SYLLABUS
MECHANICAL ENGINEERING

1. APPLIED MECHANICS:

(i) Coplanar & Concurrent Forces: Forces, types of forces, coplanar & concurrent forces, resultant of forces, condition of equilibrium. Numerical problems.

(ii) Friction: Definition, slitting & rolling friction, laws of sliding friction, co-efficient of friction, angle of friction numerical problems.

(iii) Simple machine: Machine, velocity ratio, mechanical advantage, efficiency, law of machine, pully, differential pully block, wheel & axle. Numerical problems.

(iv) Centre of gravity & moment of inertia: Centre of gravity of plane figures, moment of inertia & radius of gyration of plane figures. Numerical problems.

2. STRENGTH OF MATERIALS:

(i) Stress and strain: Load, types of loads, stress, types of stresses, relation between stress and strain, Hook's law, modules of elasticity, modulus of rigidity Linear & laterial strain, poison's ratio, volumetric stress and strain, bulk modulus. Relation between E.G. & K. Riveted & welded joint, strength & efficiency, stresses due to change in temperature. Numerical problems.

(ii) Sheer forces & bending moment: Definition, S.F. & B.M. diagram, simply supported & over hanging beams with concentrated & uniformly distributed load, cantilever with concentrated & uniformly distributed load. Numerical problems.

(iii) Torsion & defection of beams: Angle of twist, torsion equation, methods of determining defection of beams-simple supported & cantilever, loaded with concentrated load & U.D.L. numerical problems.

3. FLUID MECHANICS:

(i) Fluids & properties of fluids: Specific weight, density, pressure, pressure measuring devices. Transmission of pressure hydraulic press, total pressure, centre of pressure, meter centre, metacentric height, equilibrium of floating bodies. Numerical problems.

(ii) Flow of fluid: Types of fluid flow, continuity equation total energy of flowing fluid total heat. Bernoulli's equation, co-efficient of velocity, discharge & contraction, petot tube, ventrimeter. Numerical problems.

(iii) Flow through pipes, Reynolds number, pipe friction equation. Numerical problems.

(iv) Open channel flow: Difference between open channel and pipe flow. Chezy's equation, economic section.

4. THERMODYNAMIC:

(i) Introduction: Difference between heat and temperature, measurement of heat and temperature.

(ii) Properties of gas: Definition, properties of perfect gas, behavior of perfect gas with relation to pressure, volume and temperature. Characteristics of gas equation, internal energy, enthalpy & entropy-definition of sp. Heat of gasses, critical temperature.

(iii) Laws of thermodynamics: General energy equation, first & second law of thermodynamics, process and cycles.

Difference thermodynamics processes constant pressure, constant volume, isothermal, adiabatic, polytrophic & throttling process.

(iv) Air cycles: Carnet cycle & reversed carnet cycle, application of the cycles in engines and refrigerators.

5. THEORY OF MACHINES:

(i) Link motion: Definition, structure, link, kinetic pair, sliding, turning & screw pair, kinematics chain-mechanism, machine, inversion. Crank and slotted link quick return motion mechanism, pantograph, instantaneous centre, velocity diagram.

(ii) Belt, Rope & Chain Drive: Friction drive, types of belt drive, velocity ratio, effect of belt thickness & slip on velocity ratio, creep of belt, open & cross drive, power transmitted by belt, centrifugal tension, width of belt, V-belt, rope drive & chain drive. Numerical problems.

(iii) Clutch, Brake & Dynamometer: Single plate clutch, multiple plate clutch, brakefunction & types.

Dynamometer-function, type-pony brake and rope brake dynamometer, torsion dynamometer.

6. FLUID MACHINES:

(i) Air compressor: Classification-reciprocating air compressor, single stage compressor, multi stage compressor power, efficiency, capacity control.

Rotary compressor- fan, blower, cycle work, power & efficiency, troubles in air compressor & their remedies.

(ii) Impact of jet: Impact of jet on plane and curved vanes, velocity diagram, work power & efficiency. Numerical problems.

(iii) Pump: Reciprocating pump-types, working procedure, efficiency, air vessel, coefficient or discharge, slip, power-centrifugal pump-types-single stage & multistage, working principles, velocity diagram, power, efficiency, layout of pumping system.

(iv) Water Turbine: Classification, velocity diagram, work, power, efficiency, draught tube, specific speed, characteristic curves, troubles & their remedies.

7. MANUFACTURING PROCESS:

(i) Manufacturing of Iron & Steel: Introductive, pig iron, cart-iron, rough iron, steel, effect of carbon, mild steel, medium-carbon & high carbon steel.

(ii) Introduction to Metallurgy: Crystalline structure & grain directive, micro structure, thermal equilibrium diagram of steel, transformation of Austenite during nonisothermal cooling & isothermal decomposition of Austenite.

(iii) Heat Treatment of Steel: Heat treatment process full annealing, process annealing, isothermal annealing, hardening, tempering & defects.

(iv) Soldering: Soft soldering, hard soldering & breezing.

(v) Wilding: Oxy-acetilene wilding-process & equipments, flame cutting, operation & safety.

Metal are wilding-wilding process, ilutrode, uses.

