

S Y L L A B I : NEE-II (Vocational)

(For 10+2 vocational / ITI / NERIST Certificate holder applicants seeking admission to Diploma module in Technology stream).

Full Marks : 150

Time: 3 Hours.

SECTIONS :

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| Section-A | Physics | 25 marks. |
| Section-B | Chemistry | 25 marks. |
| Section-C | Mathematics | 30 marks. |
| Section-D | Vocational Subject | 70 marks. |

Section-A PHYSICS

25 Marks.

Units and dimensions: Units for measurements, systems of units, fundamental and derived units, SI units. Dimensional analysis and their applications.

Motion in one and two dimensions : Objects in motion in one dimension, motion in a straight line, uniform motion, its graphical representation and formulae, speed and velocity, instantaneous velocity, uniformly accelerated motion, its position-time graph, velocity-time graph and formulae.

Vectors and scalars, representations of vectors in two dimensions, unit vector, vector addition and multiplication, Resolution of vectors in plane, rectangular components, Scalar and vector products, Motion in two dimensions, projectile motion, uniform circular motion.

Laws of motion: Force and inertia, first law of motion, Momentum, second law of motion, impulse, Third law of motion, examples of third law, linear momentum, conservation of linear momentum, Equilibrium of concurrent forces, Static and kinetic friction, laws of friction, rolling friction, lubrication.

Work, Energy and Power: Work done by a constant force, Kinetic and potential energy, power, Work-energy principle, Spring constant, Gravitational potential energy, Conservation of energy, Elastic collision in one dimension.

Rotational motion: Centre of mass of a two-particle system, centre of mass of a rigid body, general motion of a rigid body, motion of centre of mass, nature of rotational motion, rotational motion of a single particle in two dimensions, Uniform circular motion and their examples, Torque, angular momentum, conservation of angular momentum, Moment of inertia and its physical significance.

Gravitation: Newton's law of gravitation, universal gravitational constant 'G', acceleration due to gravity 'g', mass and density of the earth, inertial and gravitational mass, variations of 'g'. Gravitational potential energy near the earth's surface, gravitational potential, orbital velocity, escape velocity, geostationary satellite.

Properties of matter: Inter atomic and intermolecular forces, states of matter, Elastic properties of solids, Hooke's law, Young's modulus, bulk modulus and modulus of rigidity. Fluid pressure, Pascal's law, buoyancy, flotation, Archimedes' principle, Atmospheric pressure. Surface Energy and Surface Tension, angle of contact, Capillary rise, Viscosity, Stokes law, streamline & Turbulent flow, Reynold's number, Bernoulli's Theorem & its applications.

Heat and thermodynamics: Kinetic theory of gases, pressure exerted by a Gas, kinetic Energy & Temperature, Measurement of temperature, Absolute temperature scale, Gas Laws and Avogadro's number. Specific heat of solids & liquids, Latent heats of fusion & vapourisation, Transfer of heat.

Oscillations and waves: Periodic motion, simple harmonic motion, equation of simple harmonic motion, kinetic and potential energy in simple harmonic motion, Oscillations due to a spring mass system, simple pendulum, time period of a simple pendulum. Wave motion, speed of a wave, principle of superposition, reflection of wave, Standing waves in string (graphical representation only), Sound wave and its propagation in different media, Effect of pressure and temperature on velocity of sound waves, characteristics of sound waves.

Electrostatics: Frictional Electricity, charges and their conservation, Coulomb's law, Electric field and potential due to a point charge, Dipole, its fields along the axis, Concept of dielectric and dielectric constant, Conductors and insulators.

Presence of free charges and bound charges inside a conductor, Capacitance, parallel plate capacitor with air and dielectric medium between the plates, series and parallel combination of capacitors, energy stored in a capacitor, van de graaff generator.

Current electricity: Electric current, Ohm's law, resistivity, resistance of different materials, temperature dependence of resistance, resistances in series and parallel, Kirchhoff's law - illustrations by simple examples, Wheatstone bridge and its applications for comparing emf of two cells and determination of internal resistance of a cell, Electric power and heating effects of current .

Magnetic effect of current: Oersted's experiment, Force on a moving charge in a uniform magnetic field, Force on a current carrying conductor and torque on current loop in a magnetic field, forces between two parallel current carrying conductors, definition of Ampere, Moving coil galvanometer and its conversion into ammeter and voltmeter.

