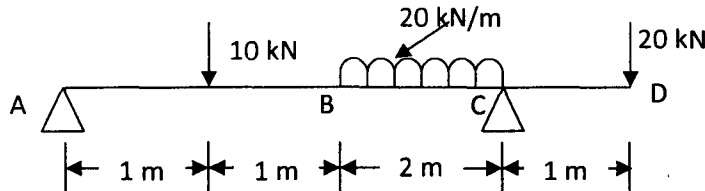


Answer any Five Questions

The Questions are of equal value

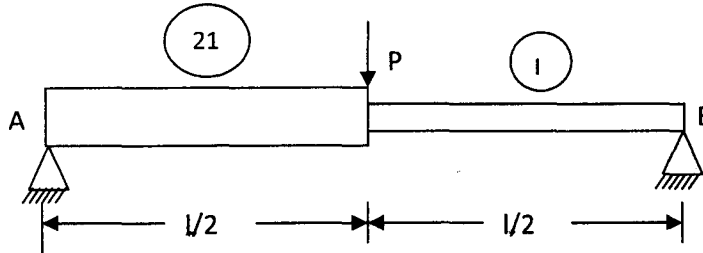
Assume any reasonable data if required. All notations have their usual meaning.

1. Draw the bending moment and shear force diagram for the beam shown as follows.



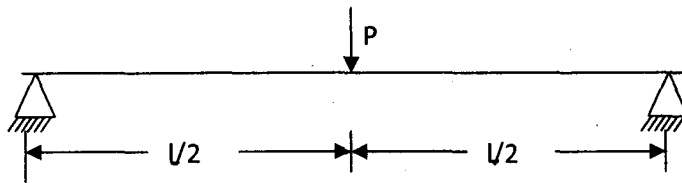
2. a) State and explain "Moment Area Theorem".

b)



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

3. Find out an expression of Critical Load for a column of length 'l' and when one end is fixed and other end is free.
4. 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  $EI = \text{Constant}$ .



5. a) What is Composite beam? What is stress ratio is steel and wood at same level for the natural axis. Take

$$M = \frac{E_s}{E_w}$$

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

6. a) Derive the flexural stress or bending stress formula i.e.  $\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$

b) A beam having dimension of 250mm wide and 450mm deep is subjected to a bending moment of 25 kNm. Determine the bending stress at extreme fiber of the beam.

7. 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 shear force of 500 KN. Draw the Shear Stress distribution in a cross section of a beam.