

MECHANICAL VIBRATIONS

Written by Administrator
Sunday, 01 November 2009 10:57 -

Subject Code

:

06ME62

IA Marks

:

25

No. of Lecture Hrs./ Week

:

04

Exam Hours

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:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

Unit - 1

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Introduction: Types of vibrations, Simple Harmonic Motion (S.H.M), principle of super position applied to Simple Harmonic Motions. Beats, Fourier theorem and simple problems.

6 Hours

Unit - 2

Undamped free vibrations: Single degree of freedom systems. Mass Undamped free vibration-natural frequency of free vibration, stiffness of spring elements, effect of mass of spring, Compound Pendulum.

7 Hours

Unit - 3

Damped free vibrations: Single degree freedom systems, different types of damping, concept of critical damping and its importance, study of response of viscous damped systems for cases of under damping, critical and over damping, Logarithmic decrement.

7 Hours

Unit - 4

Forced Vibration: Single degree freedom systems, steady state solution with viscous damping due to harmonic force. Solution by Complex algebra, Reciprocating and rotating unbalance, vibration isolation-transmissibility ratio. Due to harmonic excitation and support motion.

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6 Hours

PART - B

Unit - 5

Vibration measuring instruments & Whirling of Shafts: Vibrometer meter and accelerometer. Whirling of shafts with and without air damping. Discussion of speeds above and below critical speeds.

6 Hours

Unit - 6

Systems with two degrees of freedom: Introduction, principle modes and Normal modes of vibration, co-ordinate coupling, generalized and principal co-ordinates, Free vibration in terms of initial conditions. Geared systems. Forced Oscillations-Harmonic excitation. Applications: a) Vehicle suspension. b) Dynamic vibration absorber.

c) Dynamics of reciprocating Engines.

6 Hours

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Unit - 7

Continuous systems: Introduction, vibration of string, longitudinal vibration of rods, Torsional vibration of rods, Euler's equation for beams.

6 Hours

Unit - 8

Numerical methods for Multi degree Freedom systems: Introduction, Influence coefficients, Maxwell reciprocal theorem, Dunkerley's equation. Orthogonality of principal modes, Method of matrix iteration-Method of determination of all the natural frequencies using sweeping matrix and Orthogonality principle. Holzer's method, Stodola method.

8 Hours

Text Books:

1. **Theory of Vibration with Applications:** W.T. Thomson and Marie Dillon Dahleh, Pearson Education 5th edition, 2007.
2. **Mechanical Vibrations:** V.P. Singh, Dhanpat Rai & Company Pvt. Ltd., 3rd edition, 2006.

Reference Books:

1. **Mechanical Vibrations:** S.S. Rao, Pearson Education Inc, 4th Edition, 2003.
2. **Mechanical Vibrations:** S. Graham Kelly, Schaum's Outline Series, Tata McGraw Hill, Special Indian edition, 2007.
3. **Theory & Practice of Mechanical vibrations:** J.S. Rao & K. Gupta, New Age International Publications, New Delhi, 2001.
4. **Elements of Vibrations Analysis:** Leonanrd Meirovitch, Tata McGraw Hill, Special Indian edition, 2007.