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

G.R. No.	

Paper code – U219-154 (BE-F&T

DECEMBER 2019/ENDSEM – Backlog Exam

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

COURSE NAME: STRENGTH OF MATERIALS

COURSE CODE: MEUA21174

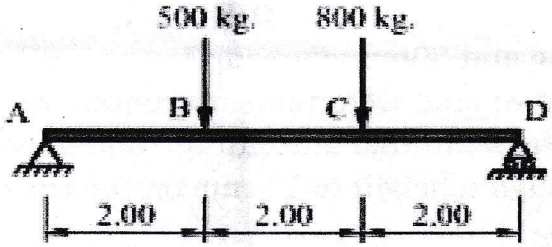
(PATTERN 2017)

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

(*) Instructions to candidates:

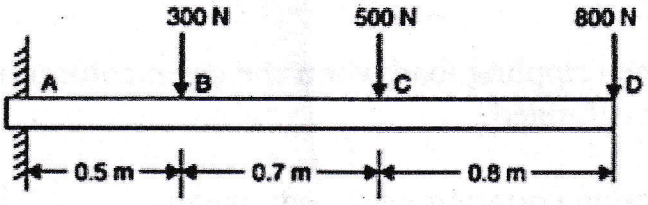
1) **Answer Q.1, Q.2, Q.3, Q.4, Q.5 OR Q.6, Q.7 OR Q.8**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data where ever required**

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) Derive the expression for volumetric strain in Rectangular bar and in Circular Bar. [6 marks]

OR

b) Explain the phenomenon of shear strain. What are the relation between Modulus of elasticity, Bulk Modulus and Modulus of rigidity? [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 Mohr Circle with suitable example [6 marks]

Q.4) a) The cross section of the beam is rectangular 60mm × 80mm deep. The maximum shear stress in section is 45 MPa. Calculate shear stress at a section 40mm above NA and 20mm above NA. [4 marks]

OR

b) Prove that for a triangular section, the maximum shear stress is 3/2 times the average shear stress. [4 marks]

Q. 5) a) A tensile load of 80kN is gradually applied to a circular bar of 4cm diameter and 2.5m long. If the value of E= 105GPa, determine maximum instantaneous stress for (1)Gradual (2) suddenly applied load. [6 marks]

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

c) Write the equations of elastic curves for deflection, slope, Bending moment, Shear force and Rate of loading [4 marks]

OR

Q.6) a) A bar of 5m long and 50mm diameter hangs vertically and it has a collar attached to it to lower end. Determine maximum stress induced when 1) Weight of 3000 N falls through a height of 100mm on the collar. 2) A weight of 30000 N falls through a height of 10 mm on the collar. ($E= 2.0 \times 10^5$KPa.) [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) Determine the crippling load when the given column is used as one end fixed and other is hinged [6 marks]

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

c) A solid circular bar 25 m long and 120mm in diameter is found to extend by 1.2 mm under the tensile load of 52kN. Determine the buckling load for the bar and also the safe load taking Factor of safety as 3 for the following condition 1] Both end fixed, 2} one end fixed and other free. [4 marks]

OR

Q.8) 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) 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 equation for buckling load of column fixed at both ends. [4 marks]

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