



## Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Analysis of Determinate Structures

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Assume any missing data suitably.*

### Module-1

- 1 Draw the Influence Line Diagram (ILD) for a simply supported beam for the below cases:
- ILD for reaction  $R_A$
  - ILD for reaction  $R_B$
  - ILD for shear force at 'C'
  - ILD for moment  $M_c$  at 'C'
- Refer Fig.Q1. Load is moving from 'A' to 'B'.



Fig.Q1

(20 Marks)

OR

- 2 Determine the maximum forces in the members  $U_2L_2$ ,  $U_3L_3$  and  $U_2U_3$  of the truss shown in Fig.Q2, when an uniformly distributed load of 60 kN/m, longer than the span, moves from left to right on top chord. Draw the influence line diagram only.

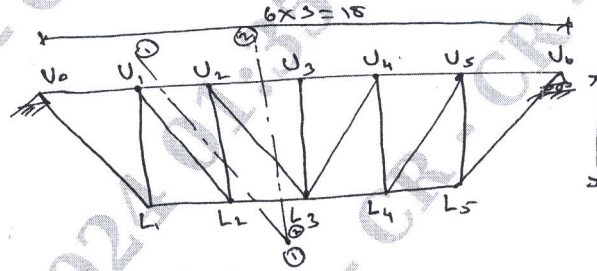


Fig.Q2

(20 Marks)

### Module-2

- 3 Simply supported beam as shown in Fig.Q3 is subjected to a set of four concentrated loads which move from left to right. Determine
- Absolute maximum shear in the beam
  - Absolute maximum moment in the beam

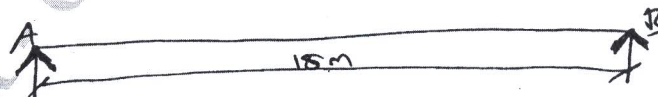
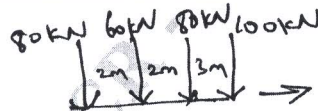


Fig.Q3

Also, draw the Influence line diagram.

(20 Marks)

OR

- 4 Determine the maximum forces in the members  $U_2U_3$ ,  $L_3U_3$  and  $L_3L_4$  of the bridge truss shown in Fig.Q4. If uniformly distributed load of 60 kN/m, longer than the span, traverse along the bottom chord members.

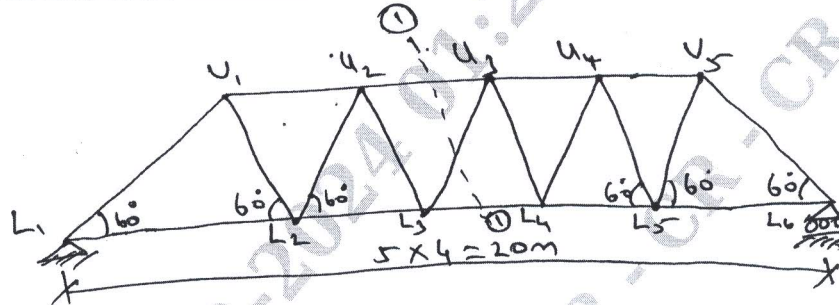


Fig.Q4

(20 Marks)

**Module-3**

- 5 Determine the slope and deflection at the free end of a cantilever beam as shown in Fig.Q5 by moment area method. Take  $EI = 4000 \text{ kN/m}^2$ .

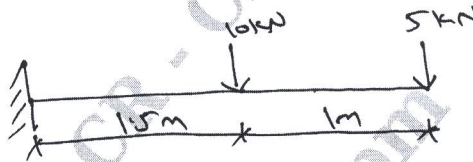


Fig.Q5

(20 Marks)

OR

- 6 Determine  $\theta_A$ ,  $\theta_B$ ,  $\theta_C$  and deflection  $\Delta_C$  in the beam shown in Fig.Q6 by conjugate beam method.

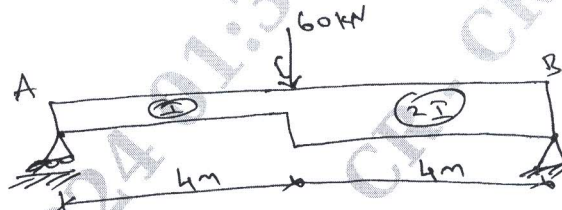


Fig.Q6

(20 Marks)

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**Module-4**

- 7 Determine the vertical deflection of point 'C' in the frame shown in Fig.Q7. Given  $E = 200 \text{ kN/mm}^2$  and  $I = 30 \times 10^6 \text{ mm}^4$  by strain energy method.

