Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2018

Programme Name: B. Tech. (FSE) **Semester** : V
Course Name : Principle of Engineering Design **Time** : 03 hrs
Course Code : FSEG-341 **Max. Marks** : 100
Nos. of page(s) :
Instructions:

SECTION A

S. No.		Marks	CO
Q 1	Write short notes: a. Buckling of compression springs b. Eccentric Loading	4	CO1
Q 2	Describe slip and creep in Flat belt drive	4	CO2
Q 3	What is surge in springs? Write the equation of natural frequency of spring under surge.	4	CO1
Q 4	.Derive the equation of stress while circular fillet welded joint subjected to torsion.	4	CO2
Q 5	Draw a schematic diagram of Screw and mention various points on it.	4	CO2
	SECTION B		
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	CO3
Q 7	An engine running at 150 r.p.m. drives a line shaft by means of a belt. The engine pulley is 750 mm diameter and the pulley on the line shaft is 450 mm. A 900 mm diameter pulley on the line shaft drives a 150 mm diameter pulley keyed to a dynamo shaft. Fine the speed of dynamo shaft, when: 1. There is no slip, and 2. There is a slip of 2% at each drive..	10	CO4
Q 8	A cast iron cylinder of internal diameter 200 mm and thickness 50 mm is subjected to a pressure of 5 N/mm^2. Calculate the tangential and radial stresses at the inner, middle (radius = 125 mm) and outer surfaces.	10	CO3
Q 9	A 50 mm diameter solid shaft is welded to a flat plate by 10 mm fillet weld. Find the maximum torque that the welded joint can sustain if the maximum shear stress intensity in the weld material is not to exceed 80 MPa. **OR**	10	CO4

	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.		
	SECTION-C		
Q 10	A helical compression spring made of oil tempered carbon steel is subjected to a load, which varies from 400 N to 1000 N. The spring index is 6 and the design factor of safety is 1.25. If the yield stress in shear is 770 MPa and endurance stress in shear is 350 MPa, find: 1. Size of the spring wire 2. Diameters of the spring 3. Number of turns of the spring 4. Free length of the spring. The compression of the spring at the maximum load is 30 mm. The modulus of rigidity for the spring material may be taken as 80 kN/mm^2. **OR** Design a single plate automobile clutch to transmit a maximum torque of 250 N-m at 2000 r.p.m. The outside diameter of the clutch is 250 mm and the clutch is engaged at 55 km/h. Find: 1. The number of revolutions of the clutch slip during engagement; and 2. Heat to be dissipated by the clutch for each engagement. The following additional data is available: Engine torque during engagement = 100 N-m; Mass of the automobile = 1500 kg; Diameter of the automobile wheel = 0.7 m; Moment of inertia of combined engine rotating parts, flywheel and input side of the clutch = 1 $kg\text{-}m^2$; Gear reduction ratio at differential = 5; Torque at rear wheels available for accelerating automobile = 175 N-m; Coefficient of friction for the clutch material = 0.3; Permissible pressure = 0.13 N/mm^2.	**20**	**CO6**
Q 11	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.	**20**	**CO6**

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