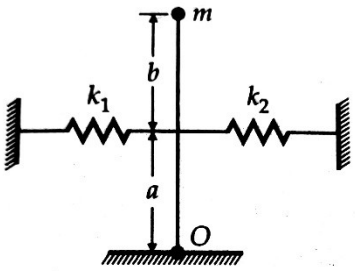
Name: **Enrolment No:**	UPES

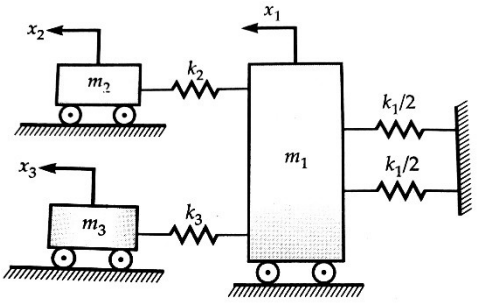
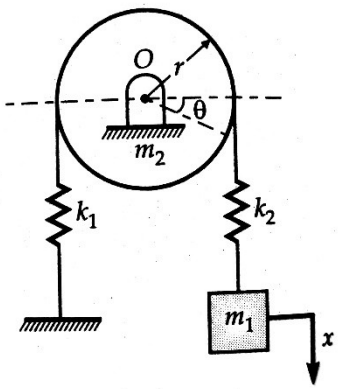
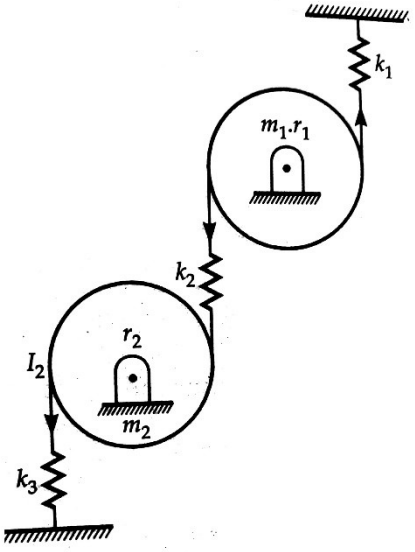
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

Mid Semester Examination, September/ October 2018

Programme Name: Mechatronics **Semester : VII**
Course Name : Mechanical Vibrations **Time : 03 hrs**
Course Code : MHEG 483 **Max. Marks : 100**

SECTION A

S. No.		Marks	CO
Q 1	Explain vibration isolation.	**5**	**CO1**
Q 2	Describe the sources of excitation in forced vibration.	**5**	**CO1**
Q 3	Describe the vibration measuring instruments.	**5**	**CO1**
Q 4	Explain the principle of vibration absorber.	**5**	**CO1**
	SECTION B		
Q 5	Find the natural frequency of vibration of the system for small amplitudes. If k_1, k_2, a and b are to be fixed, determine the value of b for which the system will not vibrate. The system is shown in Figure. 	**10**	**CO2**
Q 6	Derive the expression for the response of a damped SDoF system under excitation caused by the harmonic motion of the base.	**10**	**CO1**
Q 7	A vibratory body of mass 150 kg supported on springs of total stiffness 1050 kN/m has a rotating unbalance force of 525 N at a speed of 6000 rpm. If the damping factor is 0.3, determine (a) the amplitude caused by the unbalance and its phase angle (b) the transmissibility and (c) the actual force transmitted and its phase angle.	**10**	**CO2**
Q 8	Derive the general equation for the transverse vibration of beams.	**10**	**CO1**
	OR		
	Derive the frequency equation of torsional vibrations for a free-free shaft of length l.	**10**	**CO1**

	SECTION-C		
Q 9	A multi Degree of Freedom in system is shown in Figure. If the lowest natural frequency of the system is not to exceed 50 rad/s, find the ratio k/m. Assume, $k_1 = 7k$, $k_2 = 5k$, $k_3 = 5k$, $m_1 = 4m$, $m_2 = 3m$, $m_3 = 2m$. 	**20**	**CO4**
Q 10	Find the natural frequency of the system shown in Figure. Assume that there is no slip between cord and cylinder. 	**20**	**CO3**
	OR		
	Determine the natural frequencies of the system as shown in Figure, if $k_1 = 40$ kN/m, $k_2 = 50$ kN/m, $k_3 = 60$ kN/m, $m_1 = 10$ kg, $m_2 = 12$ kg, $r_1 = 0.10$ m and $r_2 = 0.11$ m. 	**20**	**CO3**