MMMD – 301 (A) Fatigue Fracture Analysis

FATIGUE :- (Normal conditions) Concepts of fatigue faliure, statistical methods. Endurance limit, S.N.diagram, stress cycling, strain cycling, Goodman and Gerber relations , and their application to design problems. Review of stress concentration.(Controlling factors)- Effect of frequency of the cyclic stress, effect of temperature, size, form, surface condition, surface protection, residual stresses environment(corrosion fatigue), fresting of surfaces in contact and effect of under stresses and overstress.
Fatigue testing machines, specimen and test procedures. appearance of fatigue fractures: Surface fatigue, contact stresses. Brief introduction to Random load fatigue.

CREEP :-
Mechanisms of creep, Transient creep, viscous creep. creep fractures, Anaysis of creep curves, stress relaxation, creep tests.

FRACTURE
Historical background, modes of crack displacement, opening mode, sliding mode, tearing node ;Stress intensity factor of a crack, stress intensity factor in finite bodies;
Fracture criterion- Griffith.s fracture stress, Fatigue toughness (Critical stress intensity facur). Fracture crack propogation, plastic deformation around crack tip, crack opening is placement. Application to design of steam turbine rotor discs.thin walled pressure vessels and thin \\alled pressure pipings.

REFFERENCE REFERENCE BOOKS:
I. Strength and Resistance of Metals -Lessels-J& W.
2. Engg. Material Science-Richards -Prentice Hall. Elementary Engg. Fracture Mechanics-David Brock- Nordhoff 4. Advanced Machine Design- A.Mubeen-Khanna.

MMMD – 301 (B) Experimental Stress Analysis

PHOTO - ELASTICITY :-

Nature of light, polarization, double refraction. Plane polariser. wave plates. Photoclastic polariscope arrangement for the optical elements in a polariscope and their filnctions, stress optic law in two dimension, effect of stressed model in a plane and circular polari, cope, fringe and isoclinic pattens, fringe order, stress jectories, compensation technique, separation technique,shear difference and other methods for separation of normal stresses, three dimensional photo-elasticity.

Photo elastic materials and their relation, callibration method.

STRAIN GAUGES :-

Mechanical and electrical resistance strain gauges.gauge material, gauge construction, temp.

compensation, factor influencing gauge selection,gauge sensitivity and gauge factor,correction for transverse strain effect,semi-conductor strain gauges,

Stress analysis by strain gauges,strain analysis,use of resistrnce strain gauges for dy'mmic strain

measurements,strain circuits and recording instruments.

BRITTLE COATING METHOD:-

Characteristics of brittle coatings and their use in stress analysis, method of applying brittle coatings and analysis of crack pattern,coating stresses and failure theories,

BOOK RECOMMENDED

1.Experimental Stress Analysis-

MMMD – 302 (A) Fluid Film Lubrication

I. INTRODUCTION : Classification or Bearings. Basic theory of hydrodynamic lubrication. Derivation of generalized Reynolds equations from continuity and momentum equation.

2.HYDRODYNAMIC JOURNAL BEARING: Solution or bearing Reynold equation for (i)infinite slider bearing, (ii)Rayliegh step journal bearing,(iii) lnfinitely long full journal bearin boundary conditions-Full Sommerfeld conditions, Half Sommerfeld conditions, Reynolds condition, static performance characteristics or journal bearings-Friction forces; Load carrying capacity, Attitude angle, Eccentricity,Sommerfeld number, Oil flow, Thermal Equilibrium Extent of fluid film all,d pressure distribution Kingsbury analogy.

3. Hvdrostatic Journal Bearings : Introduction, Theoretical Analysis, Boundary conditions, Static performance characteristics Load. friction coeffIcient parameter, oil-flow, telnperature rise parameter.

4. Non-Circular Journal Bearinl!s : Irttroduction, geometry of different types of non-circular bearings, boundary conditions, behaviour of non-circular bearings.

5. Gas Bearinl!s : Introduction, Difference between gas and oil bearings, Static characteristics of gas bearings, Equations governing the behaviour of gas bearings.

6. Numerical Methods For Solution of Fluid Film Equations For Bearing (lntroduction only). Collection Method, Least Square Method, Orthogonality Method, Galer Kein's Method. Ritz Method, Finite Element Method, Finite Difference Method.

7. Rolling Element Bearings: Characteristics and application of rolling element bearings, classification of bearings, Life prediction, friction, lubrication, bearing temperature, Iligh speed consideration.

REFERENCE BOOKS:

I. MACHINE DESIGN - BLACK
2. TRIBOLOGY