Total Pages—4

B.Tech - 4

SA - I

Set-1

Full Marks : 70

Time : 3 hours

Answer any **six** questions including **Q. No. 1**

The figures in the right-hand margin indicate marks

1. Explain the following very shortly : 2 × 10

(*i*) Degree of freedom

(*ii*) Static indeterminacy

(*iii*) Kinematic indeterminacy

(*iv*) Maxwell's reciprocal theorem

(*v*) Flexural rigidity

(*vi*) Direct stress and bending stress

(*vii*) Moment of inertia

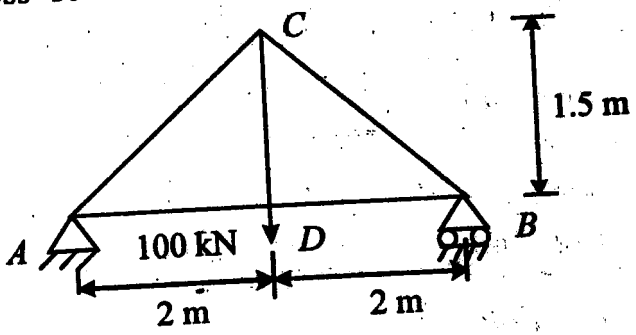
(*viii*) Section modulus

(*ix*) Castigliano's theorem

(*x*) Yield stress.

2. A simply supported beam of uniform cross -section of length 2L has an additional prop at the middle which deflects by λ times the load it can carry. If the total uniformly distributed load on the beam is W, find the reaction of the prop ? 10

3. Find the vertical deflection of joint C for the truss shown below. All members are of uniform cross -section of 800 mm^2. $E = 2{\cdot}1 \times 10^5$ N/mm^2 10



4. A beam AB 6 m long is fixed at A and simply supported at B. It carries a uniformly distributed

(*Continued*)

load of 50 kN/m in the middle third of the beam. Draw the shear force and bending moment diagrams for the beam. 10

5. A simply supported beam AB of span 12 m carries a point load of 100 kN at point C which is 4 m from end A. The moment of inertia of the beam is I in the part BC and $2I$ in the part AC. Find the slope at end B and deflection at point C. 10

$E = 2 \times 10^5$ N/mm^2 $\quad I = 100 \times 10^7$ mm^4

6. A continuous beam ACB simply supported at the two ends is 8 m long, with $AC = 3$m and $BC = 5$ m. The span AC carries a load of 50 kN/m while the span BC carries a concentrated load of 120 kN at the middle of the span. Draw the bending moment diagram. 10

7. Draw the influence line diagram for bending moment and shear force for a section of a simply supported beam at a distance X from the left end. 10

8. A suspension cable in a bridge is 120 m long and has a central dip of 12 m which is stiffened by a three hinged girder. Two point loads of 250 kN and 300 kN act on it at distance of 25m and 80 m from the left end. Find the bending moment at quarter points of the girder and tension in the cable. 10