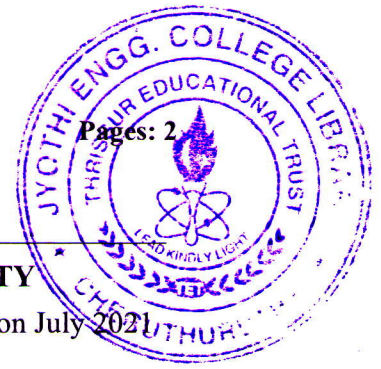


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth Semester B.Tech Degree Regular and Supplementary Examination July 2021



Course Code: MR306

Course Name: MECHANICS OF SOLIDS

Max. Marks: 100

Duration: 3 Hours

PART A

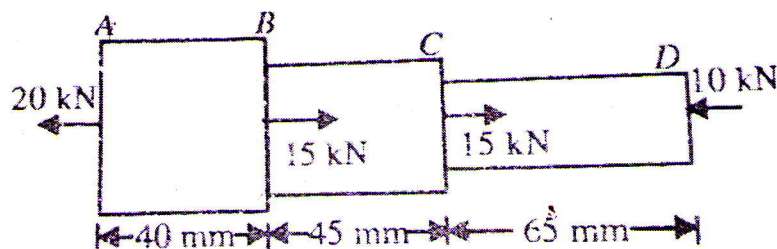
Answer all questions, each carries 5 marks.

- 1 Write the relation between elastic constants. (5)
- 2 Explain tensile and compressive stresses. (5)
- 3 Explain Hooke's law. What is modulus of elasticity? (5)
- 4 Define bending stresses. What is the value of bending stress on the neutral axis? (5)
- 5 What is torsional rigidity? (5)
- 6 What is buckling factor? (5)
- 7 What are the major limitations of Euler's theory for columns? (5)
- 8 What is point of inflection in a beam? (5)

PART B

Answer any three questions, each carries 10 marks.

- 9 A stepped circular bar 150mm long and having 3 portions: AB =40mm long and 20mm diameter, BC=45mm long and 15mm diameter and CD=65mm long and 10mm diameter is subjected to axial forces as shown. Determine the change in its length. Given $E=200\text{GN-mm}^2$ (10)



- 10 Determine the value of Young's modulus and Poisson's ratio of a metallic bar of length 30cm, breadth 4cm and depth 4cm when the bar is subjected to an axial compressive load of 400kN. The decrease in length is given as 0.075cm and increase in breadth is 0.003cm. (10)

- 11 A circular pipe of external diameter 70mm and thickness 8mm is used as a simply supported beam over an effective span 2.5m. Find the maximum concentrated load that can be applied at the centre of the span if the permissible stress in the tube is 150N/mm^2 . (10)
- 12 Compare the weights of equal lengths of a solid and a hollow shaft to transmit a given torque for the same maximum stress if the inside diameter of the shaft is three fourth of the outside. (10)
- 13 A rectangular beam 200mm deep and 300mm wide is simply supported over a span of 8m. What uniformly distributed load per metre the beam may carry, if the bending stress is not to exceed 120N/mm^2 (10)

PART C

Answer any two questions, each carries 15 marks.

- 14 A simply supported beam of 8m length carries three point loads of 8kN, 4kN and 10kN at 2m, 5m and 6m respectively from the left end. Draw the shear force and bending moment diagrams (15)
- 15 A close-coiled helical spring carries a load of 400N. Its mean coil diameter is 10 times the wire diameter. Determine these diameters if the maximum value of shear stress in the spring is not to exceed 75MPa. (15)
- 16 Determine the shortest length for a pin-jointed steel column of cross-section 75mm x 48mm using Euler's formula. Take critical stress value as 220 MPa and $E=205\text{ GPa}$ (15)
- 17 A column of timber section 15cm x 20cm is 6m long both ends being fixed. if the Young's modulus for timber = 17.5 kN/mm^2 ; determine Crippling load and Safe load for column if factor of safety =3 (15)