(vi) Forging: Forging practice, different forging methods & machine, forging defects, inspection & dafety.

8. HOT ENGINE:

(i) Steam boiler: Function of steam boiler, types of boiler and working principles of different types of boiler, boiler construction, mountings, accessories, pipe fittings.

Boiler fails, burning equipments & ash hangling.

(ii) Steam Engine: Working principle of steam engine, ranking cycle, engine componansity & function, indicator diagram, effective pressure, I.H.P, B.H.P, thermal efficiency mechanical efficiency.

(iii) Internal Combustion Engine: Introduction difference between I.C. engine & external combustion engine, classification-otto, diesel, dual combustion, two stroke, four stroke, single-acting, double acting, vertical, horizontal.

Cycle of operation n-four stroke otto, diesel & dual combustion cycle, cycle efficiency comparison between otto & diesel cycle.

S.I. engine-pertol engine, engine parts, cylinder, piston ring, connecting rod, crank, crank case, cam & cam shaft.

Carburetion of fuel, air fuel mixture, carburetor, choke, gear value timing.

C.I. engine-diesel engine & engine parts, fuel injection system, air injection & airless injection, fuel pump, fuel injectors combustion of C.I. engine-cooling system of I.C. engine-air cooling & water cooling lubrication of I.C. engine-purpose of lubrication, properties of lubricants, parts to be lubricated & the common methods used in lubrication.

9. PRODUCTION CONTROL AND MATERIAL MANAGEMENT:

(i) Organization: Introduction, principle of organization, level organization, senior executive, intermediate executive, junior executive.

(ii) Foremanship and leadership: Finction of foreman, qualification quality of foreman, the art of leadership, foreman as leader, solving problems-sequence of metros study, breaking down a job, aspect of testing, metros to be examined.

(iii) Production Control & Quality Control: Introduction, planning, casting, order quality, rating, scheduling, dispatch, progress, control, material control, benefit of quality control.

10. MACHINE POLLS:

(i) Metal Cutting & Cutting Tools: Metal forming, tool geometric and chip formation, mechanism of cutting, economic of cutting.

(ii) Lather: Finction, lathe part, fuel mechanism.

(iii) Lathe tool, Accessories & attachment & operation: Different types of tools used in lathe, check, face plate, plate & carried, strait turning, shoulder turning, eccentric turning, chamfering, knurling, facing, grooming, spinning, taper turning & trees cutting.

11. PRIME MOVER AND BOILER:

(i) Boiler: Properties of steam, boiler & component, types boiler & their working

principles, boiler mounting & accessories mance, fuel, fuel burner & combustion, feed water treatment, boiler cleaning.

Steam turbing: Function, types, estimation of work, power & efficiency.

Gas turbing: Working principle, compressor, combustion chamber, starting motor, cycle & efficiency.

I.C. Engine: Working principle of petrol & diesel engine, two stroke cycle & four stroke cycle, single suction & double acting, vertical & horizontal engine component & parts, fuel ignition cooling & exhaust system, common fault & rectification.

Water turbine: Classification estimation of work, power and efficiency.

12. AUTOMOBILE ENGINEERING:

(i) Fuel system for petrol engine, fuel system or diesel engine, intake & exhaust system, engine lubrication, cooling system, ignition system.

(ii) Suspension system, steering, brake, clutch, gear box rear wheel transmission, chasses lubrication, body recondition, garage tools & equipments.

13. MACHINE TOOLS:

(i) Drilling Machine: Types, description of different types, spindle drive mechanism, operation, cutting speed & feed.

(ii) Milling Machine: Types description & function, milling cutter tool holder, care of milling cutters & holding devices, dividing head, index plate, indexing & choice of gears calculations.

Cutter setting, horizontal & vertical boring.

(iii) Grinding: Kinds of grinding, types of grinding machine, composition of grinding wheels.

Selection of grinding wheel, mounting, dressing, tiring, balancing.

Capstan & Turret Lathes: Principle parts, difference between capstan & turrets lathe, operation, tooling scheduling chart, cutting speed, fuel & depth of cut.

14. PLANT MAINTENANCE ENGINEERING.

(i) Maintenance & installation of Mechanical Equipments: Instrument used for maintenance work, maintenance of guides surface of machine tools, fitting of key, bearing coupling, clutched & their defects & repair.

Installation of engine & machine, marking & leveling of foundation alignment courting & fixing of engine machine.

Maintenance of mechanical equipments etc. fans exhaust system, blower & dust collecting equipments, corrosion control by using chemical detergent.

(ii) Power Plant: Test, repair & maintenance of boiler & muting, maintenance of feet water heater, economizer, pre-heater, and fuel pump, fuel burner, water treatment plant.

Periodic inspection & maintenance, over hauling of I.C. engine, ignition & fuel system maintenance.

(iii) Electrical maintenance: Examination & retesting of electrical fitting, motors switches etc. locating fault, repair, safety procedure to be adopted.

120

15. DRAWING ESTIMATING AND COSTING:

Bill of material, element of estimating & costing of furniture's & patters, estimation, estimating & costing of casting and different component parts, estimating & costing of sheet metal work.

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Disclaimer : The above syllabus is broadly indicative but not exhaustive