CBCS SCHEME

USN | | | | | | | | | | 16/17MDE24

Second Semester M.Tech. Degree Examination, Dec.2019/Jan.2020
Advanced Theory of Vibrations

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Find the natural frequency of vibration of the half solid cylinder shown in Fig. Q1 (a). When it is given small displacement from the equilibrium portion and released. **(08 Marks)**

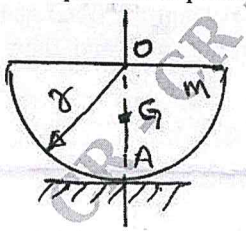

Fig. Q1 (a)

b. A centrifugal fan weighs 450 N and has a rotating unbalance of 225 N-cm. When dampers having damping factor $\xi = 0.2$ are used, specify the springs for mounting such that only 10% of the unbalanced force is transmitted to the floor. Also determine the magnitude of transmitted force. The fan is running at a constant speed of 1000 rpm. **(08 Marks)**

OR

2 a. What is dynamic vibration absorber? Show that the force exerted by the auxiliary spring on the main mass is opposite to the impressed force F_0. **(08 Marks)**

b. An aircraft radio weighing 118 N is to be isolated from engine vibrations ranging in frequencies between 1600 to 2200 CPM. What static deflection must the isolator have for 85% isolation? **(08 Marks)**

Module-2

3 a. A seismic instrument having natural frequency of 5 Hz is used to measure the vibration of a machine operation at 110 rpm. The relative displacement of the seismic mass as read from the instrument is 0.02 m. Determine the amplitude of vibration of the machine. Neglect damping. **(08 Marks)**

b. Explain vibrometer and accelerometer. **(08 Marks)**

OR

4 a. Explain the experimental modal analysis. **(08 Marks)**

b. Explain : (i) Machine condition monitoring techniques (ii) Machine vibration monitoring techniques. **(08 Marks)**

Module-3

5 a. What do you mean by unit step function? Also find its Laplace transform. **(08 Marks)**

b. Explain : (i) Shock response spectrum. (ii) Pulse excitation and rise time. **(08 Marks)**

OR

6 a. Define and explain power spectrum and power spectral density. **(10 Marks)**

b. How are the mean value and variance of a random variable defined? **(06 Marks)**

Module-4

7 a. Explain at least 4 differences between linear and non linear vibrations. **(08 Marks)**

b. Discuss the non linear spring characteristics in soft and hard springs. **(08 Marks)**

OR

8 a. Explain the perturbation method. **(10 Marks)**

b. Explain self excited oscillations. **(06 Marks)**

Module-5

9 A uniform string of length l, fixed at both ends is pulled laterally by a distance h at its mid point as shown in Fig. Q9 and then released. Determine the equation of motion for the string. **(16 Marks)**

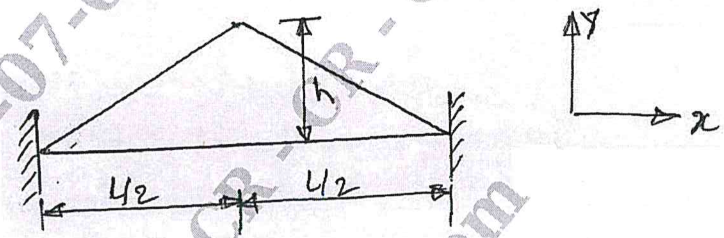

Fig. Q9

OR

10 Determine the response of a torsional system which consists of a shaft having one end fixed and disc attached to other end. Assume the torsional rigidity of the shaft as GJ and mass moment of inertia of the disc as I_0 (Refer Fig. Q10). **(16 Marks)**

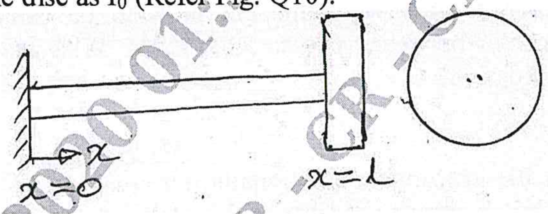

Fig. Q10

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