UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, MAY 2023

Course: Introduction to Solid Mechanics **Semester: IV**
Program: B. Tech (Civil Eng) **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 steel rod 500mm long 20mm diameter is subjected to an axial tensile load of 50kN. Determine (1) Stress (2) Strain (3) Elongation (4) Lateral Strain (5) Change in Diameter. Take $E_s = 2 \times 10^5$ & $1/m = 0.25$	10	CO1
Q.7	A shaft rotates at 150rpm and transmits a power of 300kW. The diameter of the shaft is 100mm. The maximum torque is 25% more than mean torque. What is the magnitude of torsional shear stress and the twist. The length of the shaft is 1.5m Given C = 85Gpa.	10	CO2
Q.8	A steel penstock of 1.2m diameter & 12mm thickness subjected to 120m head of water. Determine the hoop stress & longitudinal stress at the bottom of the penstock.	10	CO2
Q.9	A rod of diameter 110m and 1m long subjected to pull of 210kN in the direction of its length. The extension of the rod was found to be 0.13mm, while the decrease in diameter was 0.005mm. 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 230mm, width 25mm & thickness of 18mm subjected to an axial compressive load of 250kN. The decrease in length is 0.4mm & increase in width is 0.03mm. 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 22kN/m over the right half of the beam and a point load of 42kN at 1.5m 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 = 2.2 X 10^5Mpa & critical proportional limit is 240Mpa **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**