

Total No. of printed pages = 4

CT-401/SA/4th Sem/2016/N

## STRUCTURAL ANALYSIS

Full Marks – 70

Pass Marks – 28

Time – Three hours

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

Answer any *five* questions.

1. Determine the horizontal displacement of the roller end D of the portal frame shown in fig.1, when  $p = 5\text{kN}$  and  $EI$  is  $8000\text{ kNm}^2$  throughout. 14

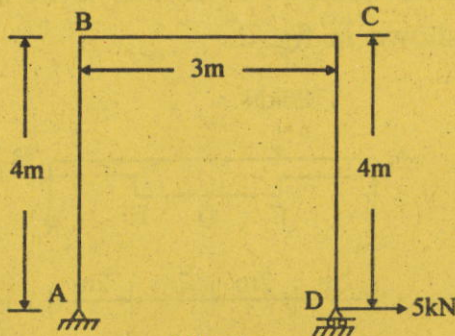


Fig.1

[Turn over

2. Define the following : 2.8×5=14

- (i) Determinate and indeterminate structure.
- (ii) Moment area theorems.
- (iii) Hooke's law.
- (iv) Strain energy.
- (v) Principle of superposition.

3. Four point loads 8,15,15 and 10 kN have centre to centre spacing of 2m between consecutive loads and they traverse a girder of 30m span from left to right with 10 kN load tending. Calculate the maximum bending moment and shear force at 8m from the left support. 14

4. (a) Describe conjugate beam theorems. 4

(b) Determine the rotations at A, B, C, E and deflections at C, D and E in the beam as shown in fig. 2. 10

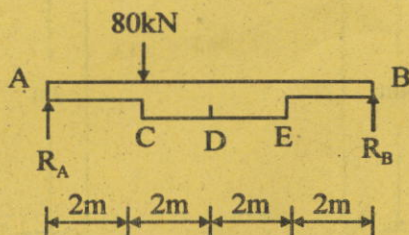


Fig. 2



5. Determine the rotation at supports and deflection at midspan and under the loads in the simply supported beam shown in fig. 3. 14

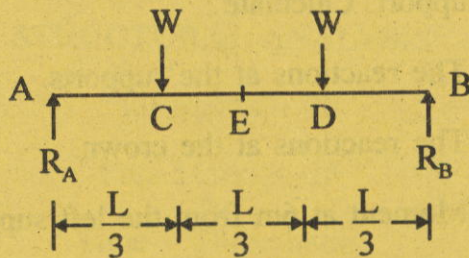


Fig. 3

6. Determine the vertical and the horizontal deflection at the free end of the bent shown in fig. 4. Assume uniform flexural rigidity throughout. 14

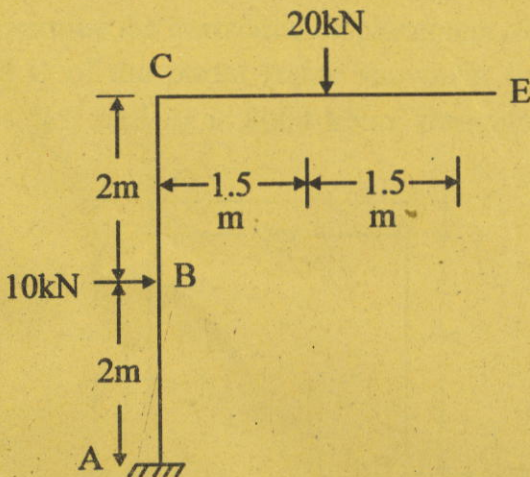


Fig. 4

7. A circular arch of span 25m with a central rise of 5m is hinged at the crown and at springing point. It carries a point load of 100 kN at 6m from the left support. Calculate : 14

- (i) The reactions at the supports.
- (ii) The reactions at the crown.
- (iii) Moment at 6m from the left support.