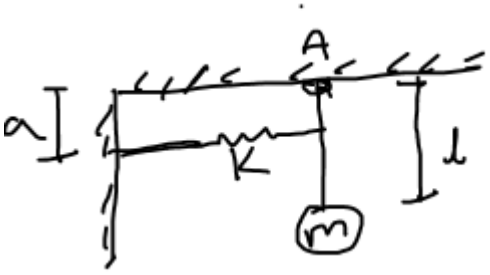
Name: **Enrolment No:**	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Vibration & Aeroelasticity **Semester: VII**
Program: B. Tech ASE **Time : 03 hrs.**
Course Code: ASEG 4013 **Max. Marks: 100**

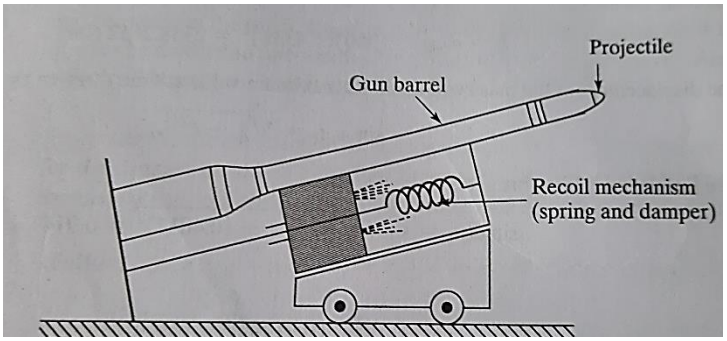
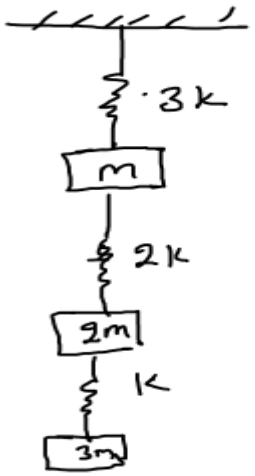
Instructions: Q.1-4 are True/False
Assume any suitable value for the missing data.

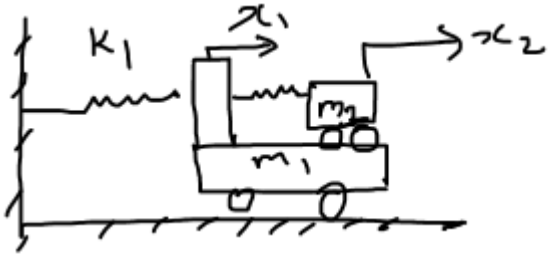
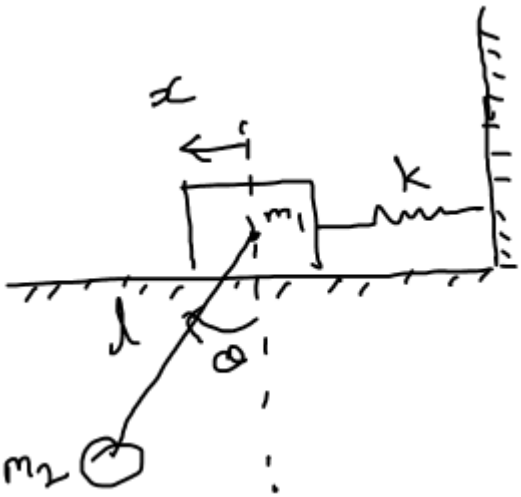
SECTION A
(5Qx4M=20Marks)

S.no.		Marks	CO
Q. 1	a) In semi definite system one of the natural frequency is infinite b) The number of natural frequencies in case of cantilever beam is infinite	**4**	**CO1**
Q. 2	a) System is said to be overdamped if damping factor is less than 1. b) Euler's buckling of column does not provide the value of deflection at any length of the column	**4**	**CO2**
Q. 3	a) For normal mode of vibration, the amplitude of mass is unity. b) Transmissibility is unity for the frequency ratio $\sqrt{2}$.	**4**	**CO2**
Q. 4	Determine the differential equation of spring controlled simple pendulum. assume the weight of the string is negligible.  .	**4**	**CO2**
Q. 5	State the difference between critically damped and overdamped systems.	**4**	**CO1**

SECTION B
(4Qx10M= 40 Marks)

Q.6	A gun barrel and the recoil mechanism have a mass of 500 kg with a recoil spring stiffness of 10000 N/m. the gun recoils 0.4 m upon firing.	**10**	**CO3**

	Find 1) the critical damping coefficient of the damper , 2) The initial recoil velocity of the gun, 3) the time taken by the gun to the return to a position 0.1 m from its initial position.  		
Q.7	Explain the divergence, derive an expression of divergence speed for 2 D wing.	**10**	**CO4**
Q.8	A machine 100 kg mass has a 20 kg rotor with 0.5 mm eccentricity. The mounting spring have k = 85 x 10^3 N/m and damping ratio = 0.02. The operating speed of machine is 600 rpm and the unit is constrained to move vertically. Find a) The dynamic amplitude of the macine b) The force transmitted to the supports	**10**	**CO3**
Q.9	The damped natural frequency of the system as obtained from a free vibration test is 9.8 rad/s. During the forced vibration test, with constant exiting force, on the same system, the maximum amplitude of the vibration is found to be 9.6 rad/s. Find the damping factor for the system and its natural frequency.	**10**	**CO2**
	SECTION-C **(2Qx20M=40 Marks)**		
Q.10	Using matrix method, find the natural frequencies of the system shown in fig. below. Determine the value of frequency if m = 100 kg and k == 200 n/m  	**20**	**CO3**

Q 11.	Determine the natural frequency of the system shown in fig. below $K_1 = 60$ N/ m , $K_2 = 40$ N/m , $m_1 = m_2 = 10$ kg.  **OR** Find the frequencies of the system shown in fig. below, K = 90 N/m, l = .25 m and $m_1 = 2$ kg, $m_2 = 0.5$ kg  	**20**	**CO4**