Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
ONLINE END SEMESTER EXAM, JAN 2021

Course: Theory of Elasticity & Plasticity — **CIVL 7002**
Program: M. Tech (Structures) — **Time: 03 hrs.**
Max. Marks: 100 — **SEM -Ist**

SECTION A

S. No.		Marks	CO
Q.1	Define stress at a point in a body under the action of external forces.	**5M**	**CO1**
Q.2	Briefly explain plane stress & plane strain problem with example	**5M**	**CO2**
Q.3	Explain the axisymmetric problem with suitable example.	**5M**	**CO2**
Q.4	Explain various assumption made in theory of torsion.	**5M**	**CO3**
Q.5	Differentiate between isotropic & anisotropic material with an example.	**5M**	**CO4**
Q.6	Briefly explain 1) St. Venant's principle 2) Principle of superposition.	**5M**	**CO3**
	SECTION B		
Q.7	Derive the equilibrium equation for plane problem in Cartesian coordinate system.	**10M**	**CO1**
Q.8	Name all theories of failure. Describe any two in detail.	**10M**	**CO4**
Q.9	A mild steel shaft 120mm diameter subjects to maximum torque of 20kN/m & a maximum bending moment of 12kN.m. Determine FOS according to maximum shear stress theory if elastic limit in simple tension is 220MN/m^2.	**10M**	**CO3**
Q.10	Derive the equation for stress-strain relationship in 2D plane stress problem in Cartesian coordinate system.	**10M**	**CO2**
Q.11	Derive the torsion equation of thin walled tube section	**10M**	**CO3**
	SECTION-C		
Q.12	Following unit elongation were recorded by rectangular strain rosette $2\ X\ 10^{-4}, 1.5\ X\ 10^{-4}$ & $3\ X\ 10^{-4}$. Determine the strain components in Cartesian coordinate system. Also, determine the principle shear strain & their direction. **OR** If the state of stress at a point given as follows. Determine the expression for τ_{xy} in order that stress distribution is in equilibrium in the absence of body forces. $\sigma_x = y^2 + \vartheta(x^2 - y^2)$; $\sigma_y = x^2 + \vartheta(y^2 - x^2)$; $\sigma_z = (x^2 + y^2)$; $\tau_{xy} = f(x, y)$ $\tau_{yz} = \tau_{zx} = 0$	**20M** **20M**	**CO1**