Full Marks – 70   Time - 3 Hours
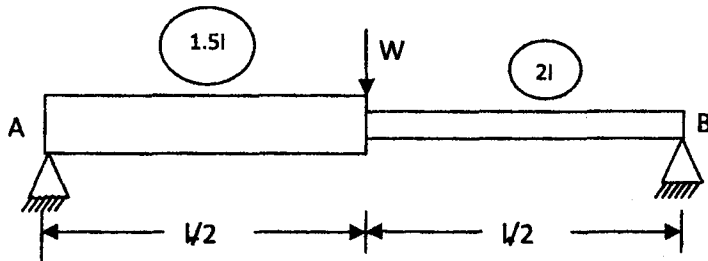
Answer any Five Questions
The Questions are of equal value
Assume any reasonable data if required. All notations have their usual meaning.

1. a) State and explain "Moment Area Theorem".
    b)

    For the above beam, find the deflection at the central point by Moment Area Method.

2. Find out an expression of Critical Load for a column of length 'L' and when one end is fixed and other end is free.

3. Derive the differentiation equation of the deflection curve of a beam, and then evaluate slopes at both ends for the beam shown as follows. Take EI = Constant.
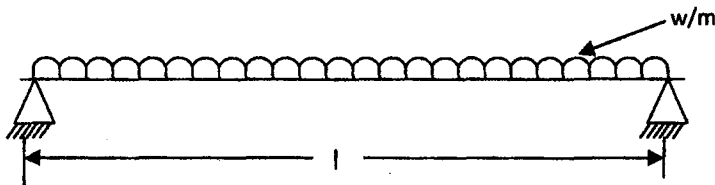

4. a) Derive the bending stress formula i.e. $\dfrac{M}{I} = \dfrac{f}{y} = \dfrac{E}{R}$. Notations used with their usual meaning.

    b) A beam having dimension of 250 mm wide and 450 mm deep is subjected to a bending moment of 20 kNm. Determine the bending stress at extreme fiber of the beam.

5. a) Derive an expression to evaluate the Shear Stress in a cross section of a beam.
    b) A beam having dimension 250 mm X 400 mm and subjected to sheer force of 400KN. Draw the Shear Stress distribution in a cross section of a beam.

6. Draw the bending moment and shear force diagram for the beam shown as follows.
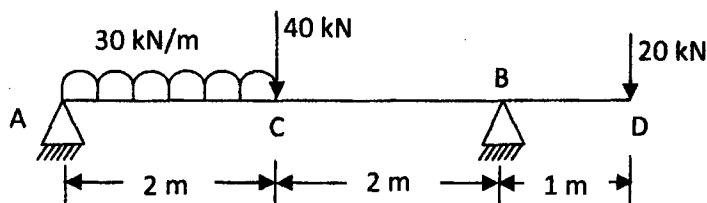
7. a) What is Composite beam? What is stress ratio in steel and wood at same level for the natural axis? Take $M = \dfrac{Es}{Ew}$.

    b) A beam is made of two wooden joists 100 mm wide and 150 mm deep is reinforced with a steel plate of 8 mm thick and 200 mm deep. Calculate moment of resistance of the beam. Given stress in steel = 140 N/mm^2 and stress in wood = 10 N/mm^2 and modular ratio of steel and wood is 15.