



অসম লোকসেৱা আয়োগ

ASSAM PUBLIC SERVICE COMMISSION

Jawaharnagar, Khanapara, Guwahati-781022.

SYLLABUS

Screening Test (OMR based) for recruitment to the post of
**Junior Engineer (Mechanical) under joint cadre of Public Works Roads Department
and Public Works (Building & NH) Department**
(Advt. No. 10/2024 dtd. 03/05/2024)

PAPER-I

Subject: Mechanical Engineering
(Multiple Choice Objective Type)

Marks: 100

Time: 2 Hours

1. ENGINEERING MECHANICS:

Coplanar concurrent and non-concurrent forces, Triangle Law of Forces vertical plane,

Polygon Law of Forces using (a) vertical plane, (b) universal force table.

Moment : Bell Crank Lever, Simply supported beam

Friction: Determination of coefficient of friction by sliding block over a smooth surface, Determination of coefficient of friction by sliding block over a smooth inclined surface.

Pulleys: Study of Simple pulleys, Screw Jack.

Power: Rope Brake or Prony Brake dynamometer

Study of simple screw jack & find out the following: Mechanical Advantage, Velocity Ratio, Efficiency of the machine, Effect of friction.

2. FLUID MECHANICS & FLUID MACHINES:

Introduction of fluid mechanics: Definition - solid, liquid & gas; Classification of Fluid: Ideal & real fluids, Units & dimensions;

Physical Properties of Fluids: Specific weight, mass density, specific gravity, compressibility Viscosity, Newton's law of viscosity, kinematic viscosity, dimensional formula and units of viscosity, Surface tension, cohesion & adhesion, Newtonian & Non Newtonian fluid.

Fluid Statics: Pressure (atmospheric, absolute & gauge), Transmission of pressure (Pascal's law & its application), Hydrostatic law (Pressure, specific weight & height relationship), Force & centre of pressure on a horizontal, vertical & inclined submerged surface with deduction; Archimedes' principle, stability of immersed & floating bodies, meta centre & determination of meta centric height.

Fluid Kinematics: Classifications of fluid flow (laminar & turbulent), steady & unsteady, uniform & non uniform, compressible & non compressible, rotational & irrotational, Flow rate & Continuity equation, equation, Bernoulli's equation, including its modification. Total Energy & Hydraulic gradient.

Fluid Measurements: Piezometer, Description & working principle of simple Tube manometer, differential manometer, Definition & relation of coefficient of contraction, coefficient of velocity & coefficient of discharge & vena contracta, Working principle & use –Venturimeter, Orifice meter & Pitot tube.

Pipe & Open Channel Flow: Flow losses in pipes (at entrance, exit, contraction, expansion & bending) only empirical formula, Laws of fluid friction, for head loss due to pipe friction, Chezy's & Manning's formula.

Fluid Machines: IMPACT OF JET, Direct impact of a jet on a stationary flat plate, Direct impact of a jet on an inclined fixed plate, Impact of a jet on a moving plate, Impact of a jet on a series of flat vanes mounted on the periphery of a large wheel.

Hydraulic Turbines: Classification –Impulse & Reaction, Pelton wheel-components, working principle, velocity diagrams, work done, power, efficiency. Francis turbine–components, working principle, velocity diagrams, work done, power, efficiency. Kaplan turbine- components, Governing of an impulse turbine (Pelton wheel), Difference between impulse & reaction turbine.

Pumps: Classification of pumps, Reciprocating pump –Types, Working principle (single acting & double acting), discharge, slip, pump work, power required, indicator diagram, Use of air vessels, Advantages & disadvantages of reciprocating pump over centrifugal pump, Centrifugal pump-types, Working of the pump, methods of converting the K.E of water leaving the impeller into pr. Energy, guide blades, priming, Work done by the impeller, manometric head, manometric efficiency, impeller power, the mechanical efficiency, the overall efficiency, Multistage centrifugal pumps specific speed of centrifugal pumps.

3. FUNDAMENTALS OF ELECTRICAL ENGINEERING:

Current, voltage, insulator, conductor, insulator, and semiconductor, resistance, capacitance, Ohm's law, DC network, Kirchhoff's current and voltage law, Kirchhoff's current and voltage law, Wheatstone bridge.

DC generator and motor, Compare the DC motor and generator, different types of DC motor and generator.

