SHRI RAMSWAROOP MEMORIAL UNIVERSITY

End Semester Examination (2021-22)-Odd Semester

M.Tech (Structural Engineering) – I Year (I Sem)	
Course Name: Theory of Elasticity and Plasticity	**Code: MCE1010/1003P**
Time: 02 Hours	**Max Marks: 60**

University Roll No.															
(To be filled by the Student)															

Note: Please read instructions carefully:

a) The question paper has 03 sections and it is compulsory to attempt all sections.

b) All questions of Section A are compulsory; questions in Section B and C contain choice.

Section A: Very Short Answer type Questions **Attempt all the questions.**		**BL**	**CLO**	**Marks (10)**
1.	What do you understand by stress tensor?	BL3	CLO1	02
2.	Briefly discuss the concept of plain strain.	BL2	CLO2	02
3.	Differentiate between torsion and bending with the help of a suitable example.	BL1	CLO3	02
4.	Write a short note on: i) Castigliano's first theorem ii) Virtual work principle	BL2	CLO4	02
5.	Discuss the theory of plasticity with the help of stress-strain curve for mild steel.	BL2	CLO3	02
Section B: Short Answer Type Questions **Attempt any 03 out of 06 questions.**		**BL**	**CLO**	**Marks (30)**
1.	Define the term 'plain stress'. Also list the basic equations of elasticity in case of plain stress.	BL3	CLO1	10
2.	Give the relations between Airy's stress function when body forces are zero.	BL2	CLO2	10
3.	Determine the total strain energy of a simply supported beam of length 5 m with cross-section of 40 mm x 60 mm and carrying a concentrated load of 50 kN at centre of the span. Assume E = 2 x 105 N/mm2.	BL5	CLO3	10
4.	Enlist the physical assumptions in case of plastic theory.	BL4	CLO3	10
5.	Prove that $\phi = A(x^4 - 3x^2y^2)$ is an Airy's stress function and examine the stress distribution represented by it.	BL1	CLO4	10
6.	Discuss the importance of flow curve in the theory of plasticity.	BL1	CLO4	10

Section C: Long Answer Type Questions/Case Study **Attempt any 01 out of 03 questions.**		**BL**	**CLO**	**Marks (20)**
1.	At a point in a stressed body, the cartesian components of stresses are σxx = 60 MPa, σyy = 30 MPa, σzz = 30 MPa, τxy = 40 MPa, τyz = τzx = 0. Determine the normal and shear stress on a plane whose outer normal has the direction cosines as follows: $\cos(n,x)=\frac{6}{11}$, $\cos(n,\mathrm{y})=\frac{6}{11}$, $\cos(n,\mathrm{z})=\frac{7}{11}$	BL6	CLO3	20
2.	A rectangular beam 70 mm wide and 100 mm thick is 1 m in length. It carries a uniformly distributed load of 20 N/mm throughout its length. Plot the variation of stresses in the beam at mid-span. Also compare the results as obtained from classical methods.	BL5	CLO4	20
3.	A cantilever beam loaded at its free end has a stress function Φ=Axy + B xy3/6. Find the expression for vertical deflection curve.	BL6	CLO4	20
