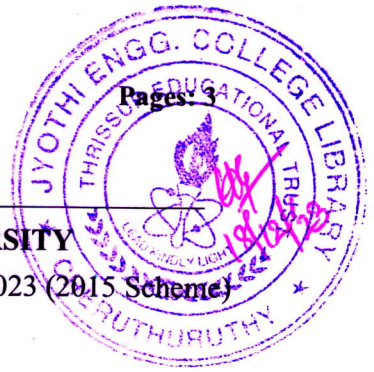


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Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S3 (S, FE) / S1 (PT) (S, FE) Examination December 2023 (2015 Scheme)

Course Code: ME201

Course Name: MECHANICS OF SOLIDS (ME, MP, MA, MT, AU, PE, SF)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any three full questions, each carries 10 marks

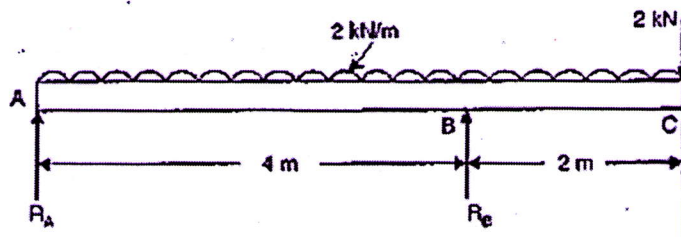
Marks

- 1 A circular bar of length 1000mm and diameter 30mm is drilled with a bore for a length of 400mm from the right side at the centre of the bar. The diameter of the hole drilled is 10mm. Prepare a sketch. If an axial tensile load of 30kN is applied, how much is the extension of the bar ($E = 2 \times 10^5 \text{ N/mm}^2$)? 10
- 2 a) Write the generalized Hook's law for a material that is anisotropic. 5
b) Calculate the thermal stresses in a bar having a coefficient of thermal expansion $\alpha = 12 \times 10^{-6}/^\circ\text{C}$ when the temperature is increased to 70°C . The bar has Young's modulus of $200 \times 10^9 \text{ N/m}^2$ and it is prevented from expansion. 5
- 3 Write stress and strain matrix for a 3D state of stress. Explain all terms in the stress matrix with a suitable sketch. 10
- 4 a) Calculate the torque (T) in the shaft while transmitting 2.5kW power at 1200rpm. 2
b) State the assumptions and derive the equation for shear stress developed on a circular shaft subjected to torsion. 8

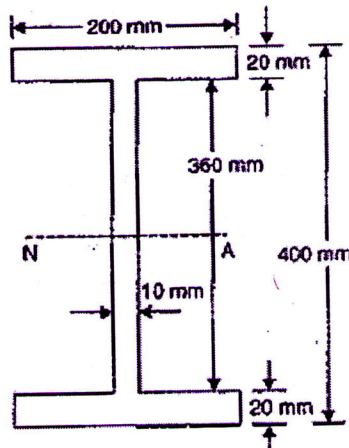
PART B

Answer any three full questions, each carries 10marks

- 5 Draw the shear force and bending moment diagrams for a simply supported beam having a span of 6m and with an overhang of 2m. 10



- 6 Obtain the relation between load, shear force and bending moment for the case of a beam element carrying a load of 'w/metre'. 10
- 7 Find the maximum bending stress for an 'I' section beam of length 10m, carrying a uniform load of 40kN/m. 10

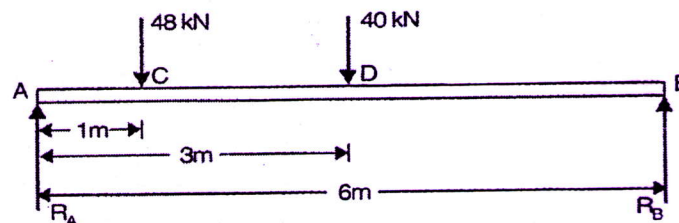


- 8 State the assumptions and derive the flexural formula for pure bending of beams. 10

PART C

Answer any four full questions, each carries 10marks.

- 9 Obtain the maximum deflection for the beam shown below 10



- 10 For a cantilever beam carrying a uniformly distributed load of w/m, find the slope and deflection at the free end using moment area method 10
- 11 The stresses at a point bar are 200 N/mm² tensile and 100 N/mm² compressive. Determine the resultant stress on a plane inclined at 60° with the axis of the major stress. Also, find the magnitude of the maximum shear stress. 10
- 12 For the plane stress condition characterized by $\sigma_{xx} = 75\text{N/mm}^2$, $\sigma_{yy} = 52.5\text{N/mm}^2$, and $\tau_{xy} = 60\text{N/mm}^2$, determine principal stresses and maximum shear stress using the method of Mohr's circle. Also, determine the inclination of the plane on which maximum principal stress act. 10

- 13 The maximum allowable shear stress in a hollow shaft of external diameter 10 equal to twice the internal diameter is 80N/mm^2 . Determine the diameter of the shaft if it is subjected to a twisting moment of 4×10^6 N-mm and a bending moment of 3×10^6 N-mm.
- 14 A 3.2 m long column fixed at both ends has internal and external diameters 10 60mm and 80mm respectively. Determine Rankine's crippling load if crushing stress is 500MPa and Rankine's constant = $1/1600$
