

Roll No.

Total No. of Questions : 091

[Total No. of Pages : 02]

B.Tech. (Sem. - 7th/8th)
MECHANICAL VIBRATIONS
SUBJECT CODE : ME - 408
Paper ID : [A0841]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section - A

Q1)

(10 × 2 = 20)

- a) What are Mechanical Vibrations?
- b) Define degrees of freedom?
- c) What are damped vibrations?
- d) What is magnification factor?
- e) Define whirling speed?
- f) What do you mean by torsionally equivalent shaft?
- g) Define influence coefficient?
- h) What is orthogonality principle?
- i) What are continuous systems?
- j) Define viscous damping?

Section - B

(4 × 5 = 20)

Q2) A harmonic motion has amplitude of 0.05m and a frequency of 25Hz. Find the time period, maximum velocity and maximum acceleration?

Q3) A cantilever shaft 50mm diameter and 300mm long has a disc of mass 100kg at its free end. The young's modulus for the shaft material is 200GN/m². Determine the frequency of longitudinal and transverse vibrations of the shaft.

- Q4)** A gun barrel of mass 600kg has a recoil spring of stiffness 295000N/m. If the barrel recoils 1.3 m on firing, determine the initial recoil velocity of the barrel and the critical damping coefficient of the dashpot which is engaged at the end of the recoil stroke.
- Q5)** In a vibrating system of mass of 3kg vibrates in a viscous medium. A harmonic force of 30N acts on the system and causes resonant amplitude of 15mm with a period of 0.25 second. Find the damping coefficient.
- Q6)** (a) Explain the working principle of a centrifugal pendulum vibration absorber with the help of a neat sketch.
(b) For damped free vibration system, derive the equation for amplitude for under-damped and over-damped system.

Section - C

(2 × 10 = 20)

- Q7)** 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.
- Q8)** Determine the normal functions for free longitudinal vibration of a bar of length l and uniform cross-section. One end of the bar is fixed and other end is free.
- Q9)** Write short note on any two of the following :
- (a) Dunkerley's method.
 - (b) Eddy current damping.
 - (c) Accelerometer.

