CBCS SCHEME

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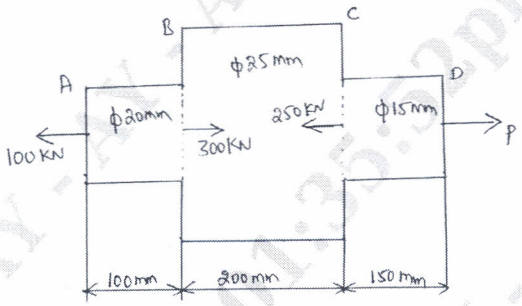
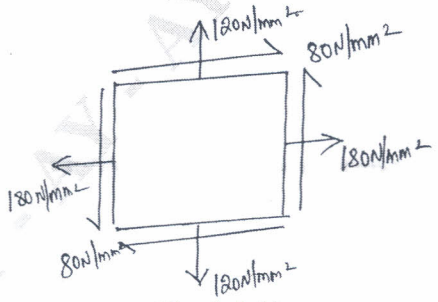
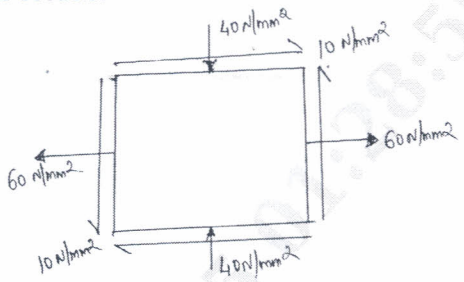
BMT301

Third Semester B.E./B.Tech. Degree Examination, June/July 2025
Mechanics of Solids and Fluids

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.	Define the following: i) Hook's Law ii) Bulk modulus iii) Volumetric strain iv) Poisson's ratio v) Modulus of rigidity	10	L1	CO1
	b.	Derive an expression for deformation of uniformly tapering rectangular bar.	10	L4	CO2
		OR			
Q.2	a.	Draw and explain the stress strain diagram of ductile and brittle materials.	10	L1	CO1
	b.	Determine the stresses in various segments of circular bar shown in Fig.Q.2(b). Compute the total elongation taking Young's modulus = 195 GPa.  Fig.Q.2(b)	10	L3	CO2
		Module – 2			
Q.3	a.	Determine the expression for normal and tangential plane θ in a general 2D stress system.	10	L3	CO2
	b.	The state of stress at a point in a strained material is shown in Fig.Q.3(b). Compute the principal planes, principal stresses, maximum shear stress and its direction.  Fig.Q.3(b)	10	L3	CO2

		OR			
Q.4		For the state of stress shown in Fig.Q.4. Determine principal stress, principal planes, maximum shear stress and shear planes. Draw the Mohr's circle to verify your results.  Fig.Q.4	**20**	**L3**	**CO2**
		Module – 3			
Q.5	**a.**	With assumptions, derive torsion equation for circular shaft.	**10**	**L4**	**CO3**
	b.	A hollow circular shaft 200 mm external diameter and metal thickness 25 mm is transmitting power at 200 rpm. The angle of twist over a length of 2 m was found to be 0.5°. Calculate the power transmitted and the maximum shear stress induced. Take G = 84 kN/mm^2.	**10**	**L3**	**CO3**
		OR			
Q.6	**a.**	Derive Euler's expression for buckling load for column with both ends hinged.	**10**	**L4**	**CO3**
	b.	A solid round bar 60 mm diameter and 2.5 m is used as a strut. Calculate the safe compressive load for the strut if i) Both ends are hinged ii) Both ends are fixed take E = 2 × 10^5 N/mm^2 and factor of safety = 3.	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Explain types of fluid with neat diagram and explain the properties of fluids.	**10**	**L2**	**CO4**
	b.	Define the following: i) Viscosity ii) Mass density iii) Capillarity iv) Gauge pressure v) Surface tension	**10**	**L1**	**CO4**
		OR			
Q.8	**a.**	Explain with a neat sketch U-tube differential manometer.	**10**	**L2**	**CO4**
	b.	Prove the expression for capillary rise.	**10**	**L1**	**CO4**
		Module – 5			
Q.9	**a.**	Explain the different types of fluid flows.	**10**	**L2**	**CO5**
	b.	Derive continuity equation in Cartesian coordinates in three dimensions.	**10**	**L4**	**CO5**

		OR			
Q.10	**a.**	Derive the expression for rate of flow through venturimeter.	**10**	**L4**	**CO5**
	b.	Water is flowing through a pipe having diameter 300 mm and 200 mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 24.525 N/cm^2 and the pressure at the upper end is 9.81 N/cm^2. Determine the difference in datum head if the rate of flow through pipe is 40 lit/sec.	**10**	**L2**	**CO5**

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