Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S3 (S, FE) (FT/WP/S1PT) Examinations May/June 2026 (2019 Scheme)

Course Code: CET201

Course Name: MECHANICS OF SOLIDS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions. Each question carries 3 marks Marks

1	State the principle of superposition	3
2	Define the terms: Longitudinal strain, Linear strain and Poisson's ratio	3
3	Show that the volumetric strain of a cube subjected to normal stress is equal to 3 times the linear strain.	3
4	For a given material, the Bulk modulus and Young's modulus are same and equal to 175GPa. Find its shear modulus.	3
5	State the types of stress acting in a thin cylinder subjected to internal pressure.	3
6	Define a) Point of contraflexure b) Moment of resistance	3
7	Show that for a rectangular section the maximum shear stress is 1.5 times the average stress.	3
8	Calculate the total strain energy due to bending in cantilever beam of span L carrying a point load W at the free end.	3
9	Explain principal planes and principal stresses	3
10	State the limitations of Euler's formula.	3

PART B

Answer any one full question from each module. Each question carries 14 marks

Module 1

11	A bar is subjected to point forces as shown in Figure 1. Calculate the elongation of the bar using method of sections. Take E= 200GPa.	14

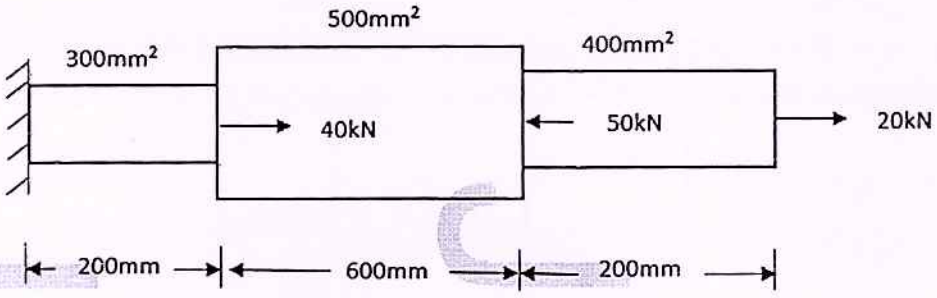

Fig.1

12 A rigid bar ABCD is hinged at A and supported in a horizontal position by two identical steel wires are as shown in Figure 2. A vertical load of 30kN is applied at B. Find the tensile forces T_1 and T_2 induced in these wires by the vertical load. 14

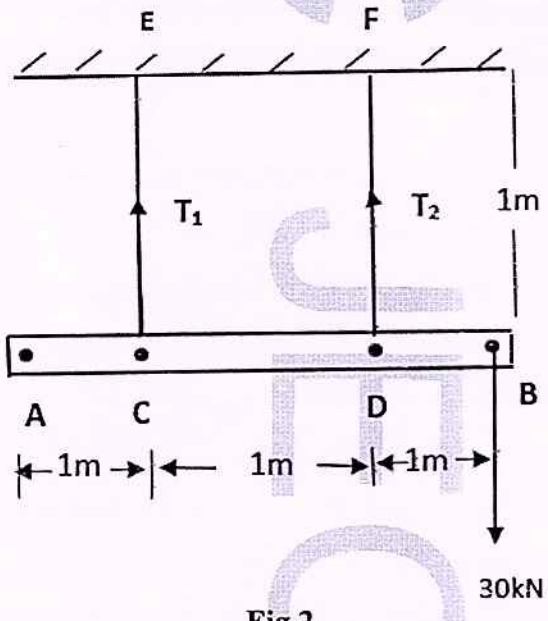

Fig.2

Module 2

13 A bimetallic thermal control made of brass bar of 8mm diameter and magnesium bar of 12mm diameter is as shown in Figure 3. The bars are so arranged that the gap between their ends is 0.1mm at room temperature. Find the temperature increase above the room temperature at which two bars just come in contact. Also find the compressive stress in magnesium bar when the temperature increase is 320^0F. 14

Take $E_b = 100$kN/mm^2 and $\alpha_b = 10\times10^{-6}$ /^{o}F,

$E_m = 40$kN/mm^2 and $\alpha_m = 15\times10^{-6}$ /^{o}F.

