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SEAT NO. : ☐

Total No of Questions: [7] *[Total No. of Pages :2]*

[4960]-1069A

M.E. (Mechanical) (Design Engineering)
Advanced Mechanical Vibrations
(502208) (2013 Course)

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.

Q.1) Use stiffness coefficients to determine the stiffness matrix for the system shown in Fig.1 using x, θ_1 and θ_2 as generalized coordinates. [10]

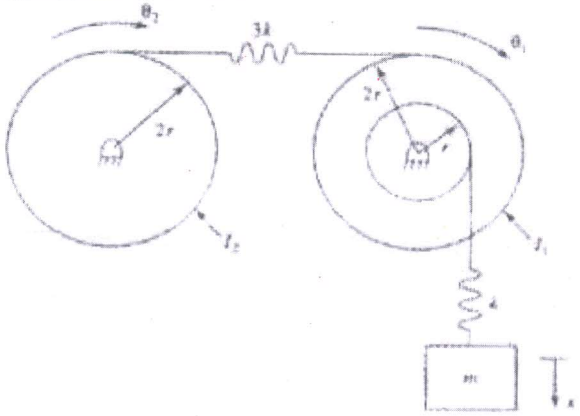

Fig.1.

Q.2) Determine the natural frequencies of vibration of a uniform beam fixed at x=0 and simply supported at x=*l*. [10]

Q.3) A single degree of freedom system described by mass m=1 kg, damping c=0.5kg/s and stiffness k=4 N/m is subjected to an impulsive excitation $\hat{F}$ =0.2N. Obtain an expression for the response of the system. [10]

Q.4) An exhaust fan, rotating at 1000 rpm, is to be supported by four springs, each having a stiffness of K. If only 10% of the unbalanced force of the fan is to be transmitted to the base, what should be the value of K? Assume the mass of the exhaust fan to be 40 kg. [10]

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Q.5) a) What is the importance of vibration measurement? [3]

b) What is difference between a vibrometer and a vibrograph? [3]

c) What is phase shift error? When does it become important? [4]

Q.6) a) Show that the frequency response function $H(\omega)$ is the Fourier transform of the impulse response function $h(t)$. [5]

b) Derive the equations for the cumulative probability and the probability density functions wave. Plot these results. [5]

Q.7) Write note on (any Four) [10]

1) Rayleigh's Damping
2) Difference in nature of the frequency equations of a discrete system and a continuous system?
3) Difference between a vibration isolator and a vibration absorber
4) Sources of industrial vibration
5) Use of frequency response function in modal analysis
6) Ergodic process
7) Holzer Method

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