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

Total No. of Pages : 02

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B.Tech.(Aerospace Engg.) (2012 Batch) (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

Q1 Attempt the following :

a) Explain the term : 'Degrees of freedom of a system.'

b) List the elementary parts of a vibrating system.

c) Differentiate between free vibration and forced vibration.

d) What is logarithmic decrement?

e) What is transmissibility ratio?

f) List the various forms of the dynamic response of a single degree of freedom system under harmonic excitation.

g) Why is a '*Continuous System*' also called a '*System of Infinite Degrees of Freedom*'?

h) State the principle of conservation of energy in the context of an undamped vibrating system.

i) State Maxwell reciprocal theorem.

j) What do you understand by orthogonality of principal modes?

SECTION-B

Q2. The maximum amplitude and the maximum acceleration of the foundation of a centrifugal pump were found to be

$x_{max} = 0.25$ mm

$\ddot{x}_{max} = 0.4g$; $g = 9.81$ m/s^2

Find the operating speed of the pump.

Q3. A spring-mass system has a natural frequency of a 10 Hz. When the spring constant is reduced by 800 N/m, the frequency is altered by 45%. Find the mass and spring constant of the original system.

Q4. The ratio of successive amplitudes of a viscously damped single degree of freedom system is found to be 18 : 1. Determine the ratio of successive amplitudes if the amount of damping is halved.

Q5. Derive an expression for maximum amplitude ratio of a viscously damped single degree of freedom system (consisting of spring and mass) in terms of damping ratio.

Q6. Find the time it takes for a transverse wave to travel along a transmission line from one tower to another one 300 m away. Assume the horizontal component of the cable tension as 30,000 N and the mass of cable as 2kg/m of length.

SECTION-C

Q7. A vibrating system is to be isolated from its support base. Find the required damping ratio that must be achieved by the isolator to limit the transmissibility at resonance to $T_r = 4$.

Q8. A diesel engine weighing 3000 N is supported on a pedestal mount. It has been observed that the engine induces vibrations into the surrounding area through its pedestal mount at an operating speed of 6000 rpm. Determine the parameters of the vibration absorber that will reduce the vibration when mounted on the pedestal. The magnitude of the exciting force is 250 N and the magnitude of motion of the auxiliary mass is to be limited to 2 mm.

Q9. Write notes on :

a) Holzer's method

b) Whirling of Shafts.

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.