Printed Pages:02 **Sub Code:KME 057**

Paper Id: 231675 **Roll No.**

B.TECH.
(SEM V) THEORY EXAMINATION 2022-23
MECHANICAL VIBRATIONS

Time: 3 Hours ***Total Marks: 100***

Note: Attempt all Sections. If you require any missing data, then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2x10 = 20

(a) Distinguish between periodic motion and harmonic motion.
(b) What do you mean by the degree of freedom?
(c) Define the Magnification Factor.
(d) Is it possible to completely balance a rotating system? Explain
(e) State Orthogonality Principle.
(f) What do you mean by two-degree freedom systems?
(g) What do you mean by static coupling?
(h) What do you mean by influence coefficients?
(i) What do you mean by Whirling of Shaft?
(j) Why Critical Speed of the shaft is so important?

SECTION B

2. Attempt any *three* of the following: 10x3 = 30

(a) What do you mean by Vibrations? Classify Vibrations systems with suitable diagram.
(b) A rotor of mass 20 kg is mounted on a shaft of 1000 mm span and 40 mm diameter in short bearings. The centre of gravity of the rotor is 0.04 mm away from the geometric centre of the rotor. If the rotor runs at 2500 r.p.m., find the amplitude, steady state vibration and dynamic load transmitted to the bearing. Take E = 200 GPa.
(c) Explain the working of the Centrifugal pendulum absorbers in detail with a schematic diagram.
(d) Explain Rayleigh's method for finding the natural frequency of a multi-degree system.
(e) What do you mean by secondary critical speed?

SECTION C

3. Attempt any *one* part of the following: 10x1 = 10

(a) Derive the equation of motion by the help of D'Alembert's principle.
(b) Define logarithmic decrement and show that logarithmic decrement 'δ' is given by $\delta = \frac{1}{n} ln \frac{A_o}{A_n}$

4. Attempt any *one* part of the following: 10 x1 = 10

(a) Derive an expression for the magnification factor and discuss its variation with frequency ratio.

(b) Explain with a neat sketch the working principle of displacement measuring instruments.

5. Attempt any *one* part of the following: 10x1 = 10

(a) Explain the working of the torsional vibration absorber in detail with a schematic diagram.

(b) How the natural frequency of torsional vibrations for a two-rotor system is obtained?

6. Attempt any *one* part of the following: 10x1 = 10

(a) Discuss Holzer's method for finding the natural frequencies of multi-rotor vibrating systems.

(b) Derive an expression for forced vibration of multi-degree freedom systems.

7. Attempt any *one* part of the following: 10x1 = 10

(a) A rotor having a mass of 6 kg is mounted midway on a12 mm diameter shaft supported at the ends by two bearings. The bearing span is 500 mm. Because of certain manufacturing in accuracies, the C.G. of the disc is 0.04 mm away from the geometric centre of the rotor. If the system rotates at 2500 rpm, find the amplitude of steady-state vibrations and the dynamic force transmitted to the bearings. Neglect damping and take $E = 1.96 \times 10^{11}$ N/m^2. Assume the shaft to be simply supported.

(b) Discuss the critical speed of a shaft having multiple discs.