

## MVSE - 201 Structural Dynamics

### UNIT 1

Single Degree of Freedom System: Free and forced vibrations, Linear Viscous Damper, Coulomb Damper: Response to harmonic excitation, rotating unbalance and support excitations, Vibration isolation and transmissibility, single degree of freedom system as vibro-meter and accelerometer, response to periodic and arbitrary excitation.

### UNIT-II

Duhamel's integral. Impulse response function, Laplace transform Fourier transform methods. Frequency response function. Phase-Plane Techniques. Critical Speed of rotors. Energy methods, Rayleigh's method, Equivalent viscous damping.

### UNIT-III

Two Degree of Freedom System. Matrix Formulation, Free Vibration, Beat phenomenon. Principle of damped and un-damped vibration absorbers.

### UNIT-IV

Multi Degree of Freedom System: Matrix formulation, stiffness and flexibility influence coefficients, eigenvalue problem, normal modes and their properties. Matrix iteration technique for eigenvalue, and eigen vectors, Free and forced vibration by modal analysis.

### UNIT-V

Continuous System: Axial vibration of bar, torsion of shafts, transverse vibration of strings and bending vibration beams. Forced vibration. Normal mode method. Lagrange's equation. Approximate methods of Rayleigh-Ritz, Galerkin etc.

### Reference Books:

1. RW Clough, J Penzien, Dynamics of structures
2. D G Fertia, Dynamics and vibration of Structures
3. J M Biggs, Introduction to structural dynamic

## MVSE - 202 FEM in Structural Engineering

### UNIT-I

Introduction to Finite Element Method: General Applicability and Description of Finite Element Method Comparison with other methods.

### UNIT II

Solution of Finite Element Method: Solution of Equilibrium Problems, Eigen value problems, propagation problems, computer implementation of Gaussian eliminations, Choleski's decomposition, Jacobi's and Ranga Kutta Method.

### UNIT III

General Procedure of Finite Element Method: Descretization of the domain, Selection of Shapes, Types and Number of elements, node numbering technique, Interpolation Polynomials, their selection and derivation in terms of global and local coordinates, Convergence requirements. Formulation of Element Characteristic matrices and vectors, Variational approach. Assembly of Element matrices and Vectors and Derivation system equations, computation of element resultants.

### UNIT-IV

Iso-parametric Formulation: Lagrange and Hermite interpolation functions, Isoparametric Elements, Numerical Integration.

### UNIT-V

Static Analysis: Formulation of equilibrium equation, Analysis of truss, Frames, Plane Stress and Plane Strain Problems Plates and Shells.

### Reference Books:

1. Weaver, Johnson, Finite element and structural analysis
2. HC Martin, Matrix structural analysis
3. CF Abel, CS Desai, Finite element methods
4. Buchanan, Finite element Analysis (schaum Outline S), TMH
5. Krishnamurthy, Finite element analysis, TMH

## MVSE - 203 Advance Concrete Technology

### UNIT I

Cement & its properties, properties of fresh concrete compaction of concrete, curing of concrete.

### UNIT II

Properties of hardened concrete, strength characteristic, shrinkage, creep, durability, fattier.

### UNIT III

Permeability & durability of concrete in detail. Special concrete and their properties.

### UNIT IV

Concrete at low & high temp. Air entrained concrete, high performance concrete.

### UNIT V

Mix Design, Non destructive Testing of Concrete.

### Reference Books:

1. A.M. Nobile, Concrete Technology , ELBS, London
2. M.L. Gambir, Concrete Technology, Tata Mc Graw Hill Book Co.
3. Peurifoy R.L., Construction Planning Equipment & Methods, TMH
4. Verma Mahesh, Construction Equipments and its Planning & Application, Metropolitan Book Company  
N.Delhi.

## MVSE - 204 Experimental Stress Analysis

### Unit I

Introduction to stress analysis by strain measurement, mechanical strain gages, Moire fringe method, Brittle coatings for stress indication, circuitry for resistance strain gages, calibrating strain gages, temperature compensation of circuitry, indication and recording equipments, unbalance of bridge systems, balanced bridge systems, reference bridge systems, constant current strain indicators, multichannel recording systems.

### Unit II

Introduction to stress analysis by photo elasticity, optical theory, stress optical relationship, equipment and models, static stress analysis (2-D, 3-D techniques), stress analysis by photo elastic strain gages

### Unit III

Conditions for crack growth, fracture mechanics and strength of solids, stress and displacement fields in the vicinity of crack tip, the Griffith Orowan-Irwin concept, stable and unstable crack growth, the integral variation principle in crack theory, some more model representations, cracks in linearly elastic bodies, stress intensity factor, basic numerical methods for calculating the stress intensity factor, calculation of stress intensity factor for double cantilever beam specimen by FEM, the method of section for an approximate calculation of stress intensity factor, some material characteristics used for evaluation of crack propagation resistance.

### Unit IV

Solution of some plane and three dimensional problems, constructional crack arrest, system of cracks, stress intensity factors for some practical important cases, shell with a crack trajectory.

### Reference Books:

1. Dove, Adams, Experimental stress analysis and motion
2. Heteny, Experimental stress analysis
3. Dally, Rilay, Experimental stress analysis
4. VZ Panon, M Morozove, Elastic-plastic fracture mechanics

## MVSE - 205 Theory of Plates and Shells

### UNIT I

Theory of Plates: Bearing of long rectangular plates to the cylindrical surface with different edge conditions. Pure bending of plates-Differential equations of equilibrium. Theory of small deflections of laterally loads plates. Boundary conditions, momentcurvature relationship.

### UNIT II

Analysis of rectangular plates, Navier's and Levy solutions, exact theory of plates, symmetrical bending of circular plates, continuous rectangular plates

### UNIT III

Special and approximate methods of theory of plates, singularities, use of influence surfaces, use of infinite integrals and transforms, strain energy methods, experimental methods.

### UNIT IV

Theory of Shells: Classification of shells, Gaussian curvature, General theory of cylindrical shells, membrane theory and bending theory for cylindrical shells, long and short shells, shells with and without edge beams, Fourier loading.

### UNIT V

Equation of equilibrium for shells of surface of revolution, Reduction to two differential equations of second order. Spherical shells, membrane theory for shells of double curvature-syn-elastic and anti-elastic. Cylindrical shells, Hyperbolic-parabolic shells, funicular shells.

### Reference Books:

1. S Timoshenko, S Woinowsky K, Theory of Plates and Shells