AU/ME - 7O3
B.E. VII semester
Examination, December 2014
Mechanical Vibration & Noise Engineering
Time : Three Hours
Maximum Marks : 70
http://www.rgpvonline.com

Note: i) Attempt all questions. All questions carry equal marks.
ii) Assume suitable data and make suitable assumptions if required.
iii)Draw neat sketches wherever necessary.

1. a) Explain Beat's phenomenon by considering a particle subjected to two different harmonic motions. A body, suspended from a spring, vibrates vertically up and down between two positions 3 cm and 5 cm above the ground. During each second it reaches the top position (5cm above ground) twenty times. Find out the frequency (in cycles per second), circular frequency (in radians per second), time-period and amplitude of vibrations of the body.

Or

a) Define and explain following terms related to vibration:
i) Natural frequency of vibrations.
ii) Fundamental mode of vibration.
iii) Degree of freedom of vibration system.

b) Add the two harmonics

$x_1 = 4\sin(\omega t + 15°)$ and $x_2 = 3\cos(\omega t - 15°)$

expressing them in the form $x = X \sin(\omega t + \phi)$. Check the solution graphically.

2. a) What do you understand by under-damped system, over damped system and critically-damped system? Explain.

b) A 25 kg. mass is resting on a spring of 5 kN/m stiffness and a dashpot of 150 N-s/m damping coefficient in parallel. If a velocity of 0.1 m/s is given to the mass at rest position. What will be its displacement from the equilibrium position at the end of first second?

Or

a) Define and explain various types of damping.

b) For a viscously damped system, show that the specific. damping capacity of the system is a constant quantity.

3. a) What do you understand by resonance? Explain the condition at which resonance occurs. What happens to the response of an undamped system at resonance? Why is damping considered only in the neighborhood of resonance in most cases.

b) The rotor of a turbo super charge of mass 9 kg is keyed to the centre of a 25min diameter steel shaft 40 cm between bearings. Determine:
i) The critical speed of shaft
ii) The amplitude of vibration of th rotor at a speed of 3200 rpm, if the eccentricity is 0.015 mm.
iii) The vibratory force transmitted to the bearings at this speed. Assume the shaft to be simply supported and the shaft material has a density of 8 x 103 kg/m3. Take E = 2.1 x 1011N/m2.

Or

a) What do you understand by critical speed of shall? Explain Also explain secondary critical speed of shaft.

b) A bodreternass 70 kg is suspended from a spring which deflects 2 cm under the load. It is subjected to a damping effect adjusted to a value 0.23 times that required for critical damping. Find the natural frequency of the damped vibration and ratio of successive amplitudes. If the body is subjected to a periodic disturbing force of 700 N and of frequency equal to 0.78 times the natural undamped frequency. Find the amplitude of forced vibrations and the phase difference with respect to the disturbing force.

4. Write detailed notes on any two of the following:
a) Undamped free vibration of two degrees of freedom system and principal modes of vibrations.
b) Coordinate coupling.
c) Dynamic vibration absorber.
d) Torsional vibration absorber.

5. Write detailed notes on any two of the following
a) A The decibel scale
b) Octave band analysis
c) Noise standards and Limits
d) Industrial noise control