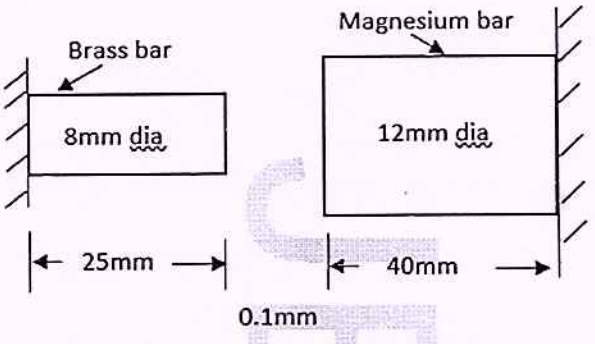

Fig.3

14 a. Prove that the stress developed due to suddenly applied load is twice that of gradually applied load. 4

b. A bar of 25mm diameter is subjected to a pull of 40kN. The measured extension on gauge length of 200mm is 0.085mm and the change in the diameter is 0.003mm. Calculate the Poisson's ratio and the values of the three moduli. 10

Module 3

15 Draw the shear force and bending moment diagram of the SS beam ABCD shown in Figure 4. 14

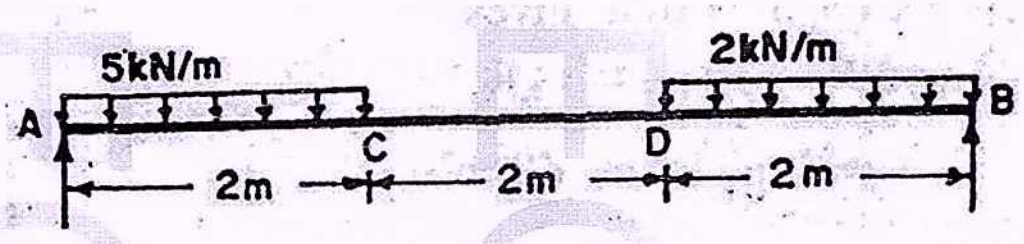

Fig.4

16 Draw the shear force and bending moment diagram of the overhanging beam shown in Figure 5. Clearly indicate the point of contraflexure, 14

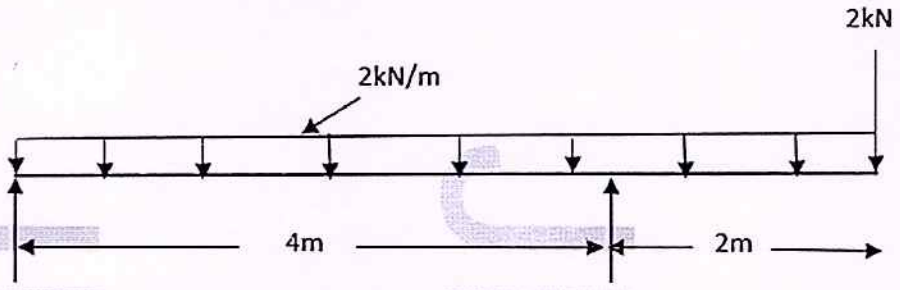

Fig.5

Module 4

17 Find the dimensions of a timber joist of span 4m to carry a brick wall 230mm thick and 3mhigh, if the unit weight of brickwork is 20kN/m^3. Permissible bending stress in timber is 10N/mm^2. The depth of the joist is twice the width. 14

18 A simply supported beam has a span of 4m and a rectangular cross section 100mm x 200mm. Find the uniformly distributed load it can carry, if the maximum bending stress and maximum shear stress are not to exceed 10N/mm^2 and 0.6N/mm^2 respectively. 14

Module 5

19 A point in a strained material is subjected to a tensile stress of 100N/mm^2 and a compressive stress of 80 N/mm^2 acting on two mutually perpendicular planes There is also a shear stress of 20N/mm^2 upon each of these planes. Determine 14

a. Principal stresses and principal planes

b. Maximum shear stress and planes of maximum shear

20 a. Find the Euler's crippling load for a hollow cylindrical steel column (one end fixed and the other end hinged) of 15cm external diameter and 10cm internal diameter. Take length of column as 10m. Take E= 95kN/mm^2. 4

b. A solid shaft of 80mm diameter is transmitting 100kW power at 200rpm. Calculate the maximum shear stress induced in the shaft and the angle of twist in degrees for a length of 6m. Take modulus of rigidity as 8x10^{4}N/mm^2, 10

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