Government College of Engineering, Aurangabad

(An Autonomous Institute of Government of Maharashtra)

M.E. (Mech. Design) PT Examination

End Semester Examination Nov. 2016

ME 513: Mechanical Vibrations Analysis

Time: Three Hours

12 2 NOV 2016

Max. Marks: 60

"Verify the course code and check whether you have got the correct question paper" Instructions:

- 1. All questions are compulsory.
- 2. Figures to the right indicate full marks and equal in subquestions.
- 3. Assume suitable data if necessary.
- 4. Use of non-programmable calculator is allowed.

Q.1: Attempt any two.

(16)

- (i) A single-degree of freedom viscously damped system has a spring stiffness of 6000 N/m, critical damping constant of 0.3 N-s/mm and a damping ratio of 0.3. If the system is given an initial velocity of 1 m/s, determine the maximum displacement of the system.
- A spring mass system with various damping is displaced through a distance x_0 and then released. Find the equations of motion when:

(a) $\xi = 2.0$

(b) $\xi = 0.2$

(c) $\xi = 1.0$

- (iii) Define transmissibility. Explain the following:
 - (a) Force transmissibility
 - (b) Motion transmissibility

Q.2: Attempt any two.

(16)

(i) Determine the natural frequencies and principle modes of vibrations for a car for following conditions:

Weight = 2000 kg

C.G. = 1.40 m from front axle

Wheel base = 3.0 m

Radius of gyration about C.G. = 1.1 m

K (front axle) = 6000 kg/cm

K (rear axle) = 6500 kg/cm

- (ii) Explain the construction and working of torsional vibration absorber with neat sketch.
- (iii) What are influence coefficients? Explain the method of influence coefficients to determine the frequencies of multi-degree freedom systems.

Q.3: Attempt any two.

(16)

- (i) Derive the wave equation for torsional vibrations of a uniform shaft.
- (ii) Explain the various materials and their properties used for vibration isolators.
- (iii) Explain the Fourier series method for the solution of non-linear vibrations.

Q.4: Write short notes on any two.

(12)

- (i) Types of vibrations
- (ii) Co-ordinate coupling
- (iii) Phase plane trajectories
- (iv) Vibration measuring instruments