Printed Pages: 3 **Sub Code:NME013**

Paper Id: 140240 **Roll No.** | | | | | | | | | | |

B. TECH.
(SEM VI) THEORY EXAMINATION 2018-19
MECHANICAL VIBRATIONS

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

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

a. What do you mean by vibrations? What methods are employed to eliminate or reduce undesirable vibrations?
b. What do you mean by simple harmonic vibrations?
c. What do you mean by critical damping? Explain its importance in brief.
d. What do you mean by logarithmic decrement?
e. Differentiate between forced and free vibrations.
f. A harmonic motion has amplitude of 0.05 m and frequency of 25 Hz. Find the time period, maximum velocity and maximum acceleration.
g. What do you mean by vibration isolation?
h. What do you mean by critical speed of shaft? What are the factors which affect it?
i. Represent through diagram a single degree and a two degree freedom system.
j. What do you mean by influence coefficients?

SECTION B

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

a. Explain Rayleigh's method for finding natural frequency of multi degree system.
b. Determine the steady-state response of the system of Figure 1.

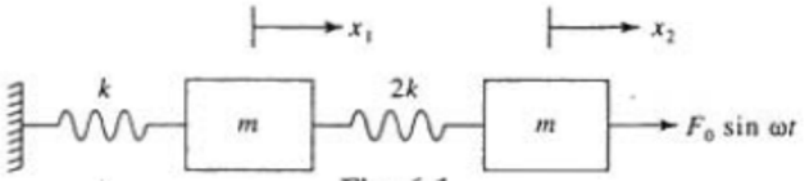

Figure 1

c. Derive the expression of total response for absolute motion of damped forced vibration and also draw the characteristic curve.
d. Explain the working of any vibration measuring equipment with suitable diagram.
e. Represent the motion by harmonic series shown in figure 2.

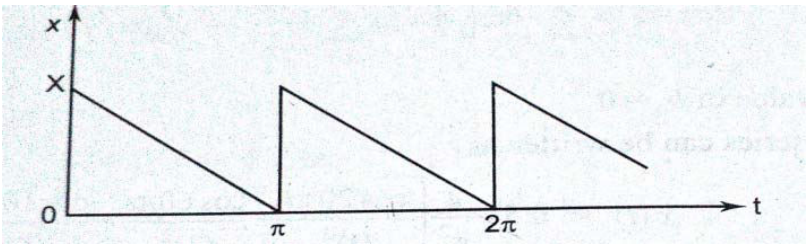

Figure 2

SECTION C

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

a. Find the equation of motion and also find the natural frequencies of the system shown in figure 3

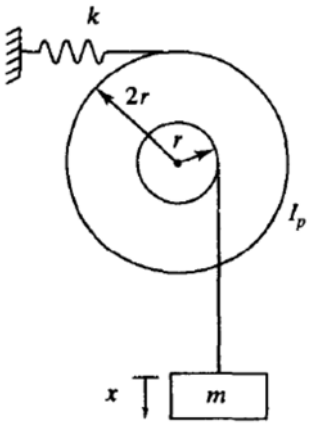

Figure 3

b. A mass of 1 kg is to be supported on a spring having a stiffness of 9800 N/m. The damping coefficient is 5.9 Ns/m. Determine the natural frequency of the system. Also find the logarithmic decrement and the the amplitude of vibrations after three cycles if the initial displacement is 0.3 cm.

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

a. A 1000 kg machine is mounted on four identical springs of total spring constant k and having negligible damping. The machine is subjected to a harmonic external force of the amplitude 490 N and frequency 180 rpm. Determine the amplitude of vibratory motion of the machine and maximum force transmitted to foundation because of the unbalanced force when k = 1.96×10^6N/m.

b. The damped natural frequency of a system as obtained from a free vibration test is 9.8 Hz. During the forced vibration test with constant exciting force on the same system the maximum amplitude of vibration is found to be at 9.6 Hz. Find the damping factor for the system and its natural frequency.

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

a. Determine the frequency equation for the system shown in figure 4, where x_1 is block displacement and x_2 bob displacement

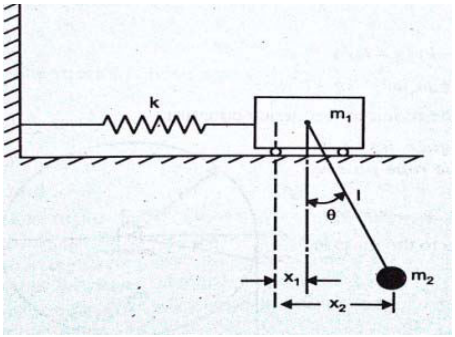

Figure 4

b. What do you mean by Undamped dynamic vibration absorber? Explain its working principle with example.

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

a. Determine the normal functions in transverse vibration for a simply supported bam of length l and uniform coss-section.

b. Determined the flexibility influence coefficient for the system shown in figure. Take E=210x 10^9 N/m^2

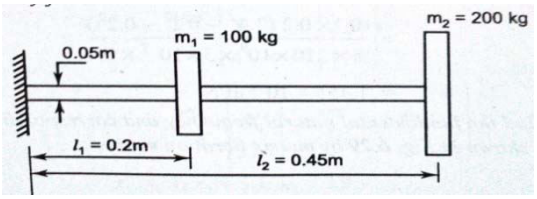

Figure 5

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

a. A rotor of mass 10 kg is mounted in the middle of 20 mm diameter shaft supported at the two bearings. The bearing span is 500 mm. Because of certain manufacturing inaccuracies, the C.G of the disc is 0.03mm away from the geometric centre of 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. Take E = 2 x 105 N/mm2.

b. For a system shown in figure 6 obtain the natural frequencies by Holzer's method. Take m1 = m2 = 1 unit, k1 = k2 = 1 unit, k3 = 2unit.

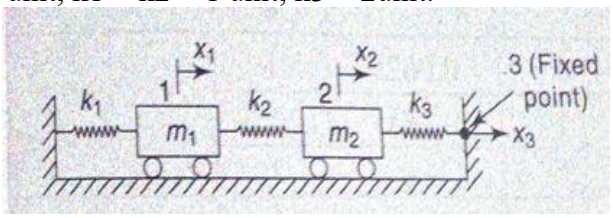

Figure 6