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B.Tech III Semester Regular/Supplementary Examinations, December 2025
STRENGTH OF MATERIALS - I
(CE)

Maximum Marks: 60

Date:30.12.2025

Duration: 3 hours

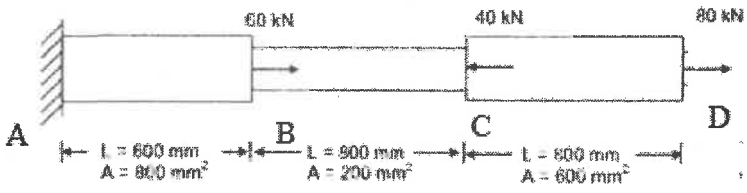
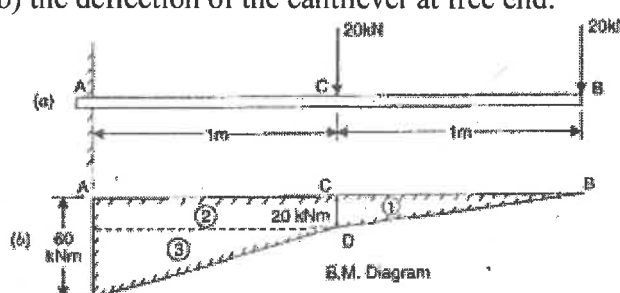
- Note:**
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	Bloom Tx
1.a)	Mention the units for strain?	1M	1	Understand
b)	Define toughness?	1M	1	Understand
c)	Integrating shear force twice results what?	1M	2	Understand
d)	The point at which shear force is zero is known as	1M	2	Understand
e)	What is neutral axis?	1M	3	Understand
f)	The ratio of average shear stress to maximum shear stress in a triangle cross section is	1M	3	Understand
g)	In two statements explain the approach of conjugate beam and moment area method?	1M	4	Understand
h)	A simply supported beam of span L is loaded throughout of its entire span. What is the maximum deflection value?	1M	4	Understand
i)	What are principal planes?	1M	5	Understand
j)	Rankine Theory is used for which type of materials?	1M	5	Understand

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx
2	a) A mild steel specimen is tested under tension. Draw and explain the stress-strain diagram by identifying its salient features.	4M	1	Understand
	b) A railway track (steel) of length 2 km is fully fixed at both ends. If the temperature rises by 30°C, calculate the thermal stress developed. (Take $\alpha = 12 \times 10^{-6}/^\circ\text{C}$, $E = 210 \text{ GPa}$).	6M		
OR				
3	a) Derive relation between E, K, G or C.	4M	1	Evaluate
	b) An axial pull of 35000 N is acting on a bar consisting of three lengths as shown in Fig. 1 If the Young's modulus = $2.1 \times 10^5 \text{ N/mm}^2$, determine (i) Find the reaction at A if the bar is in equilibrium (ii) total extension of the bar	6M		

	 <p style="text-align: center;">Fig. 1</p>			
4	<p>A balcony of span 5 m carries a point load of 15 kN at the free end</p> <p>a) Draw the Shear Force Diagram b) Bending Moment Diagram.</p>	5M 5M	2	Analyze
OR				
5	<p>A simply supported beam of length 9 m carries two point loads 3 kN and 6 kN at a distance of 3 m and 6 m from fixed end respectively.</p> <p>a) Analyze and draw the Shear Force Diagram b) Analyze and draw the Bending Moment Diagram.</p>	5M 5M	2	Analyze
6	<p>a) Derive the governing equation for pure bending. b) A beam 500 mm deep of a symmetrical section has $I = 1 \times 10^8 \text{ mm}^4$ and is simply supported over a span of 10 meters. Calculate the maximum bending stress if the beam carries a central point load of 25 kN.</p>	5M 5M	3	Evaluate Apply
OR				
7	<p>a) Derive general governing formula for calculating shear stress for any cross section. b) A rectangular-beam section width 200 mm and depth 400 mm is subjected to shear force 120 kN. Draw shear stress distribution diagram with salient values. Also find out the maximum shear stress?</p>	5M 5M	3	Evaluate Apply
8	<p>A cantilever beam ABC is as shown in figure 2. If $E = 10^5 \text{ N/mm}^2$, $I = 10^6 \text{ mm}^4$ for the cantilever then determine by moment area method.</p> <p>a) the slope of the cantilever at free end. b) the deflection of the cantilever at free end.</p>  <p style="text-align: center;">Fig. 2</p>	5M 5M	4	Analyze

	OR			
9	A simply supported beam AB of span L is carrying a UDL of w per unit run-over the whole span then a) determine slope at A and b) deflection at mid-point.	5M 5M	4	Analyze
10	At a point in an elastic material under strain, there are normal stresses of 50N/mm^2 , 30N/mm^2 at right angles to each other which are tensile in nature with a shearing stress of 25N/mm^2 . Find a) the principle stresses and principle planes and b) maximum shear stress and the plane of maximum shear stress. Solve by analytical (or) graphical method.	8M 2M	5	Evaluate
	OR			
11	Write a short note on a) Maximum Strain Energy Theory b) Maximum Principal Strain Theory	5M 5M	5	Understand

