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

Total No. of Questions : 09

B.Tech.(ME) (Sem.–7,8)

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) Define Mechanical Vibrations.

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

c) Differentiate between Linear and non linear vibrations

d) Define spring stiffness and damping constant.

e) Define whirling speed of shafts.

f) Define the hysteresis damping constant.

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

h) What is an accelerometer?

i) What is orthogonality principle?

j) What is basic assumption in deriving Dunkerlay's formula?

SECTION-B

2. Explain the principle of dynamic vibration absorber? What is the main disadvantage of such an absorber?

3. Find the damping factor of a vibrating system which consists of a mass of 3.5 kg a spring stiffness 2.5 N/mm and a damper of damping coefficient 0.018 N/mm/s. What is the natural frequency of damped vibration?

4. A 50 kg mass is attached to a base through a spring in parallel with a damper. The base undergoes a harmonic excitation of $y(t) = 0.2 \sin(30t)$. The stiffness of the spring is 3×10^4 N/m and the damping constant is 200 Ns/m. Determine

   (a) the amplitude of the mass's absolute displacement

   (b) the amplitude of its displacement relative to its base.

5. A compressor weighing 600 N and operating at 1000 rpm, is mounted on six parallel springs of stiffness 6000 N/m each. Determine the maximum permissible unbalance in order to limit the steady state deflection to 2.5 mm peak-to-peak.

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

SECTION-C

7. A solid shaft is loaded as shown in figure below. Determine the natural frequency of vibration for the system. (Take $E = 2.1\times10^{11}$ N/m^2)

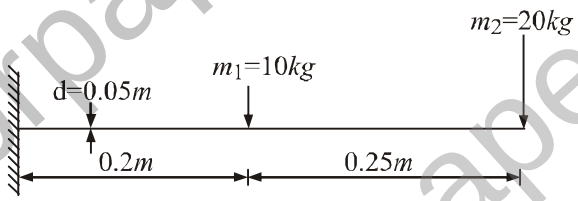

Fig.

8. A uniform string is tightly stretched between $x = 0$ and $x = l$ and is plucked at $x = l/4$, through a distance h and then released from rest. Find its subsequent displacement.

9. Write a short note on the following :

   a) Stodola method.

   b) Torsional vibration of a circular shaft.