PVP 12

Code: **MEMD2T2**

I M.Tech - II Semester - Regular Examinations – September 2015

MECHANICAL VIBRATIONS
(MACHINE DESIGN)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) Explain various types of damping. 7 M

   b) Derive the differential equation for an undamped single degree of freedom system. 7 M

2. a) Explain the role of rotating unbalance in forced vibrations of a single degree of freedom system. 7 M

   b) A seismic instrument with a natural frequency of 6 Hz is used to measure the vibration of a machine running at 120 rpm. The instrument gives the reading for the relative displacement of the seismic mass as 0.05 mm. Determine the amplitudes of displacement, velocity and acceleration of the vibrating machine. Neglect damping. 7 M

3. a) Explain undamped dynamic vibration absorber with suitable sketch. 7 M

b) A two degree of freedom system is excited by a Harmonic force, $F = F_o \sin \omega t$, determine the response of the system. 7 M

4. Consider the three degrees of freedom system shown in Figure-1. Derive the equations of motion using flexibility coefficients approach. Assume the Tension 'T' in the string is constant. 14 M

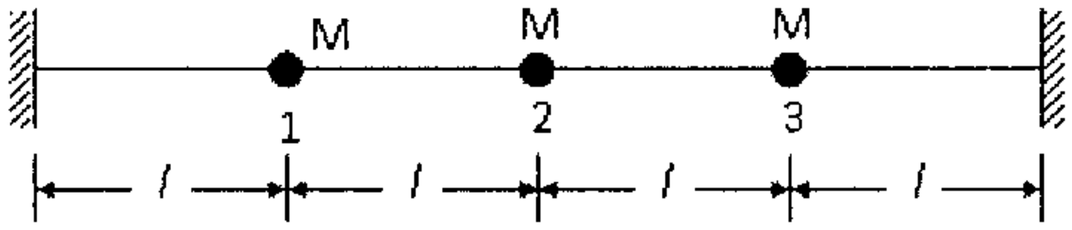

Figure-1

5. Find by using Stodola's method the lowest natural frequency of the system shown in figure-2.

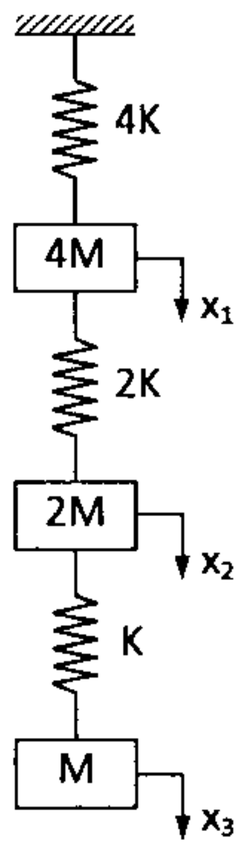

Figure-2

6. A uniform string of length 'l' fixed at both ends has a large initial tension. It is plucked at x = l/3 through a distance a_0 and released. Determine the subsequent motion. 14 M

7. A disc of mass 4 kg is mounted midway between bearings which may be assumed to be simple support. The bearing span is 48 cm. The steel shaft which is horizontal is 9 mm in diameter. The c.g. of the disc is displaced 3 mm from the geometric centre. The equivalent viscous damping at the centre of the disc-shaft may be taken as 49 N-sec/m. If the shaft rotates at 760 rpm, find the maximum stress in the shaft and compare it with dead load stress in the shaft. Also find the power required to drive the shaft at this speed.

14 M

8. a) Derive an expression for the response of a damped spring mass system to an impulsive input. 7 M

b) Find L[f(t)] from first principles, if f(t) = sin ωt. 7 M