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CBCS SCHEME

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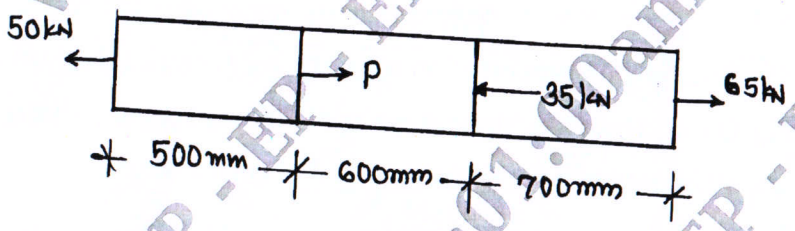
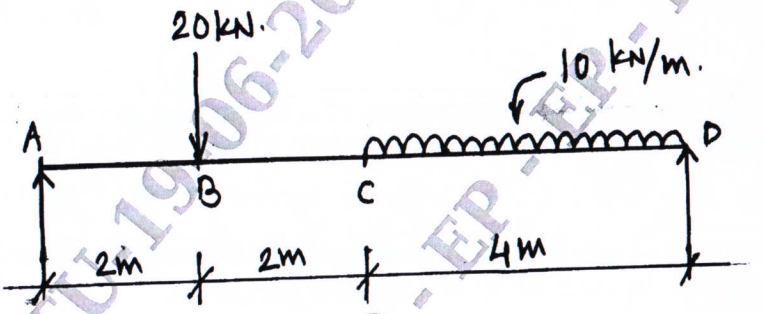
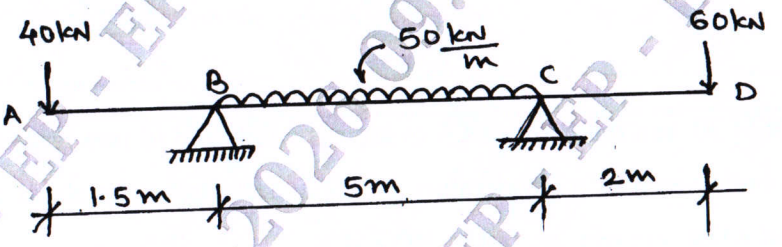
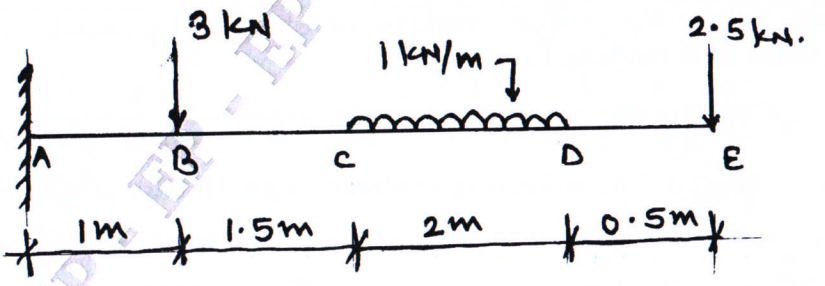
BCV301

Third Semester B.E./B.Tech. Degree Examination, June/July 2026
Strength 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.	Sketch a typical stress-strain curve for a ductile material and explain briefly the salient features of the curve.	5	L2	CO1
	b.	Derive an expression for the deformation of a rectangular tapering bar of uniform thickness.	5	L3	CO1
	c.	A circular bar having 200 mm^2 area is subjected to the axial load as shown in Fig Q1(c). Find the value of 'P' and the total elongation. Take E = 200kN/mm^2.  Fig Q1(c)	10	L3	CO1
		OR			
Q.2	a.	A steel rod of 30 mm diameter and 5 m long is connected to two grips and the rod is maintained at a temperature of 95°C. Determine the stress and pull exerted when temperature fall to 30°C, if i) The ends do not yield ii) The end yield by 0.12 cm Take E = 2×10^5 MN/m^2, $\alpha = 12 \times 10^{-6}$/ °C	6	L3	CO1
	b.	Derive the relationship between modulus of Elasticity E, modulus of Rigidity G and Bulk modulus K.	6	L3	CO1
	c.	A road of 270 kN is acting on a short RCC column of size 200 mm × 200 mm. The column is reinforced with 10 bars of 12 mm diameter. Determine the stressed in steel and concrete if modulus of elasticity of steel is 16.5 times of that of concrete [$E_s = 16.5\ E_c$]	8	L3	CO1

