B.TECH. SEM -VII MECHANICAL 2014 COURSE (CBCS) : WINTER - 2017

SUBJECT: MECHANICAL VIBRATION

Day : **Friday**
Date : **12/01/2018**

Time : **02.30 PM TO 05.30 PM**
Max. Marks: 60

W-2017-2309

N. B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use non-programmable **CALCULATOR** is allowed.
4) Assume suitable data, if necessary.

Q. 1 **a)** Explain longitudinal & transverse vibration with figure. **[06]**

b) Define : simple harmonic motion and natural frequency. **[04]**

OR

a) What are the causes of vibration? How the effect of undesirable vibration can be reduced? **[06]**

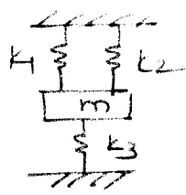
b) What are the types of vibration? **[04]**

Q.2 **a)** Explain Rayleigh's method for getting equation of motion in vibration system. **[06]**

b) Explain torsion vibration system with figure. **[04]**

OR

a) Find natural frequency of following system. **[04]**
$k_1 = k_2 = 1000$ N/m,
$k_3 = 2000$N/m,
m = 11kg.



b) A spring mass system with mass (m) and stiffness (K) N/m has natural frequency (F). Find stiffness (K) of another spring which when arrange with conjunction with spring with stiffness (K) in series will lower natural frequency by 20%. **[06]**

Q.3 In spring mass system, m = 10 kg, K = 16 KN/m, C = 1600 N-sec/m mass is displace by point 0.1m and release with velocity 2m/s in direction of return motion. Find: **[10]**

i) Displacement of mass after 0.01 sec.
ii) Damping factor
iii) Circular frequency

OR

a) In spring mass system k = 30 KN/m, m = 100 kg and damping provide is any 25% of its critical value. Find: **[06]**

i) Damping ratio
ii) Critical damping coefficient
iii) Damped natural frequency.
iv) Logarithmic decrement
v) Ratio of two successive amplitude

b) Explain displacement-time plot with help of under damped, over damped and critical damped condition. **[04]**

P.T.O.

Q.4 **a)** Electric motor of mass 25 kg is mounted on rubber pad which deflect by 1 mm to motor weight. rotor weight 5 kg has eccentricity 0.1 mm and rotate at 1500 rpm. Find amplitude of vibration of motion and transmitted to foundations under following condition. **[06]**

i) No damping **ii)** Damping factor = 0.1.

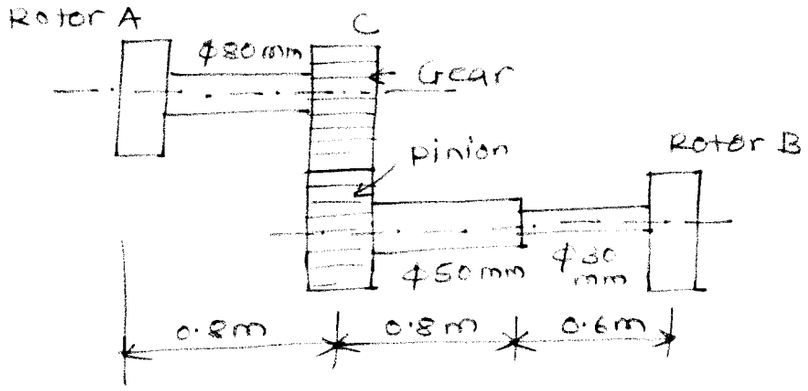
b) Write short note on Critical speed of Shaft with derivation. **[04]**

OR

Electric motor is supported on spring and dashpot. The spring has stiffness 5000 N/m and dashpot after resistance 300 N at 2.5 m/s. The unbalance mass 1.5 kg rotates at 50 mm radius and total mass of electric motor is 50 kg. If the motor runs at 340 rpm find: **[10]**

i) Damping factor
ii) Steady state vibration amplitude
iii) Phase angle
iv) Resonance speed
v) Amplitude at resonance

Q. 5 In geared system shown in figure. The mass of moment of inertia of ratio A and B are 2 kg/m^2 and 0.3 kg/m^2 gear ratio between rotor B and A is 3. Find node position and natural frequency of torsion oscillation. Ignore inertia and gears and shaft. G = 80 × 10^9 N/m^2. **(10)**



OR

a) Explain Holzer method for finding natural frequency and mode shape of multi-rotor vibration system. **[06]**

b) Explain concept of torsionally equivalent shaft. **[04]**

Q.6 **a)** Explain principle of vibrometer and Accelerometer. **[04]**

b) Classify microphone and explain any one of hem **[06]**

OR

a) What is vibration monitoring and explain various types of techniques used? **[06]**

b) Write short note on velocity measurement instrument. **[04]**