CBCS SCHEME

USN | | | | | | | | | | |

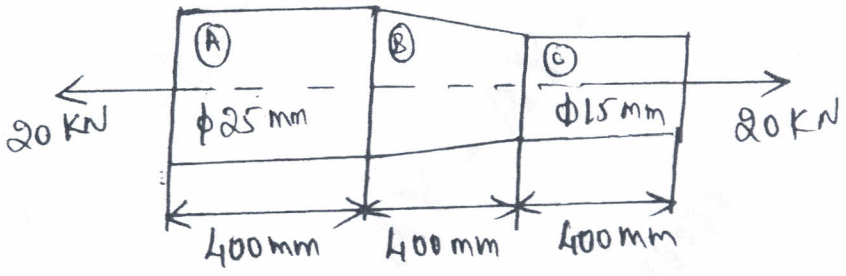
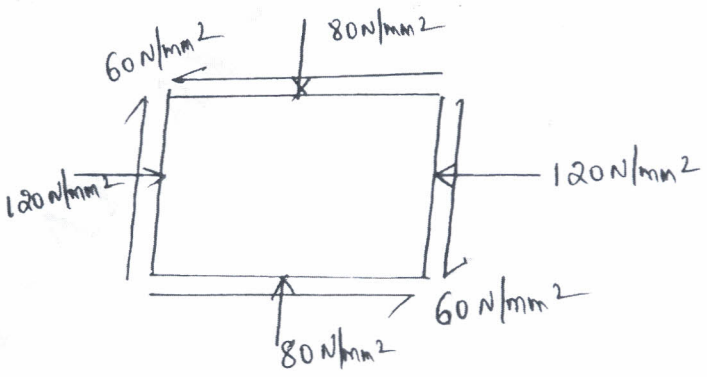
BMT301

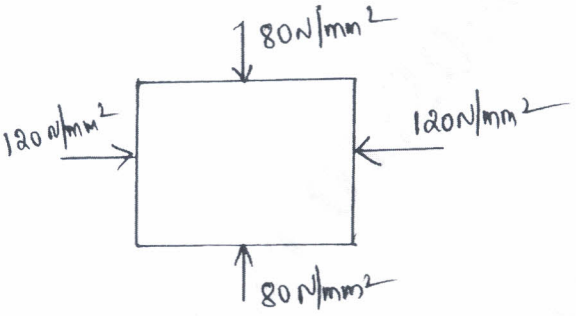
Third Semester B.E./B.Tech Degree Supplementary Examination, June/July 2024

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.	Derive an equation in a extension of an rectangular bar in uniformly reducing cross section.	10	L2	CO1
	b.	Determine the extension of the bar shown in Fig.Q1(b) under axial load of 20kN, E = 200GN/m^2.  Fig.Q1(b)	10	L3	CO1
		OR			
Q.2	a.	Define the following : i) Proof stress ii) Principle of superposition iii) Poisson's Ratio iv) Hooke's law v) Modulus of rigidity.	10	L1	CO1
	b.	Derive the relation between Young's modulus, modulus of rigidity and bulk modulus.	10	L2	CO1
		Module – 2			
Q.3	a.	Define principle stress and principle planes.	4	L1	CO2
	b.	The state of stress in a 2D stressed body as shown in Fig.Q3(b). Determine principle stress, principle planes, maximum shear stress and shear planes verify your answers by constructing Mohr's circle. 	16	L3	CO2

		OR			
Q.4	**a.**	Derive the expression for normal and Tangential plane θ in a general 2D stress system.	**10**	**L2**	**CO2**
	b.	Determine the normal, Tangential and resultant stress on a plane 30° to the plane of principle stress. Find the obliquity of the resultant stress.  Fig.Q4(b)	**10**	**L3**	**CO3**
		Module – 3			
Q.5	**a.**	Derive the torisonal equation for a circular shaft with usual notation.	**10**	**L2**	**CO3**
	b.	A solid circular shaft has to transmit a power of 1000KW at 120rpm. Find the diameter of the shaft if the shear stress of the material must not exceed 80MPa. The maximum torque 1.25 times of its mean. What percentage of saving in material would be obtained if the shaft is replaced by a hollow one whose internal diameter is 0.6times its internal diameter, the length, material and maximum shear stress being same.	**10**	**L2**	**CO3**
		OR			
Q.6	**a.**	Derive the Euler's expression for bucking load for column with both ends hinged.	**10**	**L2**	**CO3**
	b.	A 2m long pin ended column of square cross section is to be made of wood. Assuming E = 12GPa and allowable stress being limited to 12MPa, determine the size of the column to support the following loads safety. i) 95 kN ii) 200kN.	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Define the following : i)Weight density ii) Viscosity iii) Total pressure iv) Capillarity v) Real fluid	**10**	**L2**	**CO4**
	b.	Determine the intensity of shear of an oil having viscosity = 1 poise. The oil is used for lubricating the clearance between a shaft of diameter 10cm and its journal bearing. The clearance is 1.5mm and the shaft rotates at 150rpm.	**10**	**L3**	**CO4**
		OR			
Q.8	**a.**	Derive the expression for continuity equation in three dimensions.	**10**	**L3**	**CO4**
	b.	Draw a neat sketch and explain U-tube manometer.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Derive an expression for rate of flow through venturimeter.	**10**	**L3**	**CO5**
	b.	Describe different types of fluid flow.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	Derive Euler's equation of motion.	**10**	**L3**	**CO5**
	b.	Water is flouring through a pipe having diameter 300mm and 200mm at the bottom and upper end respectively. The intensity of pressure at the bottom and is 24.52N/cm^2 and the pressure at the upper end is 9.81N/cm^2. Determine the difference in datum head if the rate of flow through is 40lit/sec.	**10**	**L3**	**CO5**