Name: **Enrolment No:**	UPES

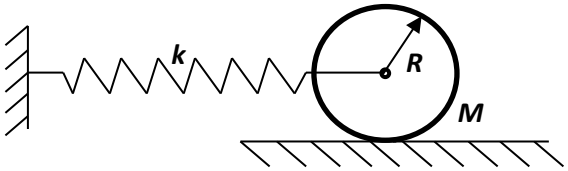
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, July 2020

Programme Name: M.Tech/RE **Semester : II**
Course Name : Rotor dynamics and condition monitoring
Course Code : MERE 7006 **Max. Marks : 100**
Nos. of page(s) : 03

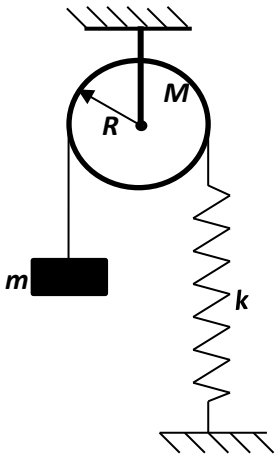
Instructions: Submit the assignment within 24 hrs after receiving it.

Q.1 A spring mass system has a stiffness of k N/m and a mass of M kg. It has natural frequency of 16 Hz. An extra 2 kg mass is coupled to the mass M and the natural frequency reduces to 4 Hz. Find k and M. [10 marks]

Q.2 A uniform hollow cylinder with end plates of negligible mass is attached to a spring as shown below. If cylinder rolls without slipping, then determine the natural frequency of the system. [10 marks]



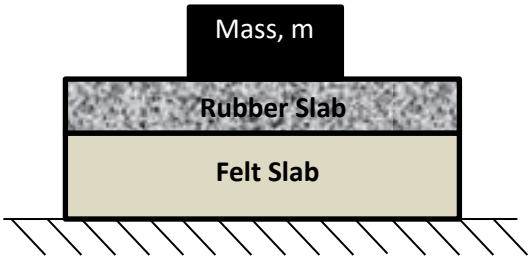
Q.3 A mass m supported by a light inextensible string is shown below. Determine natural frequency of the system. [10 marks]



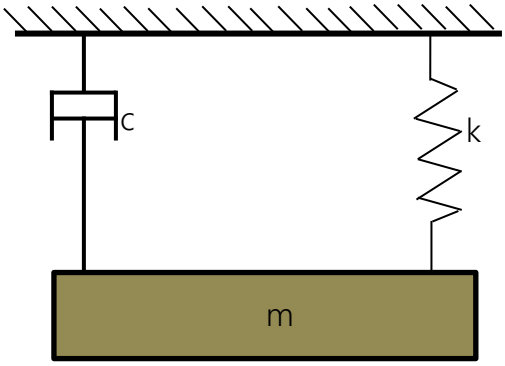
Q.4 The mass of a spring mass dashpot system is given an initial velocity of $c\omega_n$ from the equilibrium position. ω_n is the undamped natural frequency of the system. Find equation of motion for $\xi = 0.4$. [10 marks]

Q.5 Between a solid mass m of 10 kg and the rigid floor two slabs of isolators are placed as shown below. The rubber slab has a stiffness of 3000 N/m and equivalent damping coefficient of 105 N.s/m. The felt slab

has a stiffness of 12000 N/m and equivalent damping coefficient of 300 N.s/m. Calculate undamped and damped natural frequencies of the system. Neglect the mass of isolators. [15 marks]



Q.6 The amplitude of the system shown decreases to 25 % of the initial value after 5 consecutive cycles. Determine damping coefficient c of the system if k 40 N/cm and the mass m= 4 kg. [15 marks]



Q.7 A body of mass 5 kg is supported on a spring of stiffness 2000 N/m and a dashpot. The dashpot produces a resistance of 2 N at a speed of 1 m/s. in what ratio amplitude of vibrations will be reduced after 4 cycles? [15 marks]

Q.8 A rigid uniform bar of mass m and length L is pinned at O. A spring of stiffness coefficient k and a viscous damper of damping coefficient c, as shown below, support it. Measuring angular displacement θ from the static equilibrium position determine,
(A) Equation of motion for small θ
(B) Expression for undamped natural frequency [15 marks]