Total No. of Questions : 7]

SEAT No. :

P4262

[Total No. of Pages : 2

[4860] - 1069

M.E. (Mechanical) (Design Engineering)

ADVANCED MECHANICAL VIBRATIONS

(2013 Credit Pattern) (502208) (Semester - II)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any FIVE questions***
2) ***Neat Diagrams must be drawn whenever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic calculator is allowed.***

Q1) A double pendulum has lengths of L_1 and L_2, with masses m_1 and m_2 at the end of each massless link as shown in Fig.1. Use Lagrange's equation to derive the equations of motion. **[10]**

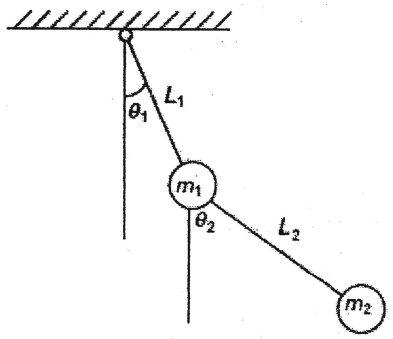

Fig. 1. double pendulum

Q2) Find the natural frequencies for bar as shown in Fig. 2. **[10]**

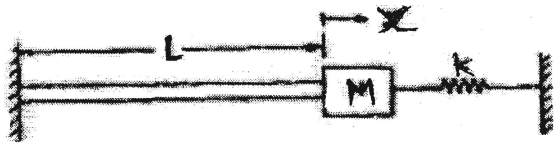

Fig.2

P.T.O.

Q3) Determine the equation of motion of the mass for free vibration as shown in Fig.3 with following details; m = 10kg, k = 1000N/m, C = 100N.s/m, $x(0)$ = 1.0001m, $\dot{x}$ = 0.10m/s. **[10]**

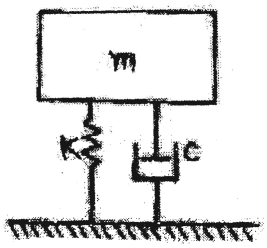

Fig.3

Q4) Derive an expression for dimensionless displacements in un-damped dynamic vibration absorber in terms of the parameters of the system and explain its working. For tuned absorber show: **[10]**

a) the relationship between response speed and mass ratio.

b) frequency response curves for main system and absorber.

Q5) a) Explain FFT analyzer with a block diagram. **[5]**

b) Explain practical applications of model analysis in car chassis. **[5]**

Q6) A random signal has a spectral density that is a constant, $S(f) = 0.004cm^2/cps$ between 20cps and 1200cps and that is zero outside this frequency range. It mean value is 2.0cm. Determine its rms value and its standard deviation. **[10]**

Q7) Write note on (any Four): **[10]**

a) Holzer Method.

b) Duhamels Integral.

c) In-situ Balancing.

d) Power Spectral Density Analyser.

e) Centrifugal Pendulum.