Alternating current and transformer: amplitude, time period, frequency, equation of alternating voltage and current, RMS, average value, instantaneous value, peak factor, RLC circuit, inductance of AC circuit, construction of transformer, operating principle of transformer, type and uses of transformer.

State step up and step down transformer.

House wiring: House wiring, different methods of house wiring, safety and precautionary measure to be taken for electrical shock.

4. MANUFACTURING TECHNOLOGY:

Basic of Machine Tool: Introduction to machine tools, Differences between machine and machine tools, Types of cutting tools, Cutting tool materials, properties and types, Single point cutting tool nomenclatures., Cutting tool life and factors effecting tool life and tool wear, Orthogonal and Oblique cutting, Cutting forces in orthogonal and oblique cutting, Chip formation process, temperature zone and forces, Types of chips and factors for producing each, chip, Chip breaker and its types.

Advanced Welding Processes: Classification of welding process, Resistance welding - Spot, Seam and Projection welding, Advanced Arc welding types-Shielded metal arc welding, TIG & MIG welding, Submerged arc welding, Plasma arc welding & Laser beam welding, Defects in welding and their remedies, Differences between Brazing and Soldering.

Powder Metallurgy: Basic concepts of powder metallurgy, Methods of powder metallurgy.

Lathe: lathe, Classification of lathes , Constructional features of Engine lathe, Lathe attachments, accessories & work holding devices, Lathe operations, Taper turning methods, Machining parameters-cutting speed, feed, depth of cut and machining time.

Drilling machine: Introduction, Classification of drilling machines, Radial drilling machine-working-drilling operations, Twist drill nomenclature, Machining parameters-cutting speed, feed, depth of cut and machining time.

Shaper : Introduction to Shaper & Classification, Specifications of Shaper, Principal parts of shaper, Shaper Mechanisms & Shaper Operations.

Planer : Introduction to Planer & Classification, Specifications of Planer, Principal parts of Planer, Planer Mechanisms & Operations, Differences between Planer & Shaper.

Slotter : Introduction to Slotter & Classification ,Principal parts of Slotter, Specifications of Slotter, Slotter Mechanisms & Operations.

Grinding & Surface finishing: Introduction to grinding & Classification, Plain Cylindrical grinding machines, Grinding wheels, Abrasives & classification, Bond & bonding, Grit, Grade & Structure of wheels, Specification of wheels, Types of grinding wheels, Selection of grinding wheels, Mounting of grinding wheels, Glazing and loading of wheels, Dressing and truing of wheels, Balancing of wheels, Diamond wheels, Introduction to surface finish, Surface finishing operations.

Milling machine: Introduction to milling and classification, Column and knee type milling machine & copy milling machine, Milling cutters and classification, Fundamentals of milling processes, Milling machine operations, Indexing methods, Cutting speed, feed, depth of cut and machining time.

Non-Traditional machining methods: Introduction to modern machining, Differences between conventional and non-conventional methods, Classification, Principle of working of - Ultrasonic machining, Electric discharge machining, Abrasive jet

machining and Laser beam machining, Applications, merits and demerits of above methods.

Jigs and Fixtures: Introduction to jigs and fixtures, Definition of jig and fixtures, Applications & merits of jig and fixture

Cutting Fluids and Coolants: Introduction, Purpose and Properties, Coolants and lubricants for different operations.

5. THERMODYNAMICS:

Fundamentals and laws of Thermodynamics. Definitions for system - boundary, surrounding, working fluid and state of a system.

Types of thermodynamic systems –closed, open and isolated systems with examples.

Properties of system- Intensive and Extensive properties with examples.

Definitions for properties pressure (p), Volume (v), Temperature (T), Enthalpy (H), Internal energy (U) Specific heat at constant pressure(c_p), specific heat at constant volume(c_v) for a gas and their units.

Definitions for quasi-static work, flow- work, specific heat.

Zeroth, first, second laws of thermodynamics, simple problems on conversion of Heat into Work and vice versa.

Steady flow energy equation.

Laws of perfect gases: Gas Laws –Boyle's law, Charle's Law--Gay-Lussac law-Avogadro's-Joule's law, Derive characteristic gas equation - universal gas equation, universal gas constant and their relationship with molecular weight of gas, Relationship between the two specific heats and characteristic gas constant.

