

(MECHANICAL ENGINEERING)

DEGREE STANDARD

1. APPLIED MECHANICS:

Statics of particles - Resolution of forces - supports and reactions - Determination of forces in member of statically determinate plane trusses by method of joints and method of section. Controls - moment of inertia, position, velocity and acceleration of particles. Newton's Second law, Equations of motion, principle of work and energy, impulse and momentum, impact of elastic bodies, friction - laws, simple machines.

2. ENGINEERING THERMODYNAMICS: -

Energy - Work - heat properties - states - processes. Energy equations. Work and PV diagrams. Laws of thermodynamics Carnot cycle, reversed Carnot cycle, efficiency - COP. Specific heats - gas laws - perfect gas relationships. mole concept, molar volume, internal energy, enthalpy, molecular weight of gas mixtures. Methods of cycle analysis - tables of thermodynamic properties of air - thermal efficiency Otto cycle - diesel cycle - dual combustion cycle - comparison of cycles - problems on use of steam tables.

3. INTERNAL COMBUSTION ENGINES: -

Basic engine nomenclature - engine classification - working of SI engine, CI engine, two stroke engine and four stroke engine - carburation - air fuel mixture ratio. Combustion in SI engine - ignition systems - timing - spark plugs - combustion chamber. Combustion in CI engine - ignition delay - valve timing diagram - fuel supply injection systems. Performance of SI and CI engines - factors affecting the performance characteristics. Cooling - lubrication systems, fuels used in SI and CI engines. Measurements of engine power - indicated mean effective pressure - indicated horse power - brake horse power - specific fuel consumption - thermal efficiency.

4. GAS DYNAMICS AND JET PROPULSION: -

Energy equation for flow process - velocity of sound - Mach number - effect of Mach number on compressibility. Isentropic flow with variable area - Area ratio as a function of Mach Number - mass flow rate - flow through nozzles - flow through diffusers. Solution of Fanno flow equation - isothermal flow with friction. Flow with normal shockwaves - governing equations. Prandtl - Meyer equation. Aircraft propulsion - jet engines - energy flow - thrust power and propulsive efficiency - performance of jet engine. Rocket engines - performance - solid and liquid propellant rockets. Comparison of various propulsion systems.

5. REFRIGERATION AND AIR CONDITIONING: -

Principles of refrigeration - mechanism of producing cold - types of refrigerations - refrigerating effect and unit of refrigeration - coefficient of performance of refrigerator. Air refrigeration systems - reversed Carnot cycle - Bell Coleman cycle. Simple vapour compression system. Advanced vapour compression systems - T.S Diagram - p-h chart - dry and wet compression - under cooling. Vapour absorption systems. Refrigerants. Refrigeration applications. Air conditioning - Factors in air conditioning - simple heating and cooling - dehumidification - humidification.

6. FLUID MECHANICS:-

Classification of fluids - fluid properties - Ideal fluid flow - Rotational - irrotational flow - Bernoulli's equation - Flow through pipes - pipes in series - pipes in parallel - DARCY'S equation - viscous fluid flow - Navier - Stokes equation - Laminar and Turbulent flow - Reynold's number - Compressible flow of perfect gas - speed of sound wave - concept of Mach number - Hydraulic

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Jump.

7. TURBOMACHINERY:-

Definition and classification of turbo machines, equation for energy transfer. Centrifugal fans, blowers and Compressors. Axial flow fans and compressors. Axial turbine stages. Free and forced vortex flow. Centrifugal pumps - workdone - head - specific energy - priming - performance of multistage pumps. Hydraulic turbines - different types - governing, performance - selection of turbines. Gravitation - method of preventing - hydraulic coupling - torque converters.

8. HEAT AND MASS TRANSFER:-

Modes of heat transfer, one dimensional heat conduction, resistance concept, unsteady state heat conduction. Fins, free and forced convection. Thermal boundary layer concept. D.B. equations and other correlations, radiation, black and gray bodies, shape factor design of heat exchangers. NTU method. Analogy of mass, Heat and Momentum transfers, mass transfer equipments.

9. POWER PLANT ENGINEERING:-

Sources of energy - conventional and non - conventional Location of steam power plant, diesel power plant and nuclear power plants - layout. Disposal of waste, safety and hazards. Hydroelectric power plants, Gas power plants - environmental problems. Power plant economics, cost benefit analysis - future power plants wind, tidal, solar energy - problems and prospects. Geothermal energy, fuel cells, thermionic and thermo electric converters etc.

