

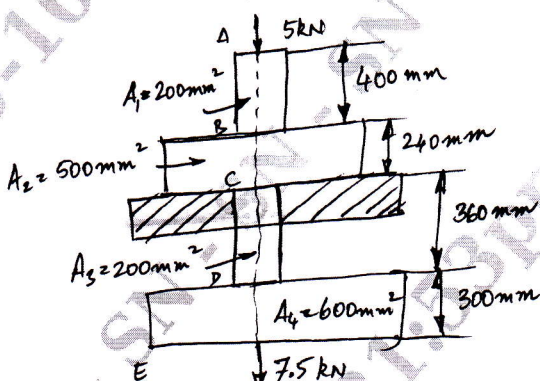
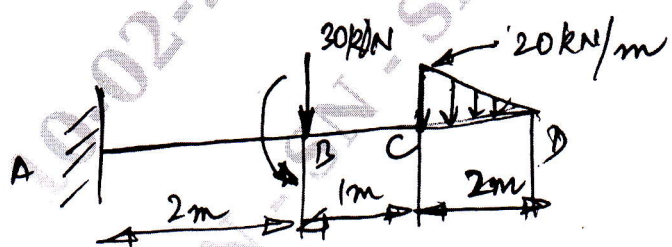
Third Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026 Mechanics of Material

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. M : Marks , L: Bloom's level , C: Course outcomes.

Module – 1			M	L	C
Q.1	a.	Explain with a neat sketch the σ - ϵ curve for ductile materials.	10	L2	CO1
	b.	Write short note on the material selection for structural performance.	10	L2	CO1
OR					
Q.2	a.	The following loaded rod of base is in equilibrium. It is supported on a stop at C. Find the change in length of the rod. Let modulus of elasticity of brass $= 1 \times 10^5 \text{ N/mm}^2$	10	L3	CO2
		 Fig Q2(a)			
	b.	Derive the expression for stress and total elongation of a uniformly tapering circular bar.	10	L3	CO2
Module – 2					
Q.3	a.	Derive the relationship between load, shear forces and bending moment.	10	L3	CO2
	b.	Draw the SFD and BMD for the following :	10	L3	CO2
		 Fig Q3(b)			
OR					
Q.4	a.	Derive the bending stress equation with its assumptions.	10	L3	CO2
	b.	A cantilever has a length of 3 m. Its cross section is of T section with a flange of 100 mm $\times$ 20 mm and a web of 200 mm $\times$ 12 mm, the flange is in tension. What is the intensity of UDL that could be applied if the maximum tensile stress is limited to 30 MPa. Also compute the max compressive stress.	10	L3	CO2

Module – 3					
Q.5	a.	Derive the equation for deflection, slope and bending moment radius of curvature.	10	L3	CO2
	b.	Establish an equation for max deflection of a simply supported beam with point load. Using double integration method.	10	L3	CO2
OR					
Q.6	a.	Derive the relationship between torque and shear stress in a solid circular shaft.	10	L3	CO2
	b.	A solid circular shaft has to transmit a power of 1000 kW at 120 rpm. Find the diameter of the shaft, if the shear stress of the material must not exceed 80 MPa. The max torque is 1.25 times the mean torque. What is the saving in material percentage wise if the solid shaft is replaced by hollow one whose internal diameter is 0.6 times its external diameter. Length, material and maximum shear stress remain the same.	10	L3	CO2
Module – 4					
Q.7	a.	Derive the equation for virtual work of a particle.	10	L3	CO2
	b.	Determine the vertical deflection of the free end of a cantilever beam subjected to a UDL of load 'P'. The Young's modulus is 'E' with a moment of inertia 'I' Let the length be 'L'.	10	L3	CO2
OR					
Q.8	a.	State and prove Maxwell's reciprocal theorem.	10	L3	CO2
	b.	Derive the principle of minimum potential energy.	10	L3	CO2
Module – 5					
Q.9	a.	Explain in detail the types of fracture.	10	L2	CO3
	b.	Explain the stage of Creep.	10	L2	CO3
OR					
Q.10	a.	Explain the S-N diagram.	10	L2	CO3
	b.	Explain fatigue testing methods (any one method)	10	L2	CO3
