Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (ME) (Sem.–7th & 8th)

MECHANICAL VIBRATIONS

Subject Code : ME-408

Paper ID : [A0841]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) What do you mean by vibration?

b) Define the degree of freedom of a vibrating system.

c) Differentiate between longitudinal and transverse vibrations.

d) What is semi definite system?

e) Define whirling speed of shafts.

f) What is structural damping?

g) What is the difference between a vibration absorber and vibration isolator?

h) Explain the term resonance.

i) What is orthogonality principle?

j) Write the limitations of Dunkerlay's method.

SECTION - B

2. Draw a neat sketch of centrifugal pendulum absorber and explain its working.

3. A spring mass system has spring stiffness k N/m and mass of m kg. The natural frequency of the system is 12 Hz. When an extra 2 kg mass is coupled to m, the natural frequency reduces by 2 Hz. Find the value of k and m.

4. A machine of mass one tonne is acted upon by an external force of 2450 N at a frequency of 1500 rpm. To reduce the effect of vibration, isolator of rubber having a static deflection of 2mm under the machine load and an estimated damping ratio of 0.2 are used. Determine

   (a) the force transmitted to the foundation

   (b) the amplitude of vibration of machine and

   (c) the phase lag.

5. A vibration of a cantilever are given by $y = y_1(1-\cos(\pi x/2l))$. Calculate frequency using Rayleigh's method using data: $E = 2 \times 10^{11}$ N/m^2, $m = 6 \times 10^4$ kg, $l = 30$ m, and $I = 0.02$ m^4.

6. Draw a neat sketch of dry friction damper and explain its working.

SECTION - C

7. A machine runs at 5000 rpm. Its forcing frequency is very near to its natural frequency. If the nearest frequency of the machine is to be at least 20% from the forced frequency, design a suitable vibration absorber for the system. Assume the mass of the machine as 30 kg.

8. A bar of uniform cross-section having length l is fixed at both ends. The bar is subjected to longitudinal vibrations having a constant velocity V_0 at all points. Derive suitable mathematical expression of longitudinal vibration in the bar.

9. Write short notes on the following :

   (a) Accelerometers.

   (b) Eddy current damping.