Total No. of Questions : 12] SEAT No. :

P1933 [Total No. of Pages : 4

[5254]-32

B.E. (Mechanical) (Common to Mechanical Sandwich)

DYNAMICS OF MACHINERY

(2008 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer to the two sections should be written in the separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to right indicate full marks.***
5) ***Use of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator & Steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you mean by Primary and Secondary Balancing in Reciprocating Engines? **[6]**

b) Three masses A, B & Care mounted on a shaft. The planes of A and B are 100 cm apart whereas the planes of B and C are 75 cm apart. The masses A, B and C are of 30 kg, 40 kg and 32 kg and have their centre of gravity at a distance of 35 mm, 20 mm and 30 mm respectively from the shaft axis. Find the angular position of all the masses from positive x-direction so that static balance is achieved.

It is required to place weights at a radial distance of 25 cm so that complete balance is achieved. If the weights are to be placed in A and C, calculate the magnitude and angular positions of desired masses. **[12]**

OR

Q2) a) Differentiate between Static & Dynamic Balancing. Why there is need of accurate dynamic balancing of high speed machines? **[6]**

b) An air compressor has four in - line cylinders at 90° intervals. The crank radius is 140 mm, while the connecting rod is 560 mm long for each cylinder. The mass of reciprocating parts is 20 kg for each cylinders and the speed of the rotation is 600 rpm. The cylinders are 300 mm apart. Show that there are no out of balance primary and secondary forces and determine the corresponding magnitudes of primary and secondary couples. **[12]**

P.T.O.

Q3) a) Define the following terms used in vibrations : **[4]**

i) Amplitude of Vibrations

ii) Resonance

iii) Forced Vibrations

iv) Damped Vibrations

b) What is Logarithmic Decrement? Derive the relations. **[6]**

c) Determine the Natural frequency of a Simple pendulum by using FBD Method and Energy Method, neglecting the mass of the rod. **[6]**

OR

Q4) a) Define the following terms : **[4]**

i) Damping Factor

ii) Coulomb Damping

iii) Damping Coefficient

iv) Critical Damping Coefficient

b) Derive the relation for the Natural Frequency of Free Torsional Vibrations. **[6]**

c) An under damped shock absorber is to be designed for a motor cycle of mass 200 kg such that during a road bump, the damped period of vibration is limited to 2 seconds and the amplitude of vibrations should reduce to one - sixteenth in one cycle.

Find **[6]**

i) Spring Stiffness

ii) Damping Coefficient of Shock Absorber

Q5) a) What are frequency response curves ? Mention the significance of these curves. **[6]**

b) A machine part of mass 2 kg vibrates in a viscous medium. Determine the damping coefficient when a harmonic exciting force of 35 N results in resonant amplitude of 12.5 mm with a period of 0.2 sec. If the system is excited by a harmonic force of frequency 4 Hz, what will be the percentage increase in the amplitude of vibration when damper is removed as compared with that with damping? **[10]**

OR

Q6) a) Explain the following terms. **[6]**

i) Force Transmissibility

ii) Vibration Isolation

b) A mass of 250 N is supported by a spring and dashpot. The spring is stretched by 150 mm due to weight and the dashpot has the coefficient of damping 1000 N per meter per sec. If the support oscillation is S.H.M. with amplitude 25 mm and frequency 6 rad/sec, find **[10]**

i) The amplitude of the Load.

ii) The relative amplitude between Load and Support.

iii) The amplitude of the load when the frequency of disturbing force is equal to the natural frequency.

iv) The amplitude of the load when the dashpot has been grounded frequency of the support is 6 rad/sec.

SECTION - II

Q7) a) Explain the Torsional Vibrations of a Geared system by **[8]**

i) Neglecting inertia of gears

ii) Considering inertia of gears

b) A rotor of 10 kg mass is mounted midway on a 2 cm diameter, horizontal shaft supported at the ends by two bearings. The bearing span is 80 cm. Because of certain manufacturing defect, the C. G. of the rotor is 0.01 mm away from its geometric centre, If the system rotates at 3000 rpm, determine the amplitude of the steady state vibration and dynamic load transmitted to the bearings. [Take $E = 2 \times 9.81 \times 10^{10} N/m^2$] **[10]**

OR

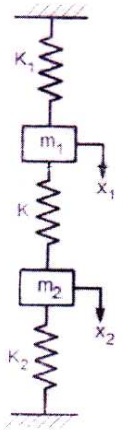
Q8) a) Explain the concept of "Torsionally Equivalent Shaft". **[6]**

b) Determine the natural frequencies of the system shown in the figure. **[12]**

Given : $K_1 = K_2 = 40$ N/m

$K = 60$ N/m

$M_1 = m_2 = 10$ kg.



Q9) a) Explain the following terms : **[4]**

i) Sound Pressure level

ii) Sound Power Level

iii) Acoustic Intensity

iv) Sound Absorption Coefficient

b) Derive an equation that gives relation between Sound Intensity Level and Sound Pressure Level. **[6]**

c) A customer care containing six officers, individually makes noise level of 60, 56, 62, 53, 51 and 54 dB respectively. Add the noise levels when **[6]**

i) All Officers are working.

ii) When first and second officers are not working.

OR

Q10)a) Write a short note on" Sound Level Meter". **[4]**

b) What is Sound Enclosure ? Describe any one type of Sound Enclosure. **[6]**

c) Explain radiation Fields of a Sound Source with a Neat Sketch. **[6]**

Q11)a) Write a short note on " Vibration Isolators". **[4]**

b) Explain Frahm's Reed Tachometer with a neat sketch. **[6]**

c) Explain with a neat sketch, the working principle of a Centrifugal Pendulum Absorber. **[6]**

OR

Q12)a) Explain Piezoelectric Accelerometer with a neat sketch. **[4]**

b) A vibrometer has a period of free vibration of 2 sec. It is attached to a machine with a vertical harmonic frequency of 1 Hz. If the vibrometer mass has an amplitude of 2.5 mm relative to the vobrometer frame, what is the amplitude of vibration of the machine? **[6]**

c) Explain the working principle of Frahm's Vibration Absorber. **[6]**