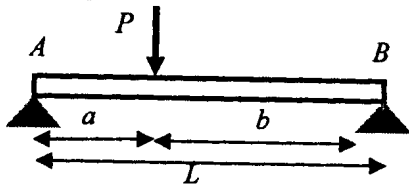

Figure Q.1

2. Find the slopes at supports and load point of the simply supported beam as shown in Figure Q.2. Also find the deflection at load point. Given $EI=20000$ kN-m^2.
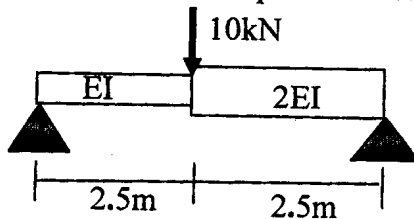

Figure Q.2

3. Find the slope at Point A and deflection at point C of the beam shown in Figure Q3 by using conjugate beam method. Assume uniform EI for the entire beam.
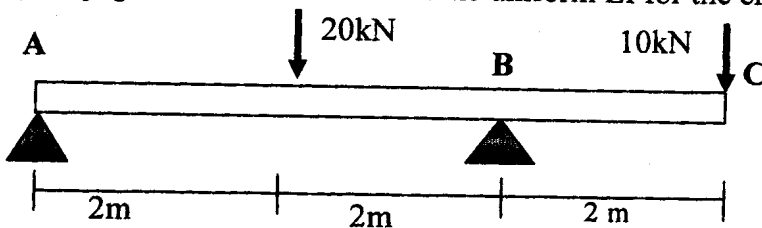

Figure Q.3

4. A propped cantilever beam is fixed at A and simply supported at B. AB=10m and overhang, BC=3m. The beam is subjected to a concentrated load of 10 kN at C. Find the reaction at B. Also find the reaction if there is an initial gap of δ at support B. Assume uniform EI.

5. Find the support moments in the continuous beam as shown in Figure Q5 by three moment equation. Moment of inertia for span AB and BC is I whereas for CD it is 2I.
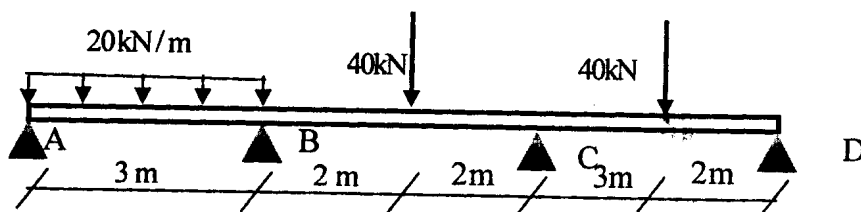

Figure Q.5

6. A continuous beam ABCD is subjected to load as shown in Figure Q.6. Find the support moments and draw the bending moment diagram. Assume uniform EI. Apply moment distribution method.
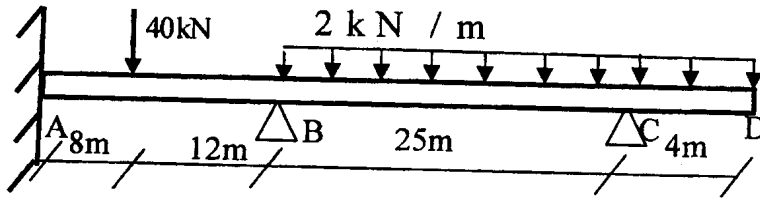

Figure Q.6

7. Draw the influence line diagram for shear force and bending moment at distance of 12m from left support of a simply supported beam of span 30 m. Hence obtain the value of maximum positive and negative shear force and maximum bending moment at the section when an udl of length 5m and intensity 25 kN/m moves across the beam. Also obtain the absolute maximum bending in the beam

8. Draw the influence line diagram for forces in member $L_1 L_2$, $U_2 L_2$ of the truss shown in Fig. Q 8. All members of the truss have equal length. Also obtain the forces in the members if an udl of 45kN/m passes through the span. Assume that the load is larger than the span.
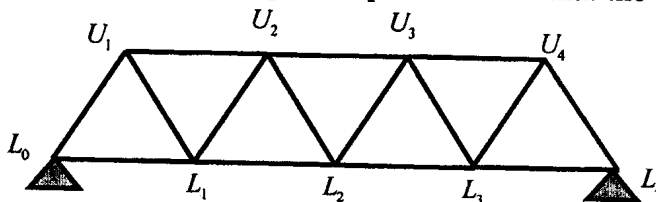

Figure Q.8

9. Find the vertical and horizontal deflection at joint B of the truss shown in Figure Q8. Assume cross section area of AB and BD are 1500 mm^2 while those of the other members are 1000 mm^2 . Take E=200 kN/mm^2.
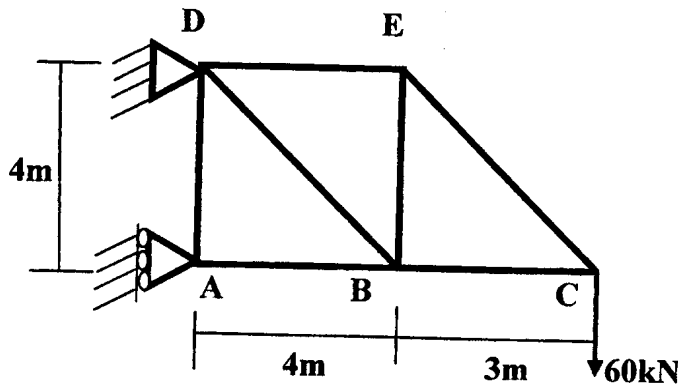

Figure Q.9

10. (a) A three hinge symmetric parabolic arch of span 60 m and rise 12 m is subjected to a concentrated load of 40 kN acting at 10m from its left support. Draw the bending moment diagram.

(b) Also draw the influence line diagram for horizontal reaction and bending moment at a section 6 m from the left support of the arch.