

B.Tech II Year I Semester (R13) Supplementary Examinations June 2016

**STRENGTH OF MATERIALS – I**

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

**PART – A**

(Compulsory Question)

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- 1 Answer the following: (10 X 02 = 20 Marks)
- How is shear strain defined?
  - Define Poisson's ratio.
  - Explain about bending moment.
  - What is shear force at free end of a cantilever beams with point load of end?
  - What are the assumptions made in deriving the bending equation?
  - Define section modulus.
  - What is meant by flexural rigidity?
  - Explain terms slope and deflection.
  - What is Kernal of a section?
  - Give example for finding slope and deflection using conjugate beam method.

**PART – B**

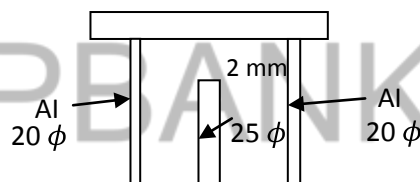
(Answer all five units, 5 X 10 = 50 Marks)

**UNIT - I**

- 2 Two aluminium bars and a brass bar support a load of 50 kN as shown in figure. Due to error in fabrication, the brass bar is 0.2 mm shorter than required. Find the stresses in the bars when a load of 50 kN is applied.

$$E_a = 70 \text{ GPa}$$

$$E_b = 105 \text{ GPa}$$

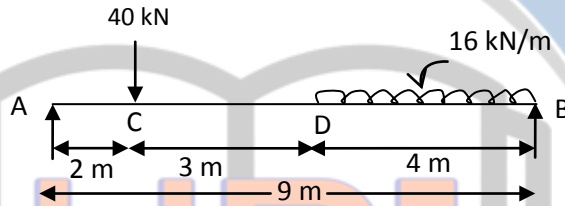
**OR**

- 3 A rectangular block  $250 \text{ mm} \times 100 \text{ mm} \times 80 \text{ mm}$  is subjected to axial load as follows: 480 kN tensile in the direction of its length, 1000 kN compressive on the  $250 \text{ mm} \times 100 \text{ mm}$  faces and 900 kN tensile on  $250 \times 80 \text{ mm}$  faces. Assuming Poisson's ratio as 0.25, find in terms of modulus of elasticity of the material  $E$  and the strain in the direction of each force. If  $E = 2 \times 10^5 \text{ N/mm}^2$ , find the values of the modulus of rigidity and bulk modulus for the material of the block. Also calculate the change in volume of the block due to loading.

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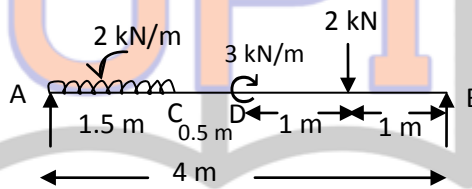
## UNIT - II

- 4 A simply supported beam of 9 m span as loaded in figure below. Draw BMD and SFD indicating principal values.



OR

- 5 A beam AB of length 4 m is acted upon by forces and moments as shown in figure below. Sketch BM and SF diagrams.



## UNIT - III

- 6 A simple beam carries a U.D.L of 15 kN/m (including self weight) over its entire span of 4 m. If the permissible stresses for timber are 12 MPa in compression, 10 MPa in tension, and 0.8 MPa in shear, design a suitable rectangular beam. Take the width of rectangular beam as one third of the depth.

OR

- 7 A beam of triangular cross section with base  $b$  and height  $h$  is used with the base horizontal. Determine the maximum shear stress and plot the variation of shear stress intensity along the section.

## UNIT - IV

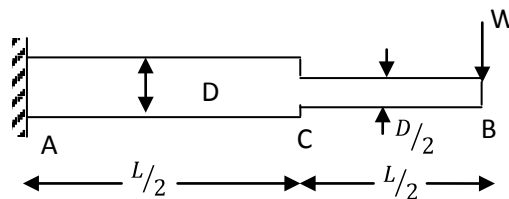
- 8 A beam simply supported at ends A and B is loaded with two point loads of 60 kN and 50 kN at distance 1 m and 3 m respectively from end A. Determine the position and magnitude of deflection. Take  $E = 2 \times 10^5 \text{ N/mm}^2$  and  $I = 8500 \text{ cm}^4$ .

OR

- 9 A S.S beam carries a UDL of 20 kN/m over its span of 8 m. Determine the slope at the ends and the deflection at mid span by moment area method if  $E = 200 \text{ GN/m}^2$  and  $I = 30,000 \text{ cm}^4$ .

## UNIT - V

- 10 A cantilever of length  $L$  carries a point load  $W$  at its free end. The member is circular in section having diameter  $D$  for a distance  $L/2$  from the fixed end and a diameter  $D/2$  for the remaining length. Find the slope and deflection at point C and B by conjugate beam method.



OR

- 11 A square chimney 30 m high has a flue opening of size  $1.5 \text{ m} \times 1.5 \text{ m}$ . Find the minimum width required at the base for no tension if the masonry weighs  $20 \text{ kN/m}^2$  and the wind pressure is  $1.5 \text{ kN/m}^2$ . Permissible stress in the masonry is  $1 \text{ N/mm}^2$ .

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