PRN:		Course Code :	PSE104

000418

First Year **M. Tech** End Semester Examination Winter 2024

Advanced Solid Mechanics

Day and Date: Mon 9 Dec 2024 Max Marks: **100**

Time : 10:30AM To 02:30PM Duration: **04** hrs

Instructions: All questions are compulsory.

			Marks	Bloom's Level	CO
Q.1		**Attempt the following**			
	a)	Describe principal stress and principal plane.	08	L2	1
	b)	Calculate octahedral stresses for the following stress tensor $\sigma ij = \begin{vmatrix} 4 & -2 & -1 \\ -2 & 3 & 4 \\ -1 & 4 & -2 \end{vmatrix}$ N/mm^2	08	L3	1
		OR			
	b)	Derive the expression for octahedral stress.	08	L3	1
Q.2		**Attempt the following**			
	a)	Derive the strain compatibility equations for 2-D	08	L3	1
	b)	Prove that the following are Airy's stress function and examine the stress distribution represented by them $\Phi = Ax^2 + By^2$	08	L4	1
		OR			
	b)	Describe plane stress and plane strain	08	L4	1
Q.3		**Attempt any two from the following**			
	a)	Derive the homogeneous differential equation for 2D problem in cylindrical coordinates.	08	L3	2
	b)	Describe Torsion of Rolled Profile Section	08	L4	2
	c)	A rolled steel channel of shown in figure 1 with an overall size of 400 X 100 X 10 mm, is subjected to a torque of 2 kN.m. Evaluate the maximum shear stress developed and the angle of twist per unit length. Assume G = 12 kN/mm^2	08	L4	2

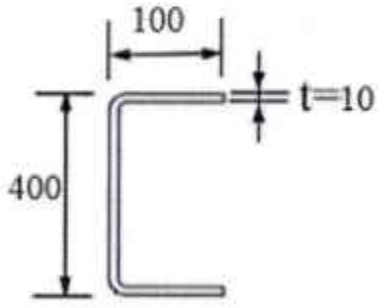


Fig.1

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Q.4		**Attempt any two from the following**			
	a)	Describe in detail Plasticity and Factors affecting on it.	08	L5	2
	b)	Describe theories of plastic flow	08	L5	2
	c)	Discuss Stress-strain relationship for various types of material in plasticity.	08	L5	2
Q.5		**Attempt any Two of the following**			
	a)	Describe in detail criterion of yielding in plasticity	09	L4	3
	b)	Explain in detail distortion energy theory (von-Mises)	09	L4	3
	c)	The state of stress at a point is given by σ_x = 70 MPa, σ_y = 120 MPa, τ_{xy} = 35 MPa. If yield strength for material is 125 MPa, check whether yielding will occur according to Tresca's and Von-Mises's condition.	09	L4	3
Q.6		**Attempt any Two of the following**			
	a)	Explain in detail Plastic bending of Beams with Stress-Strain curve	09	L4	4
	b)	What is Elasto-plastic theory?	09	L5	4
	c)	A cantilever beam 10 cm wide, 12 cm deep in 4 m long and is subjected to an end load of 5 kN. If stress strain curve for beam material is given by $\sigma = 700\ \varepsilon^{0.2}$. Determine the maximum stress induced in beam and its radius of curvature.	09	L5	4

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