Name:

Enrolment No:

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

Course: Principle of Engineering Design **Semester:** V
Program: B. Tech. FSE **Time:** 03 hrs.
Course Code: HSFS 3002 **Max. Marks:** 100

Instructions:

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Write all factors need to be considered during engineering design.	4	CO1
Q 2	Write short note on: a. Solid length b. Free length c. Spring index d. Spring rate	4	CO1
Q 3	Write Clavarino's equation and mention the use of this equation.	4	CO2
Q 4	Define 'pitch', back pitch, diagonal pitch and 'margin' of riveted joint	4	CO2
Q 5	List various types of welded joints.	4	CO2
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	Write the expression of Lame's equation for radial stress and tangential stress.	10	CO4
Q 7	Maximum shear stress induced in the wire of a helical spring, $\tau = K\frac{8 * W * C}{\pi * d^2}$ Derive the equation with suitable assumptions and diagrams.	10	CO4
Q 8	A plate 100 mm wide and 10 mm thick is to be welded to another plate by means of double parallel fillets. The plates are subjected to a static load of 80 KN. Find the length of weld, if the shear stress is 55 MPa.	10	CO4
Q 9	Describe the stresses acting in the cylindrical pressure vessel. Derive the minimum thickness of metal sheet required in a cylindrical pressure	10	CO3

	vessel to overcome the stresses. Use the suitable diagrams and assumptions.		
SECTION-C (2Qx20M=40 Marks)			
Q 10	A double riveted lap joint is made between 15 mm thick plates. The rivet diameter and pitch are 25 mm and 75 mm respectively. If the ultimate stresses are 400 MPa in tension, 320 MPa in shear and 640 MPa in crushing, find the maximum force per pitch which will rupture the joint. If the above joint is subjected to a load such that the factor of safety is 4, find out the actual stresses developed in the plates and the rivets	**20**	**CO5**
Q 11	A helical spring is made from a wire of 6mm diameter and has outside diameter of 75mm. If the permissible shear stress is 340 MPa and modulus of rigidity 80 kN/mm2, Find the axial load which the spring can carry and the deflection per active turn.	**20**	**CO5**