Magnetism: Natural and man made magnets, properties of bar magnet, current loop as magnetic dipole, Lines of force in a magnetic field, Comparison of bar magnet and solenoid, Earth's magnetic field, Tangent galvanometer, vibration magnetometer, Electromagnets and permanent magnets.

Electromagnetic induction and alternating current: Induced emf, Faraday's laws, Lenz's law, electromagnetic induction, self and mutual inductance,

Ray Optics and Optical Instruments : Sources of light, luminous intensity, luminous flux, Reflection of light at plane and spherical surfaces, Curved mirrors, mirror formula. Refraction of light, refractive index, total internal reflection, spherical lenses, thin lens formulae, lens maker's formula, magnification. Refraction and dispersion of light due to prism, spectrometer - its use for the determination of refractive index of material of a prism, Scattering of light in atmosphere, primary rainbow, Optical instruments - simple and compound microscopes, refracting and reflecting telescopes.

Section-B CHEMISTRY

25 Marks.

Structure of Atom: Discovery and properties of sub-atomic particles (electron, proton and neutron), Rutherford's atomic model, Bohr's model of hydrogen and hydrogen-like atoms, Spectrum of hydrogen, Heisenberg's uncertainty principle, Dual nature of electron, de-Broglie equation, Quantum numbers, Concept of atomic orbital, Pauli's exclusion principle, Hund's rule of maximum multiplicity, Aufbau principle, Electronic configuration of elements up to atomic number 20.

Chemical Bonding: Ionic, Covalent, Co-ordinate covalent, Hydrogen and metallic bonds, Properties of compounds having these bonds. Hybridization and VSEPR theory for the molecular shape of simple molecules such as BeCl_2 , BF_3 , CH_4 , CCl_4 , NH_3 , H_2O , NH_4^+ , H_3O^+ , PCl_5 , SF_6 , C_2H_4 and C_2H_2 .

Periodic Properties of Elements: Mendeleev's periodic table and long form of the periodic table (Main features, merits and demerits), Periodic properties (Metallic characters, ionization potential electron affinity and electronegativity), Classification of elements into s, p, d and f - blocks, General trends of periodic properties of s- and p-block elements.

Gaseous State: Physical properties of gases, Laws governing their behavior (Boyle's Law, Charles's Law, Gay-Lussac's Law, Avogadro's law, Dalton's law of partial pressure, Graham's law of diffusion), Ideal gas equation, Kinetic molecular theory of ideal gases, Deviation from ideal behaviour, van der Waals equation of state; Continuity of states, Importance of critical constants, Liquefaction of gases.

Chemical Equilibrium: Reversible reaction, Law of mass action and its application to chemical equilibrium, Homogeneous and heterogeneous equilibrium, Le Chatelier's principle and its application, Ionic equilibria. Theory of electrolytic dissociation, Ostwald's dilution law; Arrhenius, Bronsted - Lowry and Lewis concepts of acids and bases.

Redox Reactions: Oxidation and reduction processes (classical and modern concepts), Oxidation state, Calculation of equivalent mass of oxidizing and reducing agents, Balancing of redox reactions using oxidation number and ion-electron methods.

Electrochemistry: Faraday's laws of electrolysis (statement, explanation and application), Numerical problems; Electrical conductance, specific conductance, equivalent and molar

conductances; General concept of Galvanic cell and its representation; Electrode potential, Standard hydrogen electrode and reference electrode, Electro-chemical series and its applications, EMF of a Galvanic cell, Nernst equation for electrode and cell potentials; Some commercial cells and batteries.

Organic chemistry: Classification of organic compounds, Nomenclature of hydrocarbons and compound containing one functional group, homologous series, Isomerism. General methods of preparation and properties of Alkanes, Alkenes and Alkynes. Aromatic hydrocarbons, Structure of benzene. Electrophilic substitution reactions in benzene.

Organic compounds with one functional group: Simple methods of preparation and properties of Halo-alkanes, Alcohols, Phenols, Ethers, Aldehydes, Ketones, Carboxylic acids, Derivatives of carboxylic acid, amino-, cyano-, isocyano-, azo-, and nitro- compounds.

Section-C MATHEMATICS

30 Marks.

Trigonometry: Trigonometric ratios of compound, multiple and sub-multiple angles, General solution of trigonometric equations, Properties and solution of triangles, Inverse circular functions.

