R22 Regulation *Subject code:4E3AB*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech III Semester Supplementary Examinations, June 2026

STRENGTH OF MATERIALS - I

(CE)

Maximum Marks: 60 Date:11.06.2026 Duration: 3 hours

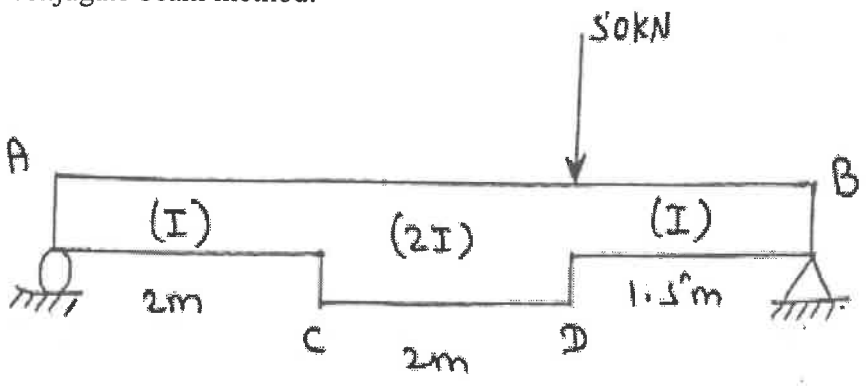
Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

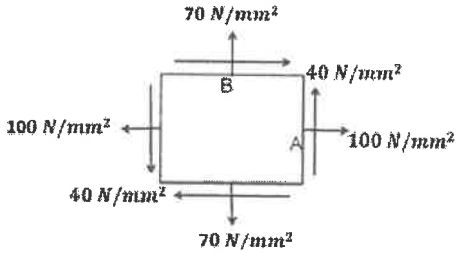
Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	Bloom Tx
1.a)	Mention the relation between E,K,G or C?	1M	1	Understand
b)	Explain the significance of ultimate point in the stress strain curve of steel?	1M	1	Understand
c)	Deriving slopes twice results what?	1M	2	Understand
d)	What is contra flexure?	1M	2	Understand
e)	The section at which no positive or negative stress exists is known as ____	1M	3	Understand
f)	The ratio of average shear stress to maximum shear stress in a circular cross section is _____	1M	3	Understand
g)	State Mohr's theorem I?	1M	4	Understand
h)	A cantilever of span L is loaded with a point load at its free end. What is the maximum deflection value?	1M	4	Understand
i)	Angle between principal plane and plane of maximum shear stress is____	1M	5	Understand
j)	The failure shape assumed by St Venant's theory is _____	1M	5	Understand

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx
2	a) Derive relation between E, K and μ. b) A rod is 2 m long at a temperature of 10°C. Find the expansion of the rod, when the temperature is raised to 80°C. If this expansion is prevented, find the stress induced in the material of the rod. Take E=1.0 x 105 MN/mm2 and α = 0.000012 per degree centigrade.	5M 5M	1	Understand Apply
	OR			
3	a) Explain the terms resilience, shock load and impact load? b) A copper rod, 25 mm in diameter is encased in steel tube 30 mm internal diameter and 35 mm external diameter. The ends are rigidly attached. The composite bar is 500 mm long and is subjected to an axial pull of 30 kN. Determine the stresses in the rod and the tube. Take E for steel = 2 x 10^5 N/mm^2 and E for copper as 1 x 10^5 N/mm^2.	4M 6M	1	Understand Apply

4	A footbridge plank of span 6 m is supported at both ends and carries a point load of 20 kN at the center. a) Analyze and draw the Shear Force Diagram b) Analyze and draw the Bending Moment Diagram.	 4M 6M	2	Analyze
	OR			
5	A cantilever of length 12 m carries two point loads 4 kN and 6 kN at a distance of 2 m and 6 m from fixed end respectively. a) Analyze and draw the Shear Force Diagram b) Analyze and draw the Bending Moment Diagram.	 5M 5M	2	Analyze
6	a) Derive the governing equation for pure bending. b) A beam 450 mm deep of a symmetrical section has $I = 1 \times 10^8$ mm^4 and is simply supported over a span of 8 meters. Calculate the maximum bending stress if the beam carries a central point load of 20 kN.	5M 5M	3	Evaluate Apply
	OR			
7	a) Derive general governing formula for calculating shear stress for any cross section. b) A rectangular-beam section width 250 mm and depth 500 mm is subjected to shear force 100 kN. Draw shear stress distribution diagram with salient values. Also find out the maximum shear stress?	5M 5M	3	Evaluate Apply
8	Find the slope and deflection of cantilever beam of span L at right end, fixed at left end and carrying (a) a point load P at the right end , (b) a U.D.L of w KN/m over the entire span, using the double integration method.	 5M 5M	4	Analyze
	OR			
9	A simply supported beam shown in figure 1. Calculate a) determine the slope at mid-section b) determine the deflection at mid-section Use conjugate beam method.  **Fig. 1**	 5M 5M	4	Analyze

10	a) For the stress system shown in Fig. 2, find the normal and tangential stresses on an inclined plane at 60° to the vertical plane.  **Fig.2** b) For the stress system shown as above, find the major and minor principal stresses and its corresponding principal planes. (ii) Find the maximum shear stress and its corresponding planes. Solve by analytical (or) graphical method.	4M 6M	5	Evaluate
	OR			
11	Briefly discuss the following a) Maximum Principal Stress Theory b) Maximum Shear Strain Energy Theory	 5M 5M	5	Understand