Thermodynamic processes on gases: Types of thermodynamic processes, Constant pressure, Constant volume, Isothermal, Free expansion, Isentropic, Polytrophic and throttling processes & equations representing the processes, Concept of Entropy, Derivation for work done, change in internal energy and Entropy for the above processes, Heat supplied or rejected during the above processes.

Fuels and Combustion: Definition of fuel. Types –solid, liquid and gaseous fuels examples and uses of different types of fuels.

Calorific values (Higher and lower) of fuels, formula Dulong's for calorific value, calculation of calorific value of a fuel of given chemical composition, Bomb calorimeter unit-Description.

Air standard cycles: Meaning of air standard cycle-its use-Reversible and irreversible process –reversible and irreversible cycles conditions for reversibility of a cycle, Carnot cycle with P.V. and T-S diagrams, Air standard Efficiency - Problems on Carnot cycle, Otto cycle with P.V. and T-S diagrams, Air standard Efficiency - Simple problems on Otto cycle.

Diesel cycle with P.V. and T-S diagrams, Air standard Efficiency - Simple problems

on Diesel cycle, Dual cycle with P.V. and T-S diagrams, Air standard Efficiency – Simple problems on dual cycle.

Highest efficiency of Carnot cycle over other cycles working between same temperature limits.

Properties of steam: Formation of steam under constant pressure, dryness, fraction and degree of super heat, specific volume.

Determination of enthalpy, internal energy, internal latent heat, entropy of wet, dry and superheated steam at a given pressure using steam tables and Mollier chart.

Vapour Power cycle: Rankine cycle, Modified rankine cycle.

Heat Transfer: Heat Transfer Processes, Conduction, Convection and Radiation.

Heat Exchanger- types with diagram.

6. ENGINEERING MATERIALS:

Mechanical Properties of Material: Mechanical properties such as strength- elasticity, plasticity, ductility, malleability, stiffness, toughness, brittleness, hardness, wear resistance, mach inability, cast ability and weld ability-Fatigue, fatigue strength, creep-temperature creep-cyclic loading and repeated loading- endurance limit.

Structure of Solids: Crystal Structure: Introduction to Atomic Structure-Crystal Structure: Unit Cell and Space Lattice-Crystal System: The seven basic crystal systems-Crystal Structure for metallic Elements: BCC, FCC and HCP- Coordination Number for simple Cubic, BCC and FCC –Atomic Packing Factor for simple cubic, BCC, FCC and HCP-Simple problems on finding number of atoms for a unit cell.

Ferrous Metals And It's Alloys: Iron and carbon steels: Introduction-Flow sheet for production of Iron and Steel Iron Ores-Pig Iron: Classification, Composition and Effects of impurities on Iron-Cast Iron: Classification, Composition, Properties and uses-Wrought Iron: Properties, Uses/Applications of Wrought Iron.

Steel- Classification of Carbon Steels: Low Carbon Steel, Medium Carbon Steel and High Carbon steel- Composition, Properties and Uses-Comparison of Cast Iron, Wrought Iron and Mild Steel and High Carbon Steel or Hard Steel Standard Commercial Sizes of Steel as per BIS.

Ferrous Alloys: Alloy Steels –Purpose of alloying-Effects of alloying elements-Important Alloy Steels: Silicon Steels, High Speed Steel(HSS) ; Heat Resisting Steel, Spring Steel, Stainless Steel (SS) : Types of SS, Applications of SS- Magnet Steel-Composition, Properties and Uses.

Non –ferrous metals & Alloys: Properties and uses of Aluminium, Copper, Tin, Lead, Zinc, Magnesium and Nickel, Copper Alloys : Brasses, Bronzes- Composition, properties and uses, Aluminium Alloys: Duralumin, Hindalium, Magnesium-Composition, properties and uses. Nickel Alloys: Inconel, Monel, Nichrome -Composition, properties and uses. Anti-friction /Bearing Alloys: Various types of bearing Bronzes. Standard commercial sizes as per BIS.

Cutting Tool Materials : Characteristics of ideal Cutting tool materials- Types: Carbon Steels, Medium alloy steel –HSS –Satellites –Cemented Carbide _ CBN – Diamond and Abrasives.

Introduction to Metal Matrix Composites (MMC) and Nanomaterials.

Plastic: Properties , composition ,classification and production method, Uses of plastic as an engineering material, production defects and remedies- it's advantages and disadvantages.

