Total No. of Questions : 7]

SEAT No. :

P3870

[Total No. of Pages : 2

[4960] - 1069

M.E. (Mechanical) (Design Engineering)

ADVANCED MECHANICAL VIBRATIONS

(2013 Pattern)

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 right indicate full marks.***
5) ***Use of non-programmable electronic calculator is allowed.***

Q1) Use Lagrange's equation to derive the equations of motion for a double pendulum having 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. **[10]**

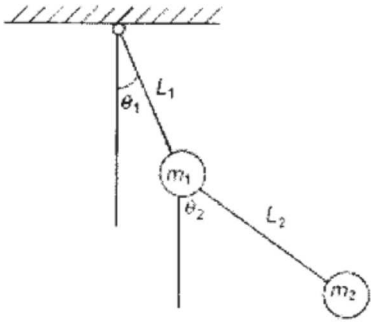

Fig. 1. double pendulum

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

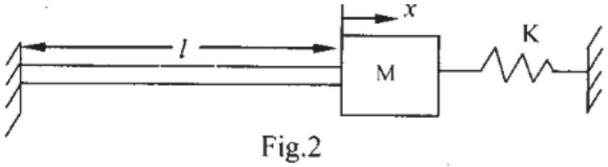

Fig.2

P.T.O.

Q3) Determine the equation of motion of the mass for free vibration as shown in Fig.3 with following details; **[10]**

m = 10kg, k = 1000N/m, C = 100N.s/m, $x(0) = 1.0001$m, $\dot{x} = 0.10$m/s.

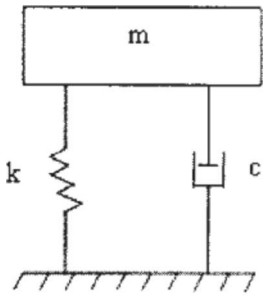

Fig.3

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, $S(f) = 0.004 cm^2/cps$ between 20cps and 1200cps and that is zero outside this frequency range. Its mean value is 2.0cm. Determine its rms value and its standard deviation. **[10]**

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

a) Centrifugal Pendulum.

b) Explain experimental modal analysis.

c) Holzer Method.

d) Duhamels Integral.

e) Power Spectral Density Analyser.