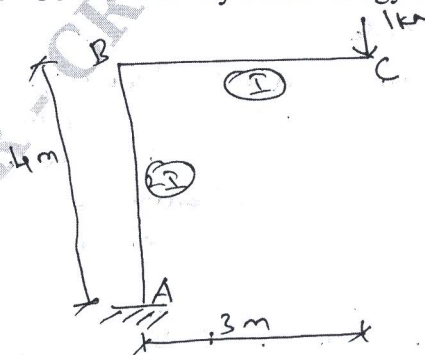


Fig.Q7

(20 Marks)



OR

- 8 A simply supported beam of span 'L' carries a concentrated load 'P' at a distance 'a' from left hand side support as shown in Fig.Q8. Using Castiglione's theorem determine the deflection under the load. Assume uniform flexural rigidity.

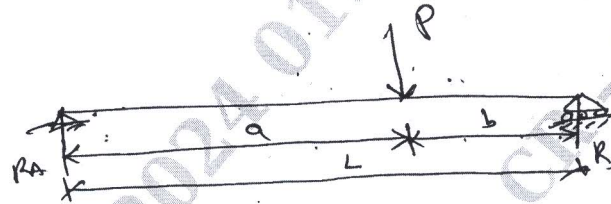


Fig.Q8

(20 Marks)

**Module-5**

- 9 A cable of span 120m and dip 10m carries a load of 6 kN/m of horizontal span. Find the maximum tension in the cable and the inclination of the cable at the support. Find the forces transmitted to the supporting pier if the cable passes over smooth pulleys on top of the pier. The anchor cable is at  $30^\circ$  to the horizontal. Determine the maximum bending for the pier if the height of the pier is 15m [Fig.Q9]

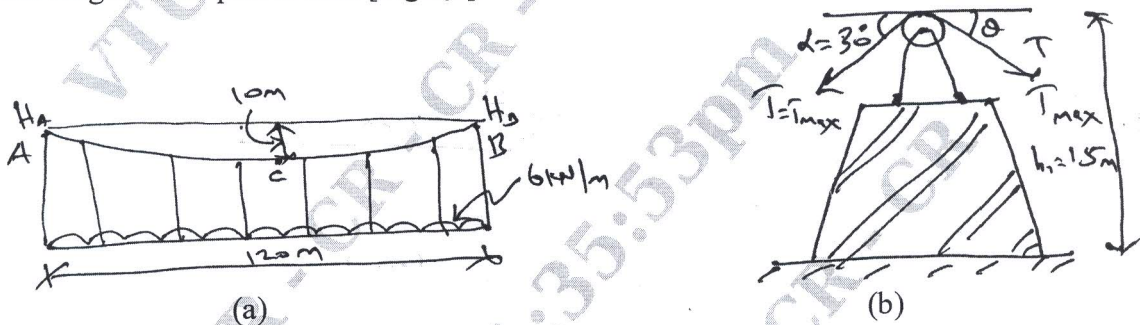


Fig.Q9

(20 Marks)

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OR

- 10 A three hinged parabolic arch hinged at the supports and at the crown has a span of 24m and a central rise of 4m. It carries a concentrated load of 50 kN at 18m from left support and uniformly distributed load of 30 kN/m over the left half portion. Determine the moment, thrust and radial shear at a section 6m from the left support. [Refer Fig.Q10]

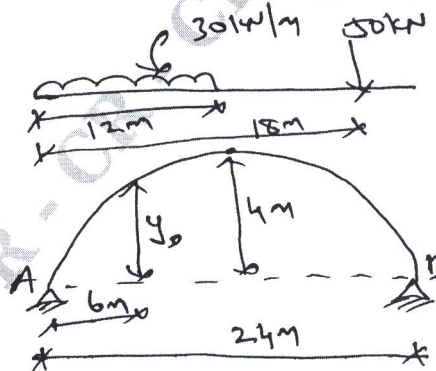


Fig.Q10

(20 Marks)

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