Total No. of Questions : 10]

SEAT No. :

P2979

[Total No. of Pages : 4

[5154]-533
B.E. (Mechanical)
DYNAMICS OF MACHINERY
(2012 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) Determine the primary and secondary unbalanced forces in a V-90 engine. **[6]**

b) A wheel is mounted on a steel shaft ($G = 83 \times 10^9$ N/m^2) of length 1.5m and radius 0.80 cm. The wheel is rotated 5° and released. The period of oscillation is observed as 2.3 seconds. Determine the mass moment of inertia of the wheel. **[4]**

OR

Q2) a) Explain how maximum primary unbalance can be found in radial engines having four cylinders by direct and reverse crank method. **[4]**

b) A 20 kg mass is resting on a spring of stiffness 4700 N/m and dashpot with damping coefficient 147 N-sec/m in paralle. If a velocity of 0.10 m/sec is applied to the mass at rest position, determine its displacement from the equilibrium position at the end of first second. **[6]**

Q3) a) Explain the significance of negative damping. **[4]**

P.T.O.

b) The restroom door shown in Fig. 3a is equipped with a torsional spring with 25 Nm/rad as stiffness and a torsional viscous damper. The door has a mass of 60 kg and a centroidal moment of inertia about an axis parallel to the axis of the door's rotation is 7.2 kg-m^2. Assuming that the system is critically damped, determine the damping coefficient. **[6]**

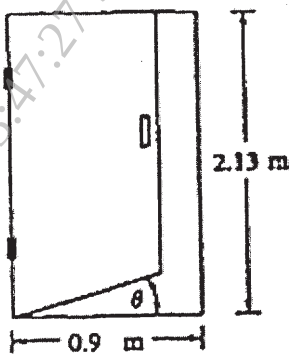

Fig. 3a

OR

Q4) a) Explain the significance of frequency response curves. **[4]**

b) A machine of mass 25 kg is placed on an elastic foundation. A sinusoidal force of magnitude 25 N is applied to the machine. A frequency sweep reveals that the maximum steady state amplitude of 1.3 mm occurs when the period of response is 0.22 seconds. Determine the equivalent stiffness and damping ratio of the foundation. **[6]**

Q5) a) Determine the natural frequencies of the system shown in Fig. 5a. **[12]**

k = 90 N/m, l =.25m, m_1 = 2kg, m_2 = 0.5 kg

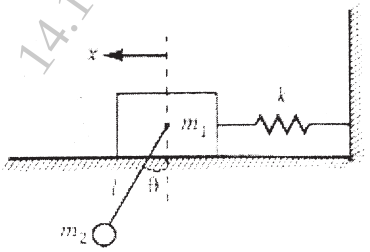

Fig. 5a

b) Explain with neat diagram mathematical model of a motorbike. **[4]**

OR

Q6) a) An automobile of mass 2000 kg has a wheel base of 2.5m. Its C.G. is

located 1.5m behind the front wheel axle and has a radius of gyration about C.G. 1.2m. The front springs have a combined stiffness of 4000 N/m and rear springs 4500 N/m. Refer Fig. 6a. **[12]**

Determine:

i) The natural frequency

ii) Amplitude ratio for two modes of vibration.

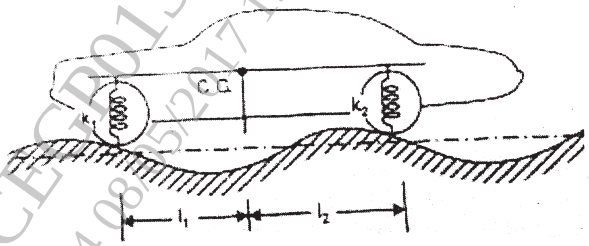

Fig. 6a

b) Explain with respect to 2DOF free vibration, torsionally equivalent shaft. **[4]**

Q7) a) Write a short note on: **[8]**

i) Using free vibrations to measure properties of a system.

ii) Using forced vibration response to measure properties of a system.

b) An electric motor running at 1500 rpm is mounted on five springs and the force transmitted is one eleventh of the impressed force. The weight of the motor is 125 N while the armature weighs 35 N with its center of gravity 0.05 cm from the rotational axis. Determine: **[8]**

i) Stiffness of each spring

ii) Natural frequency of the system

iii) Dynamic force transmitted to the base at operating speed.

OR

Q8) a) Explain with neat sketch working of vibration shaker. **[8]**

b) Vibrations of a machine tool structure subjected to an excitation at 2 Hz is measured using a seismic instrument whose natural frequency is 5 Hz. The relative displacement shown is 0.4 μm. Determine the acceleration of the machine tool structure. **[8]**

Q9) a) Explain the working of sound meter neat diagram. **[6]**

b) Explain reverberation chamber and anechoic chamber. **[6]**

c) Determine the sound pressure level for a sound with rms sound pressure of 2 N/m^2 and 0.4 N/m^2. **[6]**

OR

Q10)a) Define the following terms: **[8]**

i) sound power level

ii) sound pressure level

iii) sound intensity

iv) decibel scale

b) Given four machines producing 100dB, 91dB, 90 dB and 89 dB. What is the total sound pressure level? **[4]**

c) What is sound enclosure? Describe any one type. **[6]**