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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 :**

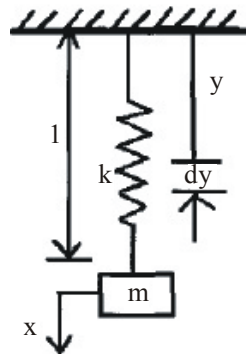
1. **SECTION-A** is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **FIVE** questions carrying **FIVE** marks each and students has to attempt any **FOUR** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students 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;
- The resonant frequency. (2)
 - The phase angle at resonance. (2)
 - The amplitude at resonance. (2)
 - The frequency corresponding to the peak amplitude. (2)
 - 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 :
- Spring constant. (3)
 - Damping coefficient. (3)
 - 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 :
- Dunkerley's method. (5)
 - Stodola's method. (5)