CBCS Scheme

USN | | | | | | | | | | |

16/17MDE24

Second Semester M.Tech. Degree Examination, June/July 2018

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. Determine the natural frequency of spring mass system taking the mass of the spring into account. **(08 Marks)**

b. Obtain the response of viscous damped system for critical damped case. **(08 Marks)**

OR

2 a. What is dynamic vibration absorber? Show that the spring force of absorber is equal and opposite to the exciting force on the main mass resulting in no motion of the system. **(08 Marks)**

b. A machine of mass 1 tonne is acted upon by an external force of 2450 N at a frequency of 1500 rpm. To reduce the effects of vibration isolator of rubber having a static deflection of 2 mm under the machine load and an estimated damping factor of 0.2 are used. Determine:
i) Force transmitted to the foundation.
ii) Amplitude of vibration of the machine.
iii) Phase lag of the transmitted force with respect to the external force. **(08 Marks)**

Module-2

3 a. Explain:
i) Frahm's reed tachometer
ii) Vibrometer **(08 Marks)**

b. With a neat sketch explain electro dynamic shaker. **(08 Marks)**

OR

4 a. Explain machine condition monitoring techniques. **(08 Marks)**

b. Briefly explain the hardware of an equipment necessary for experiment modal analysis. **(08 Marks)**

Module-3

5 a. Determine the response of a SDOF system to the step excitation shown in the Fig.Q5(a).

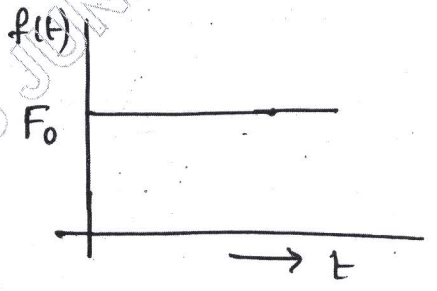

Fig.Q5(a) **(08 Marks)**

b. A container having an apparatus suitably packaged inside is shown in Fig.Q5(b), when the package is dropped on a hard surface during loading and unloading, analyze the system for its response.

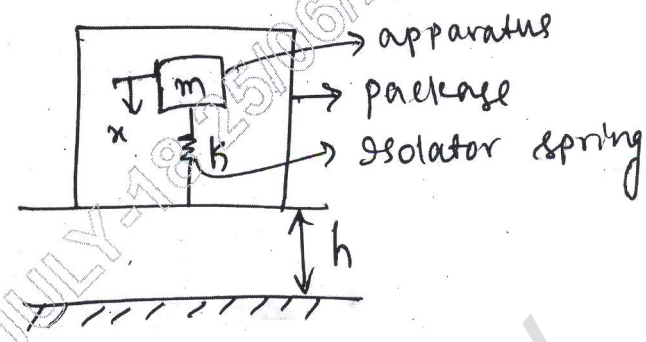

Fig.Q5(b) **(08 Marks)**

OR

6 a. Explain the following terms:
i) Auto correlation
ii) Power spectrum and power spectral density
iii) Ergotic process
iv) Random time functions **(08 Marks)**

b. Define the following terms:
i) Probability distribution
ii) Correlation **(08 Marks)**

Module-4

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

b. Derive an expression for the free oscillations of a mass on a non linear spring using perturbation parameter β. **(08 Marks)**

OR

8 a. Explain jump phenomenon. **(04 Marks)**

b. State the difference between a linear and non-linear vibrating systems. **(04 Marks)**

c. Explain:
i) Stable and unstable oscillations with respect to self excited vibrations.
ii) Self excited vibrations caused by dry friction and give examples. **(08 Marks)**

Module-5

9 a. Derive differential equation of motion for the longitudinal vibration of uniform bar. **(08 Marks)**

b. Determine the normal functions for free longitudinal vibration of a bar of length ℓ and uniform cross section. One end of the bar is fixed and the other free. **(08 Marks)**

OR

10 a. Derive the frequency equation of torsional oscillations for a free-tree shaft of length ℓ. **(08 Marks)**

b. Derive the one dimensional wave equation for lateral vibrations of string. **(08 Marks)**