Testing of materials: Destructive testing : Tensile Testing –Compression Testing– Hardness Testing, Brinell Rockwell, Scleroscope and Mohr's Test–Bend Test – Torsion Test- Fatigue Test _ Creep Test. Non –destructive Testing : Radiography- Magnetic Particle Inspection –Liquid penetrant test –Ultrasonic inspection.

Heat treatment: processes, purpose, procedures –applications of various heat treatment processes- Iron- carbon equilibrium diagram-full annealing-process annealing stress relief annealing-spheroidising annealing-isothermal annealing-normalizing-hardening-tempering-quenching medium-different types and their relative merits-case hardening-pack carburizing-cyaniding-nitriding-induction hardening and flame hardening.

Corrosion: Nature of corrosion, Electro-chemical reactions, Electrolytes –Factors affecting corrosion , Environment ,Material properties and Physical conditions- Types of corrosion (eight types) –Determination of corrosion characteristics –Corrosion Control , Material selection , Environment control and Design.

Surface Engineering: Reasons for surface engineering –Surface engineering processes, Coatings and Surface treatments –Cleaning and Mechanical finishing of surfaces – Organic Coatings –Electro –plating and special metallic plating –Electro-polishing and Photo –etching –Conversion coatings: Oxide, Phosphate and Chromate coatings- Thin film coatings, PVD and CVD –Surface analysis –Hard –facing, Thermal spraying and High-energy processes – Process /Material Selection.

7. THEORY OF MACHINES:

Introduction: Definition of Theory Of Machine (TOM)Sub –divisions of TOM

Basic kinematics of Machines: Kinematic link or element, Types of links, Kinematic pair –type, Types of constrained Motions, Kinematic chain, Machine, Structure and Mechanism, Difference between Machine and Structure, Difference between Machine and Mechanism, Inversions, Types of Kinematic Chains, Four Bar Chain, Beam Engine, Coupling Rod of, Locomotive, Indicator Watt's Mechanism, Single Slider Crank Chain, Pendulum Pump, Oscillating cylinder engine, Rotary I.C Engine, Crank and, Slotted Lever Quick Return Motion Mechanism, Whitworth Quick Return Motion Mechanism, Double Slider Crank Chain, Elliptical trammel, Scotch yoke mechanism, Oldham's coupling.

Friction: Friction - Friction in Journal Bearing, Friction of Pivot and Collar Bearing,

types of Pivot and Collar Bearing (No derivation requires, formulae only). Simple Problems on the above topic. Dynamometer- Difference between brake & clutch, difference between brake and Dynamometer. Types of Dynamometer, classification of absorption type dynamometers.

Transmission of Power: Types of Belt Drives, Length of belt –open and cross belt drives, Velocity Ratio, Ratio of driving Tensions, Centrifugal Tension and Initial Tension, Power Transmitted by belts (flat and V) and ropes, Maximum power transmitted by belt (without proof), Problems on belt drives.

Gears: Introduction to Gears, Classification of Gears; Spur Gear Terminology, Problems on gears, Introduction to Gear Trains, Types of Gear trains –Simple, Compound, Reverted and Epicycle gear trains, Problems on Gear Trains

Cams: Introduction, Classification of cams, Classification of followers, Terminology of Radial disc cam, Mechanical Vibrations.

Vibrations: Introduction, Terms used in Vibrations, Types of Vibrations

Free Vibrations, Forced Vibrations, Damped Vibrations, Types of Free Vibrations-Longitudinal, Transverse and Torsional, Critical or Whirling speed of a shaft.

Balancing: Introduction, Static and Dynamic balancing, Balancing of single rotating mass in the same plane of projection, Balancing of several masses rotating in the same plane of projection, Problems on above (Analytical and Graphical methods).

Governors: Introduction ,types of Governors, Centrifugal Governor, Terms used in governors, Watt Governor, Porter Governor.

8. STRENGTH OF MATERIALS:

Simple Stresses and strains: Define the strength, Mechanical properties of engineering materials, commonly used. Identify the nature and effect of tensile, compressive and shear forces. Define the terms stress, strain, modulus of elasticity, poisson's ratio. Draw typical stress Vs strain curve for a mild steel specimen under tension indicating salient points on it. Mention the significant of factor of safety. Compute stress and strain values in bodies of uniform section and of composite section under the influence of normal stresses.

