MECHANICAL ENGINEERING

PAPER-1

Statics-Equilibrium in three dimensions, Suspension, cable, Principle of virtual work.

Dyanamics- Relative motion, Coriolis force, Motion of a rigid body. Gyroscopic motion. Impulse.

Theory of Machines:- Higher and lower pairs inversions, steering mechanisms, books joint velocity and acceleration of links, inertia, forces. Cams conjugate action in gearing and interference, gear trains, epicyclic gear clutches, belt, drives, break, dynamometres flywheels, governors balancing of rotating and reciprocating masses and multicylinder engines. Free, force and damped vibrations for single degree of freedom, Degrees of freedom Critical speed and whiling of shafts.

Mechanics of Solids- Strees and strain in two dimensions Mohr's Circle. Theories of failure, Deflection of beams, buckling of columns, combined bending and torison. Castingaliano's the orem. Thick cylinders, Rotating disks. Shrink fit.Thermal stresses.

Manufacturing Science- Merchant's theory, Taylor's equation, Machine ability. Unconventional machining methods including E.D.M.E.C.M and ultrasonic machining. Use of lastars and plasmas. Analysis of forming processes. High velocity forming. Explosive forming. Surface roughness gauging comparators.Jigs and Fixtures.

Production Management :- Work simplification, work sampling value engineering. Line balancing work station design storage,space requirement. ABC analysis: Economic order quantity including finits production rate, graphical and simplex methods for linear programming, transportation, model elementary quing theory. Quality control and its uses in product design. Use of X.R.P. and C. Chart, single sampling plains; operating characteristic curves. Average sample size Regression analysis.

PAPER-II

Thermodynamics:- Applications of the first and second laws of thermodynamics. Detailed analysis of thermodynamic cycles.

Fluid Machines:- Continuity,momentum and energy equations Velocity distribution laminar and turbulent flow dimensional analysis. Boundry layer on a flat plate. Adiabatic and isentropic flow Mach number.

Heat Transfer:- Critical thickness of insolation. Conduction in the presence of heat sources and sinks. Heat transfer from fins. One dimensional unsteady conduction. Time constant for thermocouples, momentum and energy equations of boundary layers on a flat plate. Diminsionless numbers. Free and forced conviction. Boiling and condersation. Nature of radiant heat. Stefan-Boltzmann law. Configuration factor logarithmic mean temperature difference. Heat exchanger effectiveness and number of transfer units.

Energy Conversion.-- Combustion phenomenon in C.I. and S.I. engine card buration and fuel injection slection of pumps. Classification of hydraulic turbines, specific speed. Performance of compressors. Analysis of steam and gas turbines. High pressure boilers. Unconventional power systems including Nuclear power and MHD systems. Utilisation of solar energy.

Environmental Control.-- Vapour comoression, absorption, steam jet and air refrigeration systems, properties and characteristics of important refrigerant. Use of psychrometric chart and comfort chart, Estimation of cooling and heating loads. Calculation of supply air state rate. Air conditioning plant layout.