10. INSTRUMENTATION AND CONTROL:-

Elements of measurement systems. Range, span, sensitivity, accuracy, precision and repeatability of instrument. Errors in measurement system. Transducers for measurement of pressure, manometers, temperature measuring instruments, measurement of speed, strain gauge basics, force measurement using load cells and electromechanical methods. Dynamometers for power measurement, flow meters, rotameters, using velocity process, hot wire anemometer, accelerometers. Open and closed loop control systems. Transfer function, Hydraulic and Pneumatic control systems, Different types of controls like, two way proportional, differential and integral control.

PAPER -II

1. STRENGTH OF MATERIALS:-

Direct stress and strain - elasticity - Hook's law - Poisson's ratio - bulk modulus. Shear stress-modulus of rigidity. Analysis of stress and strain compound stress. Strain energy, resilience and strength theories. Bending moment and shearing forces. Bending stresses in beams, shearing stresses in beams, deflection of beam, fixed and continuous beams. Combined direct and bending stresses. Columns and struts, torsion of shafts, springs, thin and thick cylindrical and spherical shells. Riveted joints.

2 THEORY OF MACHINES - I:-

Kinematics of mechanisms - link pair - inversions of mechanism four bar chain - slider crank mechanisms. Motion and inertia - velocity - acceleration - force - mass - centrifugal and centripetal force - mass moment of inertia - velocity in mechanism - velocity polygons - acceleration in mechanism - lower pair - cams - gyroscope.

3. THEORY OF MACHINES - II:-

Friction - laws of solid friction - wedge - screws - threads collar - pivot - clutch - bearing. Belt, rope and chain drive - toothed gears - gear trains - inertia force analysis and fly wheel governors - stability - friction and insensitiveness. Balancing of several masses in different planes. Mechanical vibrations - force vibrations - damping.

4. DESIGN OF MACHINE ELEMENTS:-

Design of riveted and welded joins - Design of detachable joints - Bolted joints cotter Joint -

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knuckle joint - Design of crank shaft and connecting rod - Flange coupling - Helical and leaf springs - Fly wheel - Design of journal and thrust bearings.

5. DESIGN OF TRANSMISSION ELEMENTS:-

Selection of flat and vee belts - design of cone pulley belt drive - design of spur gears, helical gears and bevel gears - Design of worm and wheel pair for power transmission - Design of single and two stage speed reducers.

6. PRODUCTION PROCESSES:-

Classification of machining processes, metal cutting tools, tool materials, tool geometry, Lathe: mechanisms for feed and spindle drive, work holding device, types of operation, Drilling machines, shaper, slotter and milling machines: drives and types of work done, milling machines: drives for spindle speed and feed. Workholding devices indexing, milling machine operations.

7. MACHINING PROCESSES:-

Grinding machines: Abrasives, grain structure and designation of grinding wheels, various types of grinding, work holding devices. Fine finishing process: honing, buffing, metal spraying and electroplating.

Gear and gear manufacturing: Gear milling, shaping,, hobbing, gear finishing: gear shaving, grinding, lapping and gear honing. Special Machining process: Electro discharge machining, Electro Chemical grinding, electron beam and laser beam machining abrasive jet machining. NC & GNC machine operations, Flexible manufacturing systems automated guided vehicles, FMS layout, material handling system.

8. METROLOGY AND QUALITY CONTROL:-

Precision instruments: Vernier, micrometer, slip gauges, sine bars, comparators. Inter changeability, limit gauges. Profile projector, tool maker's microscope, screw thread projector, measurement of surface finish, Testing geometric accuracy of machine tools, Errors in threadpitch measurement, gear tooth errors statistical quality control concept, use of control charts, Acceptance sampling. economic aspects of quality control.

9. INDUSTRIAL ENGINEERING:-

Work study - techniques - Method study - objectives - basic procedure - work measurement - objectives - basic procedure - production planning and control - machine loading and scheduling - product sequencing - inventory control - E O Q - quantity discounts - ABC Analysis - Plant layout - product and process layout - material handling systems - simplex method - Transportation model - Assignment model.

10. INDUSTRIAL MANAGEMENT:-

The basic of management theory and practice - planning - The nature and purpose of Planning - Decision making - Organising - Nature and purpose of organising - staffing - Nature and purpose of staffing - Leading - Motivation - Leadership - controlling - control techniques - Ensuring effective managing.