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Total No. of Pages : 02

Total No. of Questions : 09

**B.Tech.(Aerospace Engg.) (2012 Batch) (Sem.-6)**

**VIBRATION AND STRUCTURAL DYNAMICS**

**Subject Code :ASPE-311**

**Paper ID : [72456]**

**Time : 3 Hrs.**

**Max. Marks : 60**

**INSTRUCTION TO CANDIDATES :**

1. **SECTION-A** is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **FIVE** questions carrying **FIVE** marks each and students has to attempt any **FOUR** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students has to attempt any **TWO** questions.

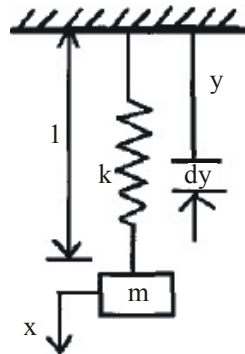
**SECTION-A**

**Q1 Attempt the following :**

- a) Classify any four types of vibration.
- b) What is the equivalent stiffness of spring combinations in series? Show with diagram.
- c) What is critical damping in vibratory system?
- d) What is Transmissibility?
- e) Define Energy Method for vibration analysis.
- f) What is defined as Critical speed of a shaft?
- g) State Maxwell's reciprocal theorem.
- h) What are torsional vibrations?
- i) What are Continuous Systems in vibrations?
- j) Explain the phenomenon of Resonance.

**SECTION-B**

- Q2 Determine the effect of the mass of the spring on the natural frequency of the system as shown in the figure below; (assume values if needed)



Where,  $x$  is displacement of the mass 'm'  
 $k$  is the stiffness of the spring.

- Q3 What are Vibration Measuring Instruments? Explain Vibrometer.  
 Q4 Discuss Vibration Isolation. Elaborate on various means of vibration isolators.  
 Q5 Explain co-ordinate coupling with the help of a neat sketch.  
 Q6 Derive the One-Dimensional wave equation for lateral vibrations of a string.

**SECTION-C**

- Q7 A vibrating system having mass 1kg is suspended by a spring of stiffness 1000 N/m and it is put to harmonic excitation of 10N. Assuming damping, determine;
- a) The resonant frequency. (2)
  - b) The phase angle at resonance. (2)
  - c) The amplitude at resonance. (2)
  - d) The frequency corresponding to the peak amplitude. (2)
  - e) Damped frequency. (2)
- Q8 A gun barrel having mass 560kg is designed with the following data:  
 Initial recoil velocity = 36 m/sec; Recoil distance on firing = 1.5m  
 Calculate :
- a) Spring constant. (3)
  - b) Damping coefficient. (3)
  - c) Time required for the barrel to return to a position 0.12m from its initial position. (4)
- Q9 Explain the following methods for system having several degrees of freedom :
- a) Dunkerley's method. (5)
  - b) Stodola's method. (5)