UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018

Course: B.tech **Semester: VI**
Program: ADE
Time: 03 hrs. **Max. Marks: 100**
Instructions:

Assume suitable value for any missing data
Use the design data handbook if required

SECTION A
(Attempt all questions. All questions carry equal marks)

S. No.	Questions	Marks	CO
Q 1	Discuss various loads, stresses acting on vehicle frames.	**04**	**CO1**
Q 2.	List out the different cross sections used in rigid type front axle of a vehicle and at which section torsional and bending are predominant.	**04**	**CO6**
Q 3.	Explain the factors to be considered while designing the automotive friction clutch	**04**	**CO4**
Q 4.	Define whirling of shafts	**04**	**CO5**
Q 5.	Write down the drive thrust transmitted on Hotchkiss drive and torque tube drive	**04**	**CO6**
	SECTION B ***(All questions carry equal marks)***		
Q 6.	Design a close coiled helical compression spring for a service load ranging from 2250 N to 2750 N. The axial deflection of the spring for the load range is 6 mm. Assume a spring index of 5. The permissible shear stress is 420 MPa and modulus of rigidity is 84 kN/mm2. Draw the dimensioned sketch of the spring.	**08**	**CO3**
Q 7.	A plate clutch has three discs on the driving shaft and two discs on the driven shaft, providing four pairs of contact surfaces. The outside diameter of the contact surface is 240 mm and inside diameter 120 mm. Assuming uniform pressure and $\mu = 0.3$. Find the total spring load pressing the plates together to transmit 25 Kw at 1575 rpm. If there are 6 springs each of stiffness 13 kN/m and each of the contact surfaces has worn away by 1.25 mm, find the maximum power that can be transmitted, assuming uniform wear.	**08**	**CO4**
Q 8.	An automobile engine develops 25 kw @ 1800 rpm when the torque is maximum. Calculate the amount of torque transmitted to each wheel based when the low gear ratio of transmission is 2.85:1 and back rear axle ratio is 4:1. The effective wheel radius is 0.325m and co efficient of friction between the tire and road surface is 0.45. Take the permissible shear stress is 25373×10^4 Pa.	**08**	**CO5**
Q 9.	Give expression on determination of loads and reactions on wheel spindle bearings and kingpin bearings of front axle beam.	**08**	**CO6**
Q 10.	Determine the wheelbase, which will give true rolling for all wheels when the car is turning so that the inner wheel stub axle is 30^o to the centerline of the car. A track has pivot pins 1.25 m apparat, the length of each track arm is 0.13 m and the track rod is behind the front axle and 1.13 m long. A geometrical construction may be	**08**	**CO5**

	used. (Or) Calculate the turning circle radius of outer rear and front inner wheels and correct angle of outside lock when, The inside lock is 35^o, Pivot center distance is 1.055 m Wheelbase of a vehicle 2.45 .m apart, Wheel track is 1.25 m.		
	SECTION-C ***(All questions carry equal marks)***		
Q 11.	a) A semi elliptical laminated spring 900 mm long and 55 mm wide is held together at the center by a band 50mm wide. If the thickness of each leaf is 5 mm. Find the number of leaves required to carry a load of 4500 N. Assume a maximum working stress of 490 MPa. If the two of these leaves extend the full length of the spring, find the deflection of the spring. The young's modulus for the spring material is 210 kN / mm^2. b) Describe in detail design procedure of the ladder chassis frame bending moment and deflection calculations with suitable dimensions of the vehicle (Or) c) Describe in detail design procedure of the leaf spring with suitable dimensions of the vehicle. d) Calculate the maximum bending moment and maximum section modulus assuming the flowing particulars: Wheel base: 180cm; Overall length=360cm; Equal overhand on either side. In addition there is a uniformly distributed load of 1.75 kgf per cm run over entire length of the chassis. 270 kgf acting at center of gravity of load 45cm in front of the front axle 180 kgf acting at center of gravity of load 45cm behind the front axle 180 kgf acting at center of gravity of load 45cm in front of the rear axle 67.5 kgf acting at center of gravity of load 45cm behind of the rear axle	**20**	**CO2** **CO1**
Q 12.	a) A hooke's joint connects two shafts whose axes intersect at α. The driving shaft rotates uniformly at ω and the driven shaft rotates at ω_1. Derive the expression to calculate the velocity ratio use of hooke's joint. b) Write the expression to calculate the center of gravity of a vehicle for the following condition of the vehicle. a) Longitudinal location of CG b) The height above the ground of CG (h) c) Side location of CG.	**20**	**CO6** **CO7**