MECHANICAL ENGINEERING
PAPER - I

Statics : Equilibrium in three dimensions, suspension cables, principle of virtual work.

Dynamics : Relative motion coriolis force, Motion of a rigid body, Gyroscopic motion impulse.

Theory of Machines : Higher and lower pairs, inversions, steering mechanisms, Hooks joint, velocity and acceleration of links, inertia forces, Cams Conjugate action of gearing and interference, geartrains, epicyclic gears, Clutches, belt drives, brakes, dynamometers, Fly wheels, governors, Balancing of rotating and reciprocating masses and multicylinder engines, Free, forced and damped vibrations for a single degree of freedom, Degrees of freedom, Critical speed and whisling of shafts.

Mechanics of solds : Stress and strain in two dimensions, Mohr's circle Theories of failure, Defection of beams, Buckling of columns, Combined bending and torsion, Castiglano's theorem, Thick cylinders Rotating disks, Shrink fit, Thermal stresses.

Manufacturing Scince : Merchants theory, Taylors equation, Machineability Unconventional machining methods including EDM, ECM and ultrasonic mechining, Use of lasers 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 AEC analysis. Economic order, quantity including finite production rate, Graphical and simplex methods for linear programming, transportation model, elementary quieing theory, Quality control and its uses in product design, Use of X,R,P (Sigma) and C charts. Single sampling plans, operating characteristics curves, Average sample size, Regression analysis.

MECHANICAL ENGINEERING
PAPER - II

Thermodynamics : Applications of the first and second laws of themodynamics, Detailed analysis of thermodynamic cycles.

Fluid Machanics : Continuty, momentum and energy equations. Velocity distribution in laminar and turbulent flow, Dimensional analysis, Boundary layer on a flat plate, A diabatic and isentrophic flow, Mach number.

Heat Transfer : Critical thickness of insulation conduction in the presence of heat sources and sinks. Heat transfer from fins, One dimensional unsteady conduction. Time constant for themocouples, Momentum and energy equations for boundary layer on a flat plate, Dimensionless numbers free and Forced convection, Boiling and condensation, Nature of rediant heat, Stefan - Bolttzmenn Law, Configuration factor, logarithmic mean temperature difference. Heat exchanger efectiveness and number of transfer units.

Energy Conversion : Combustion phenomenon in C.I. and S.I. engines, Carburation and fuel injection, Selection of pumps, Classification of hydraulic turbines, specific speed, Performance of compressor, Analysis of strem and gas turbines, High Pressure boilers, Unconventional power systems, Including Nuclear Power and MHD systems, Utilisation of solar energy.

Environment Control : Vapour compression, absorption steam jet and air refrigeration systems, Properties and Characteristics of important refrigerants, Use of Psychrometric chart and confort chart, Estimation of cooling and heating loads, Calculation of supply, air state and rate, Air-conditioning plants layout.