		Module – 2			
Q.3	a.	Define : i) Shear force ii) Bending moment iii) Point of contra flexure.	6	L2	CO2
	b.	Derive the relationship between Rate of loading, shear force and bending moment at a section of a beam.	6	L3	CO2
	c.	Draw shear force and bending moment diagram for the beam loaded as shown in Fig Q3(c).  Fig Q3(c)	8	L3	CO2
		OR			
Q.4	a.	A beam 8.5 m long rest on supports 5 m apart the beam carries the load as shown in Fig Q4(a). Draw the shear force and bending moment diagram and also mark all important point including point of contra flexure.  Fig Q4(a)	12	L3	CO2
	b.	Draw shear force and bending moment diagrams for the cantilever shown in Fig Q4(b).  Fig Q4(b)	8	L3	CO2

		Module – 3			
Q.5	**a.**	Derive the simple bending equation in the form $\frac{M}{I}=\frac{\sigma}{y}=\frac{E}{R}$ with usual notations.	**10**	**L3**	**CO3**
	b.	A simply supported beam of span 5m has cross section 150 mm × 250 mm. If the permissible stress is 10 N/mm^2. Find : i) Maximum UDL it can carry ii) Maximum concentrated load 'P' acting at middle of a beam.	**10**	**L3**	**CO3**
		OR			
Q.6	**a.**	List the assumptions made in the Theory of Torsion.	**4**	**L2**	**CO3**
	b.	Derive Torsional Equation with usual notation.	**6**	**L3**	**CO3**
	c.	A solid circular shaft is transmit 300 kW at 100 rpm. If the shear stress is not to exceed 80 N/mm^2. Find diameter of shaft. What percentage saving in weight would be obtained if this shaft is replaced by hollow one whose internal diameter equals to 0.6 external diameter. The length, the material and maximum shear stress being the same.	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Derive moment curvature equation.	**8**	**L3**	**CO4**
	b.	Derive the equation of maximum deflection for a simply supported beam carrying udℓ 'w' kN/m throughout the span. The span of a simply supported beam is 'ℓ' m.	**12**	**L3**	**CO4**
		OR			
Q.8	**a.**	Write the assumption in Euler's Theory.	**4**	**L2**	**CO4**
	b.	Derive Euler's Buckling load for columns whose ends are fixed.	**6**	**L3**	**CO4**
	c.	A hallow tube 8 m length of external diameter 20 mm and thickness 5 mm is subjected to minimum crippling load. Find Euler's load for this column when : i) Both ends are fixed ii) One end fixed and other end is hinged Take E = 200 GPa.	**10**	**L3**	**CO4**

		Module – 5			
Q.9	a.	Define : i) Principle planes ii) Principal stress	4	L2	CO5
	b.	A point in a strained material is subjected to two mutually perpendicular tensile stresses of 200 MPa and 100 MPa. Determine the intensities of normal, shear and resultant stresses on a plane inclined at 30° with the axis of minor tensile stress.	10	L3	CO5
	c.	A thin cylinder 800 mm diameter is made up of 10 mm thick plates. If the cylinder is subjected to an internal pressure of 2.5 MPa, find the circumferential and longitudinal stresses induced in the cylinder.	6	L3	CO5
		OR			
Q.10	a.	Derive Lame's equation with usual notation.	10	L3	CO5
	b.	A cast iron pipe of 400 mm internal diameter and 100 mm thickness carries water under a pressure of 8 N/mm^2. Determine the maximum and minimum intensities of Hoop stress across the section.	10	L3	CO5

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