Name: Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, MAY 2022

Course: Introduction to Solid Mechanics **Semester: IV**
Program: B. Tech (Civil Engg.) **Course Code CIVL 2017**
Time: 03 hrs. **Max. Marks: 100**

SECTION A

S. No.		Marks	CO
Q.1	Mention the relationship between elastic constants.	**4**	**CO1**
Q.2	Explain the terms torsional rigidity & polar modulus of shaft.	**4**	**CO2**
Q.3	Write bending equation with all notations.	**4**	**CO3**
Q.4	Explain the relationship between volumetric strain, hoop strain & longitudinal strain.	**4**	**CO4**
Q.5	Explain the practical significance of SFD & BMD.	**4**	**CO3**
	SECTION B		
Q.6	A rectangular bar 1000mm X 50mm X 40mm long subjected to an axial pull of 250kN. If the Poisson's ratio is 0.3 & E = 2 X 10^5. Find the change in length, width, thickness & volume.	**10**	**CO1**
Q.7	A steel shaft transmits 125kW at 175rpm. The diameter of the shaft is 100mm. Determine the torque developed in the shaft and the maximum shearing stress-induced. Also, calculate the twist in the shaft in the length of 6m. take C = 8.5 X 10^4Mpa	**10**	**CO2**
Q.8	A steel penstock of 1.5m diameter & 15mm thickness subjected to 100m head of water. Determine the hoop stress & longitudinal stress at the bottom of the penstock.	**10**	**CO2**
Q.9	A rod of diameter 100m and 1m long subjected to pull of 200kN in the direction of its length. The extension of the rod found to be 0.15mm, while the decrease in diameter was 0.007mm. Find the young's modulus, Poisson's ratio, modulus of elasticity & bulk modulus for the material of the rod. **OR** A metallic bar of the length of 250mm, width 30mm & thickness of 20mm subjected to an axial compressive load of 240kN. The decrease in length is 0.5mm & increase in width is 0.02mm. Determine the Poisson's ratio & young's modulus of bar.	**10**	**CO1**
	SECTION-C		
Q.10	A beam of 6m span simply supported at the ends carries a UDL of 20kN/m over the right half of the beam and a point load of 40kN at 1m from the left support. Determine the position and magnitude of Maximum B.M. draw SFD & BMD for the beam	**20**	**CO3**
Q.11	Determine the shortest length "L" for the pin-ended steel column having a cross-		

	section of 70mm X 110mm for which Euler's formula applies. Take E = 2.1 X 10^5Mpa & critical proportional limit is 250Mpa **OR** Determine the ratio of buckling length of the two columns of circular section, one hollow & other solid. When both are made of same material, having the same length, cross-sectional area & end conditions. The internal diameter of hollow column is half of external diameter	**20**	**CO4**