PVP 12

Code: **MEMD2T2**

I M.Tech - II Semester - Regular Examinations – AUGUST 2016

MECHANICAL VIBRATIONS
(MACHINE DESIGN)

Duration: 3 hours Max. Marks: 70

Answer any FIVE questions. All questions carry equal marks

1)

a) What is meant by under damped, over damped and critically damped system in case of a single degree of freedom free vibrations? 7 M

b) A light cantilever of rectangular section (5 cm deep by 2.5 cm wide) has a mass fixed at its free end. Find the ratio of the frequency of free lateral vibration in vertical plane to that in the horizontal plane. 7 M

2)

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

b) A system of beams supports a motor of mass 1000 kg. The motor has an unbalanced mass of 1 kg located at 6.0 cm radius. It is known that the resonance occurs at 2210 rpm. What amplitude of vibration can be expected at the motor's operating speed of 1440 rpm if damping factor is assumed to be less than or equal to 0.1. 7 M

3)

a) A tuned vibration absorber has a mass ratio of 0.25. Determine the two frequency ratio ω/ω_2 between which the response X_1/X_{ST} of the main mass is less than unity. 7 M

b) Fig.1 shows a two rail road cars of mass 10 tonnes each. They are coupled by springs of total stiffness 2.94×10^6 N/m. How many natural frequencies does this system have? Find their values. 7 M

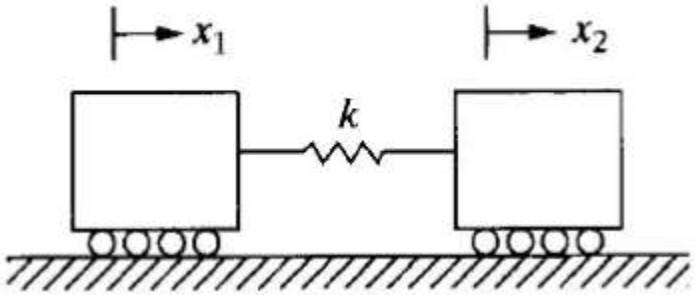


Fig.1

4)

a) Explain the coupling of coordinates in a multi-degree freedom system. 6 M

b) For the three degrees of freedom system shown in Fig.2, obtain the three natural frequencies. 8 M

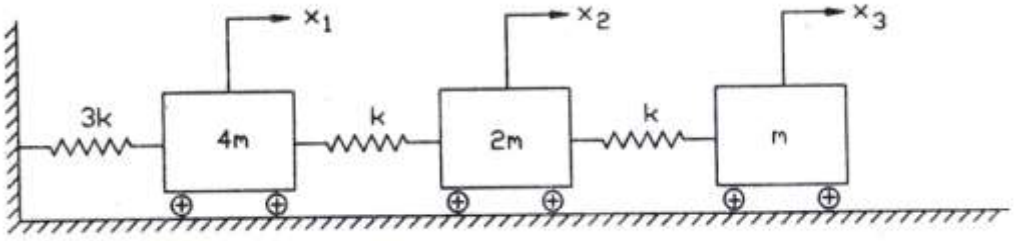


Fig.2

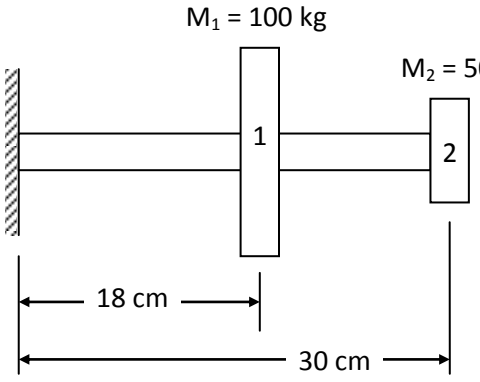
5) Describe, in detail, the procedure of determining natural frequencies of a multi-degree of freedom system using Holzer's method. 14 M

6) A simply supported beam of length 'L' is deflected by a force 'P' applied at a point distance 'C' from one end. Find the resulting transverse vibrations when the load is suddenly removed. 14 M

7)

a) What are primary and secondary critical speeds? Explain. 7 M

b) Find the two critical speeds of the system shown in Fig.3 below. 7 M



$E = 1.96 \times 10^{11}$ N/m^2

$I = 4.0 \times 10^{-7}$ m^4

Fig.3

8)

a) Find the Laplace transform of a pulse of height A and duration τ. Also deduce the Laplace transform of unit impulse. 7 M

b) For a vibratory system subjected to an impulse, plot the maximum peak displacement against the damping ratio. 7 M