Calculate thermal stresses, in bodies of uniform section and composite sections.

Find the relations between E, G, and K & Poisson's ratio. Compute the changes in axial, lateral and volumetric dimensions of uniform sections under the action of normal forces. Define resilience and Derive an expression for strain energy. Riveted joint. Failure, Strength, efficiency and design of Rivet.

Shear force and bending moments: List the type of beams and type loads. Definition of shear force and bending moments. SF and BM diagrams for various loads for simply supported, cantilever and over hanging beam and related problems, Point of contraflexure.

Theory of simple bending and Deflection of beam: State the theory and terms of simple bending. List the assumptions in theory of simple, Bending.

Define and explain the term deflection.

Stresses in beams: Neutral surface and neutral axis, Bending Equation, Problems of stress on different beams. Torsion in circular shafts and springs, Function of shaft. Explain Polar moment of inertia of solid and hollow shaft. Design of solid and hollow shafts and power transmitted by solid And hollow shaft. Definition of spring and types of spring.

Definition of stiffness of a spring, Design of helical spring.

Columns and Struts: Definition of columns and struts. Failure of a column and a strut. Euler,s and Rankine formula for finding critical load. Problems on various (4) end conditions of column.

Rivets and riveted joints: Riveted joint. Failure, Strength, Efficiency.

9. THERMAL ENGINEERING:

Steam generators: Steam boiler- function of boiler -classification of boilers Comparison of water tube and fire tube boilers.

Boiler mountings- Pressure gauge, water level indicator, fusible plug, blow off valve, stop valve, safety valve

Boiler accessories - feed pump, economizer, super heater and air pre-heater. Boiler fuels, burning equipment and ash handling. Chimney draught and measurement. Feed water treatment. Boiler performance, Boiler acts, dry inspection and hydraulic test.

Steam nozzles: Introduction -Types of stem nozzle, Flow of steam through nozzle, Friction in a nozzle.

Steam turbine: Classification of steam turbines with examples and their working. Turbine components, Working principle with line diagram of a simple De-Laval turbine - velocity diagram of impulse turbine; Expression for work done, axial thrust, diagram efficiency, stage efficiency, nozzle efficiency.

Steam condensers and Cooling towers: Function of condenser, Elements of steam condensing plant, Types of Condenser-Jet Condenser and Surface Condenser, Vacuum in condenser and its measurement, Cooling tower.

Internal Combustion Engine: Introduction- Definition of Internal combustion engine, Difference between IC engine and EC engine, Classification of IC engines, Main components of IC engine and operation.

Cycle of operation- Otto, Diesel and Dual combustion cycle- Actual p-v diagram, Air standard efficiency and mean effective pressure, simple problem, Four-stroke diesel engine and two-stroke diesel engine –principle, working and valve timing diagram. Four-stroke petrol engine and two-stroke petrol engine –principle, working and valve timing diagram, Carburetion of fuel, air fuel mixture, single jet and multiple jet carburetor, knocking in SI engine, Working of S.U electrical and A.C mechanical

pump, Fuel filters
MPFI system.

Ignition systems: Battery and magneto ignition system, effect of advancing and retarding of ignition on engine performance, octane number, effect of compression ratio in different fuels i.e., ordinary petrol, high octane petrol, Electronic Ignition system, Fuel injection system- Air injection and airless injection, fuel pump, fuel injector, combustion in CI engine, Cetane number, Delay period and Diesel knock, CRDI system and new updated system

Cooling system of IC engine: Air cooling and water cooling, calculation of heat carried away by cooling water, Exhaust system- Exhaust manifold, Muffler, different types of muffler, heat carried away by exhaust gases

Governing of IC engine- Hit and miss, Quality and Quantity governing

Lubrication of IC engine- purposes of lubrication, properties of lubricant, S.A.E rating of lubrication system and common methods of lubrication

Testing of IC engines- Measurement of Brake power, Indicated power of single cylinder and multi cylinder engine, Mechanical efficiency, Indicated thermal efficiency, Brake thermal efficiency, Air standard efficiency, Relative efficiency, Volumetric efficiency.

10. AUTOMOBILE ENGINEERING:

Introduction to Automobile, Classification of Automobiles.

