CBCS SCHEME

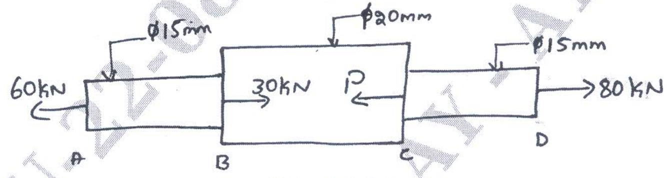
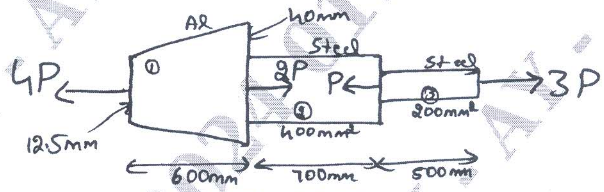
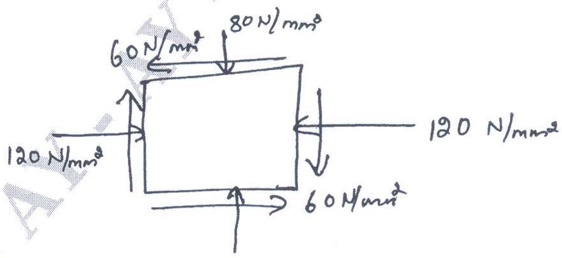
USN

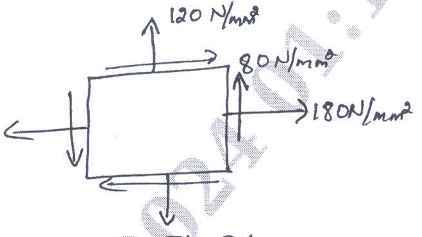
BMT301

Third Semester B.E./B.Tech. Degree Examination, June/July 2024
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.	Write the stress strain diagram of mild steel and explain its salient points.	08	L2	CO1
	b.	Find the force P acting at C in the bar shown in below Fig.Q1(b). Find the extension of the bar if $E = 2\times10^5$ MPa.  Fig.Q1(b)	12	L3	CO1
		OR			
Q.2	a.	Derive an equation for change in length of a continuously varying rectangular cross sectioned bar with usual notations.	10	L2	CO1
	b.	A stepped bar is subjected to forces as shown in Fig.Q2(b). Determine the magnitude of force P such that the net deformation in the bar does not exceed 1mm. E for steel = 200 GPa. E for aluminium is 70 GPa. Big end and small end diameter of the tapering part are 40mm and 12.5mm respectively.  Fig.Q2(b)	10	L3	CO1
		Module – 2			
Q.3		The state of stress in a two dimensionally stressed body is as shown in Fig.Q3. Determine the principal plane, principal stress, maximum shear stress and their plane, analytically and validate the answers graphically (using Mohr's circle).  Fig.Q3	20	L3	CO2

		OR			
Q.4		The state of stress at a point in a strained material is at shown in Fig.Q4 Determine. i) The direction of principal plane ii) The magnitude of principal stress iii) The magnitude of maximum shear stress and its direction iv) Draw Mohr's circle and validate analytical results.  Fig.Q4	**20**	**L3**	**CO2**
		Module – 3			
Q.5	**a.**	Give assumptions taken for pure torsional theory and derive torsional equation with usual notations.	**10**	**L2**	**CO3**
	b.	A solid circular shaft is to be designed to transmit 22.5 kW power at 200 rpm. If the maximum shear stress is not to exceed 80 N/mm^2 and the angle of twist is not to exceed 1° per meter length, determine the diameter of the shaft. Take G = 80 kN/mm^2.	**10**	**L3**	**CO3**
		OR			
Q.6	**a.**	Give the assumptions of Euler theory and derive the equation for critical load of a column when both ends of the column are hinged.	**12**	**L2**	**CO3**
	b.	What is the limitation of Euler's theory and derive Rankine's formula.	**08**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Define the following : i) Viscosity ii) Surface Tension iii) Compressibility and Bulkmodulus iv) Capillarity v) Specific gravity	**10**	**L1**	**CO4**
	b.	The space between two square plate is filled with oil each side of the plate is 60 cm. The thickness of the film is 12.5mm the upper plate moves 2.5m/s requires force of 98.1 N to maintain the speed. Determine i) the dynamic viscosity of oil in poise ii) kinematic viscosity of the oil in stokes if the gravity of the oil is 0.95.	**10**	**L3**	**CO4**
		OR			
Q.8	**a.**	Define the following : i) Pascal's law ii) Absolute pressure iii) Gauge pressure iv) Vacuum pressure	**08**	**L1**	**CO4**
	b.	Derive an expression for total pressure force and depth of pressure for a vertical surface submerged in water.	**12**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Derive Euler's equation of motion for ideal fluids and hence deduce Bernoulli's equation.	**10**	**L2**	**CO5**
	b.	The water is flowing through a taper pipe of length 100m having diameters 600mm at the upper end and 300mm at the lower end, at the rate of 50 *l*/s. The pipe has slope of 1 in 30. Find the pressure at the lower end if the pressure at the higher level is 19.62 N/cm^2.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	Explain different types of fluid flows.	**10**	**L1**	**CO5**
	b.	Derive continuity equation for fluid flow in three dimensional Cartesian coordinate.	**10**	**L2**	**CO5**

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