Roll No. | | | | | | | | | | | | |

Total No. of Pages : 02

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B.Tech.(Aerospace Engg.) (2012 Onwards) (Sem.–6)

VIBRATION AND STRUCTURAL DYNAMICS

Subject Code : ASPE-311

M.Code : 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 have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Distinguish between the following :

(a) Simple pendulum and compound pendulum

(b) Internal and external sources of excitation

(c) Discrete and continuous systems

(d) Damped and un-damped systems

(e) Single degree of freedom and two degree of freedom systems

(f) Derive the equivalent spring constant for two springs in series.

(g) Over-damping and under-damping

(h) Free and forced vibration

(i) Principle modes and normal modes vibration

(j) Whirling of shaft with and without air damping

SECTION-B

2. What are vibration absorbers? Explain the working principle of a centrifugal pendulum vibration absorber with the help of a neat sketch.

3. For damped free vibration system, derive the equation for amplitude for over-damped and critically damped system.

4. An Instrument has a natural frequency of 15 Hz. It can stand a maximum acceleration of 10 m/s^2. Find the maximum displacement amplitude.

5. A 25 kg mass is resting on a spring of 5 kN/m stiffness and a dashpot of 150 N-s/m damping coefficient in parallel. If a velocity of 0.1 m/s is given to the mass at rest position. What will be its displacement from the equilibrium position at the end of first second?

6. Add the following harmonic motions analytically :

$x_1 = 4 \cos(\omega t + 15°)$; $x_2 = 6 \sin(\omega t + 60°)$

SECTION-C

7. A vibrating system having mass of 1 kg is suspended by a spring of stiffness 1100 N/m and it is put to harmonic excitation of 12 N. Assuming viscous 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 and 2

(e) Damping frequency. Take C = 40 N-sec/m. 2

8. Write short notes on the following :

(a) Holzer's method. 3

(b) Euler's equation for beams 3

(c) Vibration measuring instruments 4

9. A uniform string is tightly stretched between $x = 0$ and $x = l$ and is plucked at $x = l/4$, through a distance h and then released from rest. Find its subsequent displacement. 10

NOTE : Disclosure of identity by writing mobile number or making passing request on any page of Answer sheet will lead to UMC case against the Student.