

Total No. of Questions - [8]

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G.R. No.

Paper Code - U218-154CBE-FS

MAY 2019 / END SEMESTER

S. Y. B. TECH. (MECHANICAL) (SEMESTER - I)

COURSE NAME: STRENGTH OF MATERIALS

COURSE CODE: MEUA21174

(PATTERN 2017)

Time: [2 Hours]

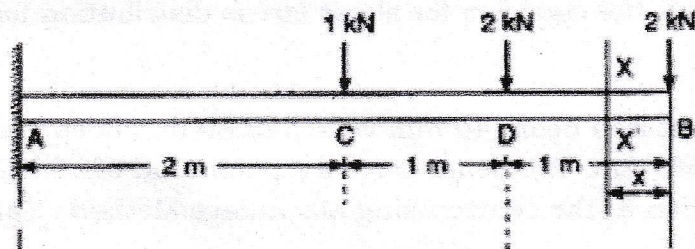
[Max. Marks: 50]

(*) Instructions to candidates:

- 1) Answer Q.1, Q.2, Q.3, Q.4, Q.5 OR Q.6, Q.7 OR Q.8
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculator is allowed
- 4) Use suitable data where ever required

Q.1) a) Draw the shear force and bending moment diagram.

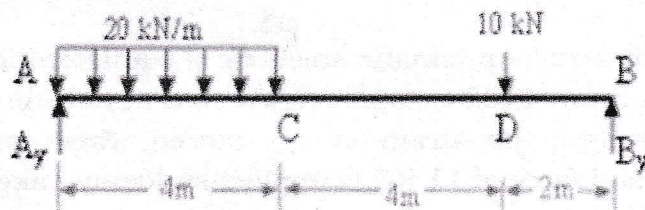
[6 Marks]



OR

b) Draw the shear force and bending moment diagram.

[6 Marks]



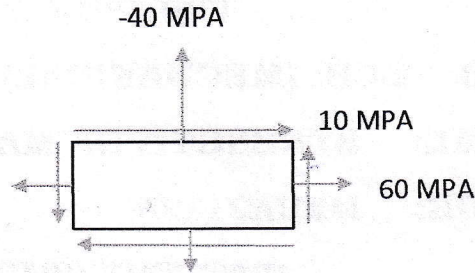
Q.2) a) The ultimate stress for a hollow steel column which carries an axial load of 1.9 MN is 480 N/mm^2 . If the external diameter of the column is 200mm. Determine the internal diameter. Take factor of safety as 4.

[6 marks]

OR

- b) What is thermal stress? Derive the equations for Thermal strain, Actual expansion and actual stress. [6 marks]

- Q.3) a) Determine Normal stresses and maximum shear stress using graphical Method



[6 marks]

OR

- b) List the different theories of Failure. Explain graphical method for member subjected to normal stresses in two mutually Perpendicular directions. [6 marks]

- Q.4) a) The simply supported beam rectangular cross section having depth is two times the width. . It carries a UDL of 5 kN/m and permissible stress is 15 N/mm². Determine the beam dimensions. [4 marks]

OR

- b) Derive the equation for shear stress distribution for a beam having I type section. [4 marks]

- Q.5) a) A cast iron beam 40 mm wide and 80 mm deep is simply supported on a span of 1.2m. The beam carries a point load of 15 kN at the centre. Find the deflection at the centre using Macaulays Method . Take $E = 108000 \text{ N/mm}^2$ [6 marks]

- b) Cantilever of span L carries a UDL of W over its entire length. Determine maximum slope and deflection. [4 marks]

- c) Explain the details of Macaulays Method to determine the slope [4 marks]

OR

- Q.6) a) A solid vertical prismatic steel bar of equilateral triangular section of side 30mm is firmly fixed at top. A rigid collar at a distance of 800mm from the top. Calculate the strain energy stored when pull of 15 kN applied is gradual and force of 11 kN is applied suddenly Take of $E = 2.0 \times 10^5 \text{ N/mm}^2$. [6 marks]

- b) Derive the differential equation for the deflection with neat sketch [4 marks]

- c) A simply supported beam is subjected to a point load w at the mid length. Determine maximum slope and deflection [4 marks]

- Q.7) a) A solid shaft of 180 mm diameter has the same cross section area as that of the hollow shaft of the same material of inside diameter 110 mm. Find the ratio of power transmitted by the two shafts of with considering the same angular twist. Also compare the angle of twist in equal length of these shafts when stressed equal. [6 marks]
- b) Derive the torsion equation for hollow with neat sketch. [4 marks]
- c) A solid circular shaft 3m long transmits 300 KW at a speed of 100 rpm. If the allowable shear stress is 80 MPa, find the diameter of shaft. What percentage saving in weight would be observed if this shaft is replaced by hollow shaft whose internal diameter is equal to 0.6 of external diameter. The length is being same. [4 marks]
- OR
- Q.8) a) Determine the crippling load when the given strut is used with 1) One end fixed and other end free 2) Both end fixed and 3) one end fixed and other is hinged [6 marks]
- b) A solid circular bar 5 m long and 4 cm in diameter is found to extend under the tensile load of 48 kN. The bar is used as a strut with both end hinged. Determine the buckling load for the bar and also the safe load taking Factor of safety as 3 [4 Marks]
- c) Derive the equation of buckling of column fixed at both ends [4 marks]
- c) A simply supported beam is subjected to a point load w at the mid length. Determine maximum slope and deflection [4 marks]