PVP 17

Code: **17MEMD1T3**

I M.Tech - I Semester – Regular Examinations – February 2018

MECHANICAL VIBRATIONS
(MACHINE DESIGN)

Duration: 3 hours Max. Marks: 60

Answer the following questions.

1. a) Explain the response of single degree freedom system under coulomb damping with sketches. 8 M

   b) For spring- mass- damper system m=50 kg, k=5000N/m. find i) critical damping coefficient ii) damped natural frequency when $c=0.5c_c$ and iii) logarithmic decrement 7 M

OR

2. a) A simple harmonic motion has displacement amplitude of 0.30 cm and a period of 0.20 sec, determine :

   i) Maximum velocity and acceleration

   ii) if the harmonic motion has a frequency of 15 cycles/sec and its maximum velocity is 5m/s, determine its displacement amplitude, period and maximum acceleration . 7 M

   b) Explain elementary parts of vibrating systems. 8 M

3. A harmonic force of amplitude 200N and frequency 5HZ acts on the mass of a damped single-degree of freedom system having m=10kg, k=200N/m and c=50Ns/m.

Determine the complete solution representing the motion of the mass, if the initial displacement and velocity of the mass are 10mm and 5m/s respectively. 15 M

OR

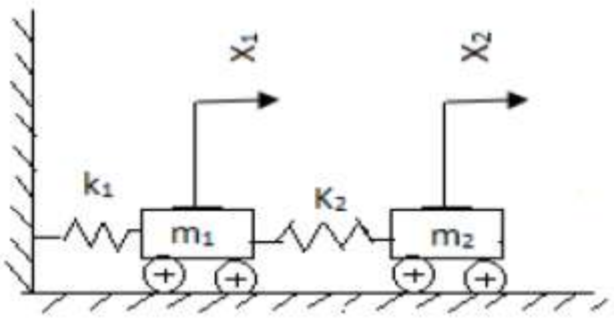
4. A damped single degree of freedom is excited by the force F=0.5sin15t where F is in Newton's and t is in seconds. The mass of the system is 0.2kg and the damping coefficient is 0.25 N-S/m. Determine:

a) The steady-state amplitude for spring stiffness k values of 5, 50 and 200 N/m

b) The spring stiffness that will produce the maximum amplitude

c) The maximum amplitude produced 15 M

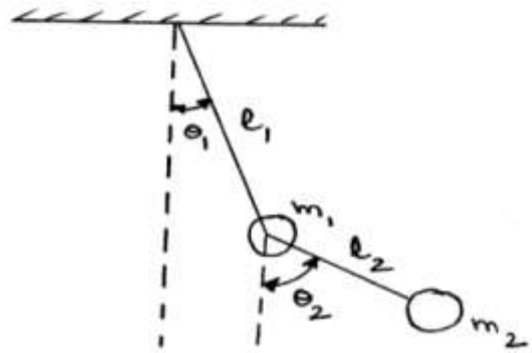
5. Find the natural frequencies and first two normal mode shapes of the system shown in Figure. Assume $k_1 = k_2 = k$ and $m_1 = m_2 = m$. 15 M



OR

6. Obtain the response equation for an undamped single degree freedom system subjected to a) an impulse input b) A rectangular pulse 15 M

7. Using Lagrange's method, set up the equations of motion of the system shown in figure. 15 M



OR

8. Derive the differential equation of motion for the longitudinal vibration of uniform bars and find the frequency equation when both ends of the bar are fixed.
15 M