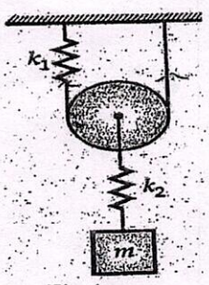
Exam.Code:0942
Sub. Code: 6732

2053
B.E. (Mechanical Engineering)
Sixth Semester
MEC-603: Mechanical Vibrations

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt <u>five</u> questions in all, including Question No. I which is compulsory and selecting two questions from each Section.

x-x-x

1	(a) Write the name of the different parts of a vibrating system (b) Define the term magnification factor. (c) What do you understand by transient vibrations? (d) What do you mean by Co-ordinate coupling? (e) Define semi definite system.	10
	Section A	
2	(a) A body is subjected to two harmonic motions as given below : $X_1 = 15 \cos(\omega t + \Pi/6)$, $X_2 = 8 \cos(\omega t + \Pi/6)$ What extra harmonic motion should be given to the body to bring it to static equilibrium?	5
	(b) A steel wire with $E = 1.96 \times 10^{11}$ N/m^2 is of 2mm diameter and is 30mm long. It is fixed at the upper end and carries a mass M kg at its lower end. Find M so that frequency of longitudinal vibration is 4 cycle/sec.	5
3	(a) Determine the natural frequency of the mass m=15 kg as shown in Fig.1 assuming that the cords do not stretch and slide over the pulley rim. Assume that the pulley has no mass. Given $K_1 = 18 \times 10^3$ N/m, $K_2 = 8 \times 10^3$ N/m  Fig.1	5
	(b) A mass of 1 kg is attached to a spring having a stiffness of 3920 N/m. The mass slides on a horizontal surface, the coefficient of friction between the mass and the surface being 0.1.Determine the frequency of vibrations of the system and the amplitudes after one cycle if the initial amplitude is 0.25 cm. Determine the final rest position.	5
4	(a) A single cylinder vertical petrol engine of total mass 320kg is mounted upon a steel chassis and causes a vertical static deflection of 2mm.The reciprocating parts of the engine have a mass of 24kg and move through a vertical stroke of 150mm with simple harmonic motion. A dashpot attached to the system offers a resistance of 490N at a velocity of 0.3 m/sec. Determine (i) The speed of the driving shaft at resonance (ii) The amplitude of steady state vibration when the driving shaft of the engine rotates at 480rpm.	6
	(b) Drive an expression for force transmissibility.	4

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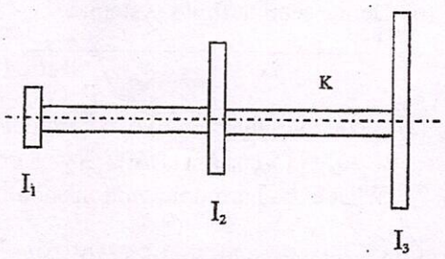
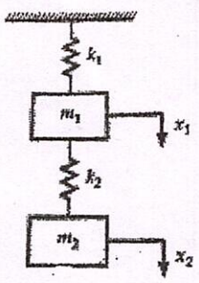
	Section B	
5	(a) Explain semi-definite system. Derive the equation of motion and also find the natural frequency of the system. (b) A steel shaft of diameter 10cm is carrying three masses 2.5 kg, 3.75 kg and 7 kg respectively as shown in Fig.2. The distances between the rotors are 0.70m. Determine the natural frequencies of torsional vibrations. The radii of gyration of three rotors are 0.20, 0.30 and 0.40 m respectively. Take $G= 9\times10^8$ N/m^2.  Fig.2	5 5
6.	Determine the natural frequencies and mode shapes of the spring mass system shown in the Fig.3.The mass m_1=1.5 kg, m_2=0.8 kg, and stiffness of the spring K_1=K_2=40N/m.  Fig.3	10
7	Find frequency equation of a uniform beam fixed at one end and free at the other for transverse vibrations.	10

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