CBCS SCHEME

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16/17MDE24

# Second Semester M.Tech. Degree Examination, Aug./Sept. 2020
## 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. Derive an expression for a natural frequency of a spring mass system by considering the mass of the spring. **(08 Marks)**

b. A vibrating system is defined by the following parameters : m = 3kg, K = 100N/m, C = N-Sec/m. Determine :
i) The damping factor
ii) The natural frequency of damped vibration
iii) Logarithmic decrement
iv) The ratio of two consecutive amplitudes. **(08 Marks)**

**OR**

2 a. A machine of 100kg mass in supported on springs of total stiffness 700kN/m and an unbalanced rotating element which results in a disturbing force of 350N at a speed 300rpm. Assuming a damping factor of $\xi = 0.2$, determine :
i) Its amplitude of motion due to the unbalance
ii) The transmissibility
iii) The transmitted force. **(08 Marks)**

b. Write a note on :
i) Dynamic vibration absorbers
ii) Practical aspects of vibration analysis. **(08 Marks)**

### Module-2

3 Explain the following :
i) Transducers
ii) Vibration pickups
iii) Vibration exciters
iv) Signal analysis. **(16 Marks)**

**OR**

4 Explain the following :
i) Experimental modal analysis
ii) Machine condition monitoring and diagnosis. **(16 Marks)**



### Module-3

5 a. Show that the natural period of the isolated system must be greater than six times the pulse rate. **(06 Marks)**

b. Determine the response of a single DOF system to the unit impulse. **(10 Marks)**

**OR**

6 a. Show that the auto correlation of a deflection at a given point due to separate loads $F_1(t)$ and $F_2(t)$ cannot be determined by simply adding the autocorrelations $R_x(z)$ and $R_y(z)$. **(08 Marks)**

b. Explain the following as regard to Random vibrations

i) Frequency response function

ii) Probability distribution **(08 Marks)**

## Module-4

7 a. Determine the isoclines for the simple pendulum. **(08 Marks)**

b. Determine the phase plane of a single DOF oscillator : $\ddot{x} + w^2 x = 0$ **(08 Marks)**

**OR**

8 a. Explain in detail about perturbation method. **(08 Marks)**

b. Explain in detail the method of iteration. **(08 Marks)**

## Module-5

9 a. Derive an expression for longitudinal vibration of a uniform bar. **(08 Marks)**

b. Derive an expression for a transverse vibration of a cable. **(08 Marks)**

**OR**

10 a. Derive an expression for torsional vibration of a uniform shaft. **(08 Marks)**

b. Derive an expression for lateral vibration of Beams. **(08 Marks)**

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