Chassis, layout of chassis and its main components, classification of chassis. Chassis lubrication, Importance of chassis lubrication, Lubricants used for chassis lubrication
Frame, Functions of frame and different parts of a frame,

Types of frame sections , Sub frame, Functions of sub frame.

Engine Operations and Constructions: Heat Engines, Difference between I.C Engines and E.C engines, Engine operations of Four stroke and Two stroke - Spark Ignition

Engines and Compression Ignition Engines, Comparison of Four stroke cycle Engines and Two stroke cycle Engines, Comparison between Petrol and Diesel Engines .
Scavenging: meaning and necessity of scavenging. Cross flow, back flow and uniform flow scavenging. Diesel and Petrol Engines parts and their functions.

Material used, constructional details and function of cylinder block, cylinder, Head , cylinder liner(dry and wet type),crank case, crankshaft, camshaft, piston Piston rings, piston pin, connecting rod, Gasket, inlet and exhaust manifolds, etc. Valve mechanism, classification of engines according to valve arrangement, valve Timing diagrams (Theoretical and Actual), valve overlap, tappet clearance.

Engine Fuel system: Line diagram of petrol engine fuel system , components of petrol engine fuel system and constructional details of mechanical and electrical fuel pump. Atomization and vaporization, carburetion, air fuel ratio, Rich mixture , lean mixture,

maximum power ratio, economic ratio for average cruising operation. Carburetor-Working principles of simple carburetor, constructional details of different components of a simple carburetor -Choke, venturi, throttle valve, float chamber, needle valve, etc .Line diagram of Diesel engine fuel system, components of Diesel engine fuel system and constructional details of fuel injector(Atomizer). Types of fuel injection systems, Types of fuel injection nozzles. Function of governors in Diesel engine. Concepts of CRDI system.

Concepts of Multi Point Fuel Injection system, Types of Multipoint Fuel Injection System, supercharging, Object of Supercharging, Superchargers-centrifugal, van type, blower type etc. Turbo-supercharger and its uses.

Engine Lubricating, Cooling & Intake & Exhaust system: Function of lubricating system , Parts of lubricating system ,constructional details of lubricating system: Pet roil type, splash type, forced feed lubrication ,dry sump ,wet sump system. Functions of engine lubricants, physical and chemical properties of lubricants, rating of lubricants, viscosity, viscosity index, SAE numbers , specific gravity flash point, fire point, pour point etc. crank case ventilation. Necessity of engine cooling system, disadvantages of overheating and under cooling, Cooling system: air cooling constructional details, fins.

Water cooling system: types, thermo-siphon system, forced circulation system, constructional details of the systems.

Functions of different parts of water cooling system-water pump, radiator, thermostat, fan, water-jacket.

Air cleaner, type and functions, intake and exhaust manifolds, silencer.

Automotive Electrical system: Starting system: Introduction to starting system, Functions of Battery & Starting motor.

Charging system: Introduction to charging system ,Functions of Generator(Dynamo) and Alternator (A.C. generator).

Ignition System: Purpose of ignition system , Types of ignition system-Battery ignition and Magneto ignition system, comparison between these two circuit of the system. Voltage necessary for ignition, Ignition in single cylinder and multi cylinder engines, Firing order, Function of distributor, coil condenser, spark plug, battery, Effect of enhancing and retarding of ignition.

Suspension System , Front axle and Steering System: Functions of Suspension System ,Rigid axle front wheel and independent front wheel suspension system, Types of suspension springs used in suspension system., Shock absorbers, principle, construction and working of a telescopic shock absorber, Functions of Shackle,

Torsion bar, stabilizer

Necessity of Front Axle, types, stub axles and types. Front wheel drive assembly, live axle, dead axle, Functions of Steering System, Different components of Steering System, Different type of steering gear mechanism, steering gear ratio.

Fundamental equation for correct steering Factors effecting Wheel alignment, Steering geometry- camber angle, caster angle, king pin inclination, included angle, toe-in, toe-out Cornering force, slip angle, turning radius, under-steering, over steering, Concepts of Power Steering. Common defects and remedies in steering system.

