Department of Mechanical Engineering

Syllabus for Ph.D Admission Eligibility Test

Section 1: Mechanics and Design

Engineering Mechanics: Free body diagrams and equilibrium, Trusses and frames.

Strength of materials (SOM): Principal Stress and Strain, Stress and Strain, Bending Moment and Shear Force Diagram, Torsion, Riveted and Welded Joint, Spring, Theories of Column (Euler method, end conditions), Strain Energy Method (Castigliano's theory), Theories of failure.

Theory of Mechanism (TOM): Mechanism, Linear Vibration Analysis of Mechanical Systems, Gear train, Flywheel (Coefficient of Fluctuation of speed, Coefficient of Fluctuation of energy)

Design: Rolling Contact Bearings, Load-life Relationship, Sliding contact bearing, Modes of Lubrication, Sommerfeld Number, Fluctuating Load Consideration for Design, Clutch, Brake.

Section 2: Materials, Manufacturing, and Industrial Engineering

Engineering Materials: Iron-carbon Equilibrium diagram, TTT diagram, Heat treatment, Crystal structure & crystal defects.

Manufacturing Science: Theory of metal cutting, forces, tool life, Rolling calculations, Wire drawing and Extrusion calculations, Sheet metal operations, clearance, force, power, shear calculations, Lathe, drilling, milling, shaping cutting time calculations, Grinding and finishing, ECM MRR, feed calculations, EDM theory, comparison of all NTMM, Limit, tolerance, fit, Jig & Fixture, 3-2-1 principle, Welding: V-I Characteristics calculations, Resistance welding calculations, Casting: allowances, Riser Design, Sprue Design, Pouring time calculations, Special, Castings.

Industrial Engineering: EOQ Models, PERT & CPM, Forecasting, Assembly line balancing.

Section 3: Fluid Mechanics and Thermal Sciences:

Fluid Mechanics: Properties of fluid, Pressure measurement, manometers, Fluid kinematics, Bernoulli's Equation, Venturimeter, Boundary Layer, Thermal Boundary Layer, Compressible Flow, Hydraulic Turbine, Centrifugal Pump.

Thermodynamics: Basic Concepts, Application of First law, Entropy, Availability, Pure Substance, Gases and Gas mixture, Thermodynamics relations.

Heat Transfer: Conduction, Critical Thickness of Insulation, Unsteady Conduction (Lumped Parameter Analysis), Heat Exchangers (LMTD, NTU), Radiation (The Stefan-Boltzmann Law, Shape Factor Algebra, Heat Exchange between Nonblack Bodies).

Refrigeration and Air Conditioning (RAC): Heat engine, heat pump, refrigerator, Vapour Compression Systems, Psychrometry.

Power plant: Steam Cycle, Gas Cycle, Compressor.