6. Define orthogonality principle. Find out the natural frequency of a simple supported beam loaded at midpoint of the beam using Dunkerley's method. **15**

Unit IV

7. Explain working principle of piezoelectric accelerometer with net sketch. Briefly discuss about the amplitude and phase measurement. **15**

8. Discuss the concept of 1X, 2X and 3X vibration signals in rotating mahines. Also define condition monitoring ? Explain its needs and various types. **15**

H-62

B. Tech. EXAMINATION, May 2017

(Eighth Semester)

(Main & Re-appear)

ME

ME-404-B

MECHANICAL VIBRATION

Time : 3 *Hours*]   [*Maximum Marks :* 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Motion of a particle is represented by the equation $x = 4 \sin \omega t$. Sketch roughly the variation of the maximum of (i) Displacement, (ii) Velocity, (iii) Acceleration, and (iv) Jerk.   **6**

(b) Show that two simple harmonic motions with frequency p and $2p$ when added will result in a periodic function of frequency p. Generalize the above for a number of harmonic functions with frequencies p, $2p$, ..., np etc.   **9**

2. (a) Discuss in detail about viscous damping. **6**

(b) Define critical damping constant and damping ratio. Depending upon the value of damping ratio derives the relation for displacement and velocity in case of over damped system.   **9**

Unit II

3. A vibrating body is supported by six isolators each having stiffness 32000 N/m and 6 dashpots having damping factors as 400 N-s/m. The vibrating body is to be isolated by a rotating device having amplitude of 0.06 mm at 600 r.p.m. Take m = 30 kg. Determine : (a) Amplitude of vibration of body, (b) Dynamic load on each isolator due to vibration.   **15**

4. The spring of an automobile trailer are compressed 0.1 m under its own weight. Find the critical speed when the trailer is passing over a road with a profile of sinewave whose amplitude is 80 mm and the wavelength is 14 m. Find the amplitude of vibration at a speed of 60 km/hr.   **15**

Unit III

5. 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. **15**