Total No. of Questions – [08] Total No. of Printed Pages- 03

G.R. No.	

U218- 154 (ESE)

DECEMBER 2018/ENDSEM

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

COURSE NAME: STRENGTH OF MATERIALS

COURSE CODE: MEUA21174

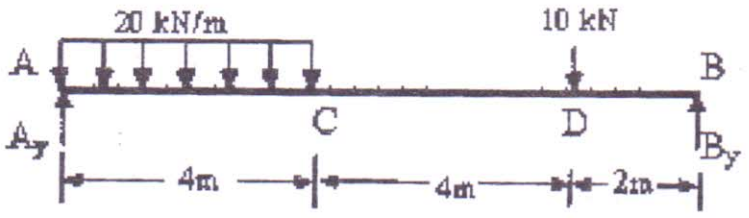
(PATTERN 2017)

Time: [**2 Hours**] [Max. Marks: **50**]

(*) Instructions to candidates:

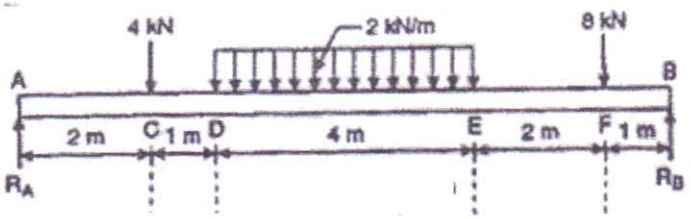
1) **Answer Q.1, Q.2, Q.3, Q.4, Q.5 OR Q.6, Q.7 OR Q.8**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data where ever required**

Q.1) a) Draw the shear force and bending moment diagram and determine maximum bending moment. [6 Marks]



OR

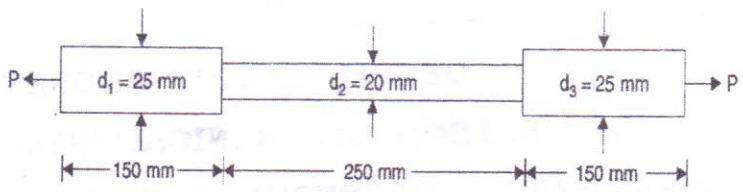
b) Comment on shear force and bending moment variation across the entire length of the beam. [6 marks]



Q.2) a) Determine the changes in length, breadth, and thickness of a steel bar which is 4m long, 30mm wide and 20mm thick and is subjected to a axial Pull of 30 kN in the direction of its length. Take E = $2x10^5$ N/mm² and Poisson's ratio =0.3 [6 marks]

OR

b) The following bar is tested in material testing laboratory using universal testing machine. It is found that at a load of 40kN the total extension of bar is 0.280 mm. Determine Young's modulus of the material. [6 marks]



Q.3) a) List the different theories of failure with its application. Explain the graphical method for member subjected to normal stresses in two mutually perpendicular directions [6 marks]

OR

b) Explain the mathematical equations for Rankine theory, maximum shear stress theory and St.Venants theory. [6 marks]

Q.4) a) The cantilever beam has rectangular cross section of 50mm width and 150mm height and is 3m long. It is loaded by an end force of 10kN. Find the maximum deflection of the beam and the maximum shear stress. [4 marks]

OR

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

Q. 5) a) A tensile load of 60kN is gradually applied to a circular bar of 4cm diameter and 5m long. If the value of E= 2.0x 10^5N/mm^2, determine (1) stretch in rod (2) Stress in rod (3) Strain energy absorbed by the rod. [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 boundary conditions used in determination of slope and deflection of beams. [4 marks]

OR

Q.6) a) Calculate instantaneous stress produced in a bar 10 cm^2 in area and 3m long by the sudden application of tensile load of unknown magnitude, if the extension of the bar due to suddenly applied load is 1.5 mm. Also determine the suddenly applied load. Take of E= 2.0x 10^5N/mm^2. [6 marks]

b) A simply supported beam is subjected to a uniform distributed load 'w' over its entire length. Determine maximum slope and deflection [4 marks]

c) Explain in details of Macaulay's Method. [4 marks]

Q.7) a) What are the assumptions made in theory of torsion. Compare the weights of equal length of hallow and solid shaft having same external diameter to resist the same torsion moment for the same maximum shear stress. Assume internal diameter as 0.8 times the external diameter of the hallow shaft. [6 marks]

b) Derive the equation for buckling load of column fixed at both ends. [4 marks]

c) A solid circular bar 5 m long and 4 cm in diameter is found to extend by 4.5mm under the tensile load of 48kN. The bar is used as a column with both end hinged. Determine the buckling load for the bar and also the safe load taking Factor of safety as 3. [4 marks]

OR

Q.8) a) Determine the crippling load when the given column is used as one end fixed and other is hinged [6 marks]

b) A solid shaft in a rolling mill transmits 20 kW at 2 Hz. Determine the diameter of the shaft is the shear stress is not to exceed 40 MPa and the angle of twist is limited to 6^0 in a length of 3m take G=85 GPa [4 marks]

c) Derive the torsion equation with neat sketch. [4 marks]

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