Power Transmission system: Clutch: Function of clutch, Principles of operation of a clutch, Main parts of a clutch, concepts of different types of clutches- Friction clutch, centrifugal clutch, diaphragm clutch, dog and spline clutch, vacuum clutch, hydraulic clutch, Common defects and remedies in the clutch

Gear Box: Functions of Gear Box, Types of Gear Box-Sliding Mesh, and Synchronesh, constant mesh Gear Box, epi-cyclic gear box., Overdrive – Construction, operation and advantage Common defects and remedies in the Gear Box, Propeller Shaft and Joints, Final Drive and Differential &

Rear Axle: Functions of propeller shaft. Universal joint, slip joints, Construction of Propeller shaft, Function of final drive, Function of Differential, principles of differential, description, differential lock, Rear axle drives-Hotchkiss drive, Torque tube drive Rear axle types- full floating, three quarter floating, semi floating axle, rear axle housings.

Power transmission system of two wheelers like scooter, motor cycle etc.

Brake System: Necessity of brakes, Functions of brake , classification of brake and Disc brake, Parking and Emergency brake. brake shoe, brake lining, brake drum. Hydraulic brake system, master cylinder, Tandem master cylinder, wheel cylinder, piping, bleeding 8.4 Common defects and remedie.

Wheels and Tyres: Function of wheels, type of wheels, hubs, rims, assembly. Functions of Tyres , types of tyre-tube tyre and tubeless tyre, tyre construction, tyre tread pattern, tyre pressure and wear-under inflation, over inflation and proper inflation. Causes of tyre wear, tyre size, tyre maintenance.

11. REFRIGERATION AND AIR CONDITIONING:

Terms and definition – Heat engine, refrigerator, heat pump, refrigeration, refrigerant, refrigerating effect, refrigeration capacity, COP, relative cop, Methods of refrigeration (names and application)

Air Refrigeration System: Reversed Carnot cycle, Bell-Coleman cycle- open system, closed system, Determination of cop. Vapour Compression Refrigeration System: Fundamental operations and analysis with schematic T-S and p-h diagrams for simple cycle, COP, Advantages and disadvantages of vapour compression system over air refrigeration system Actual vapour compression cycle—variation from theoretical cycle. Effects of sub cooling and superheating.

Vapour Absorption System: Flow diagram and operation of NH₃- WATER cycle, components- absorber, generator, rectifier, condenser, evaporator, absorber, heat exchanger, pump, Flow diagram and operation of Lithium bromide –water cycle, Flow diagram and operation of electrolux refrigerator, Comparison between vapour compression and vapour absorption systems.

Refrigerants: Definition and function of refrigerant, Desirable properties of refrigerant, Classification of refrigerant, Important requirements, secondary requirements, Selection of refrigerant for required purpose.

Refrigeration Components, Control And Safety Devices: Brief description and field of application of reciprocating compressor, rotary compressor, centrifugal compressor, Brief description and field of application of air cooled and water cooled condensers, Brief description and field of application of evaporators.

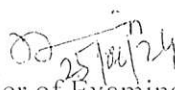
Brief description and field of application of expansion devices-capillary tube, thermostatic expansion valve, Control and safety devices- low side float valve, high side float valve, solenoid valve, compressor over current and overheating, protection, high and low pressure cut-outs.

Application Of Refrigeration: Food preservation- spoilage agents and their control, preservation by refrigeration, Cold storage-construction (layout), capacity and application .Refrigerators and freezer: construction (layout), capacity and application, Ice- cream plant- construction (layout) and operational features, Dry ice production-construction (layout) and operation of simple system, application, Water cooler.

Introduction to Air Conditioning: Definition of air conditioning, factors affecting human comfort and comfort values.

Psychometrics: Definitions of different terminology

Psychometric properties, relations, processes and use of psychometric charts.


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SYLLABUS

Screening Test (OMR based) for recruitment to the post of
Junior Engineer (Mechanical) under joint cadre of Public Works Roads Department
and Public Works (Building & NH) Department
(Advt. No. 10/2024 dtd. 03/05/2024)

PAPER-II

Subject: General Studies & General English
(Multiple Choice Objective Type)

Marks: 100

Time: 2 Hours

SL. NO.	SUBJECT
1	Current Affairs (India/ Assam)
2	Indian History & National Movement
3	Assam History
4	Geography (India/Assam)
5	Indian Polity & Constitution
6	Sports/ Books/ Author and important people of Assam
7	Economy of India & Assam
8	Environment of Assam
9	General Mental Ability
10	Literature, Culture & Festivals of Assam & North East
11	English Grammer

25/06/24
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