Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: **Principle of Engineering Design** **Semester: V**
Program: **B. Tech. (Fire and Safety)** **Time: 3 Hrs.**
Course Code: HSFS 3002 **Max. Marks: 100**

Instructions:

SECTION A

S. No.		Marks	CO
Q 1	**Mention True or False:** a. If, distance between two pulleys are more than 8 m, flat belt drive is not useful. b. Whal's stress factor, only depends on diameter of spring wire and mean diameter of spring. c. Buckling factor is the function of axial load and deflection. d. Failure due Surge is possible only at the Centre of the spring. e. Solid length does not depend on pitch.	**5**	**CO1**
Q 2	Describe slip and creep in Flat belt drive	**5**	**CO2**
Q 3	Write short notes: a. Buckling of compression springs b. Eccentric Loading	**5**	**CO1**
Q 4	Describe various methods of welded joints.	**5**	**CO2**
	SECTION B		
Q 5	A thin cylindrical pressure vessel of 500 mm diameter is subjected to an internal pressure of 2 N/mm^2. If the thickness of the vessel is 20 mm, find the hoop stress, longitudinal stress and the maximum shear stress.	**10**	**CO4**
Q 6	Two plates of 12 mm thickness each are to be joints by means of a single riveted double strap butt joint. Determine the rivet diameter; rivet pitch, strap thickness and efficiency of the joint. Take the work stresses in tension and shearing as 80 MPa and 60 MPa respectively	**10**	**CO4**
Q 7	A closed ended cast iron cylinder of 200 mm inside diameter is to carry an internal pressure of 10 N/mm2 with a permissible stress of 18 MPa. Determine the wall thickness by means of Lame's and the maximum shear stress equations.	**10**	**CO4**

Q 8	Derive the speed ratio of driver pulley (size = x) and follower pulley (size = y) where a slip occurs at both pulleys of a simple flat belt drive (thickness = z). Write proper assumptions and draw a suitable diagram. **OR** 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**	**CO3**
	SECTION-C		
Q 9	At the bottom of a mine shaft, a group of 10 identical close coiled helical springs are set in parallel to absorb the shock caused by the falling of the cage in case of a failure. The loaded cage weighs 75 kN, while the counter weight has a weight of 15 kN. If the loaded cage falls through a height of 50 metres from rest, find the maximum stress induced in each spring if it is made of 50 mm diameter steel rod. The spring index is 6 and the number of active turns in each spring is 20. Modulus of rigidity, G = 80 kN/mm^2. **OR** A multiple disc clutch (steel on bronze) is to transmit 5100 W at 14 rps. The inner radius of contact surface is 0.05 m and outer radius of contact surface is 0.08 m. The clutch operates in oil with an expected co-efficient of 0.13. The average allowable pressure is 0.38 N/mm^2. Find: a. Total number of steel and bronze discs b. The actual axial force required c. The actual average pressure d. The actual maximum pressure	**20**	**CO5**
Q 10	Derive stress equations with diagram for following situations: a. Circular fillet weld subjected to torsion. b. Circular fillet weld joint subjected to bending moment. c. Long fillet weld subjected to torsion. d. Transvers fillet weld subjected to tensile stress.	**20**	**CO3**