Algebra: (i) Complex Numbers : Complex number and its properties, Different forms of complex numbers, roots of complex numbers, cube roots of unity and their properties, De-Moivre's theorem.

(ii) Progressions : Arithmetic and Geometric progressions, Arithmetic and Geometric means, Harmonic Progression, sum of n-terms and nth terms of A.P. & G.P.

(iii) Permutation and combinations, Binomial theorem for positive integral index, Middle term, greatest term, Binomial coefficients.

(iv) Partial fractions of different forms

(v) Determinants of order two, three and their properties.

Coordinate Geometry(2D): Coordinates of a point in a plane, distance between two points, Division of a line segment in a given ratio (internal and external division), Different forms of equation of a straight line, Distance of a point from a line, Angle between two lines, Bisector of an angle between two lines, Pair of straight lines, Equation of a circle, tangent and normal to a circle, Equation of second degree representing a conic section, Basic ideas about parabola, ellipse and hyperbola.

Coordinate Geometry (3D): Coordinates of a point in three dimensions, Distance between two points, division of join of two points. Angle between two lines, Direction cosines and direction ratios of a line, Projection of a point on a line.

Equation of a plane, Different forms of equation to a plane, Angle between two planes, Plane through three given points, Angle between a plane and line, Equation of a straight line in space, Coplanar lines, shortest distance, centre and radius of sphere.

Vector Algebra: Vector and its components, Different kinds of vectors, Addition and subtraction of vectors, scalar and vector products of two and three vectors.

Differential Calculus: Functions and their representation limit, continuity and differentiability of a function, Derivatives of elementary functions Derivatives of sum, product and quotient of functions, Derivatives of exponential, logarithmic and hyperbolic functions. Successive differentiation and Leibnitz theorem, Rolle's theorem and Lagrange's mean value theorem, L'Hospital's Rule, Curvature, Asymptotes, and concepts of curve tracing, Maxima & minima of functions of one variable.

Integral Calculus: Integration, Integral of elementary functions, Integration by parts and by substitution, Integral of rational functions and trigonometric functions, Integration of irrational functions Definite Integrals, Area under simple curves.

Statistics: Mean, median, mode and standard deviation of discrete and grouped data.

Section-D VOCATIONAL SUBJECT 70 Marks.

Note: Each Vocational Subject (from Sl. No. 1 to 8 below) consists of the Syllabus of Common Engineering Sciences (a) and that of one Trade/Branch subject (b) appropriate to the academic qualification of an applicant.

(1) AE(FE) - Agricultural Engineering (Farm Equipment Trade)

(a) Common Engineering Sciences:

(10 questions of 1-mark each & 5 questions of 2-marks each).

Engineering Drawing : Lines, lettering and dimensioning, geometrical construction, scales, Engineering curves, conic sections, cycloid, Projection of points, straight lines, planes and solids, Sectional views, Isometric views, Auxiliary Projections.

Workshop : Hand tools for carpentry and fitting, forging, welding, specification and use; various operations : sawing, planing, chiseling, joining, filing, marking, chipping, gas cutting, maintenance and types of maintenance (preventive and corrective), materials for machine components.

Mechanics : Vector concept, force and force system, static equilibrium, Newton's laws of motions and derived concepts like friction, centroid, area, moment of inertia, work energy principle and application of impulse.

Electricity : Concept of voltage, current, resistance, power and energy, relation between electrical, mechanical and thermal units, temperature coefficient of resistance. Ohm's law, series, parallel, circuits and Kirchoff's law, Capacitance and inductance.

(b) Farm Equipment Trade:

(20 questions of 1-mark each & 15 questions of 2-marks each).

Tractors and power tillers : History of tractor and power tillers, technical specifications of various types and models of tractors and power tillers. Working principles of tractor and power tiller engines including fuel system, cooling system, lubrication, air intake and exhaust system. Working principles of clutch, gear box, final drive, steering, brake, hydraulic and electrical system. P.T.O. and belt pulley. Wheels and ballasting.

Farm machinery : Agricultural mechanization, scope, benefits and limitations. Land reclamation machinery .Equipment required for seedbed preparation, sowing, planting, interculture, irrigation, plant protection, harvesting and threshing. Implement hitching, safety in operation, Machinery management.

Servicing and maintenance : Selection of site for establishing centre for repair and overhaul of tractors. Selection of hand tools, workshop machines, materials, seals and packing. Repair and preventive maintenance of general purpose machine components like fasteners, bearing, coupling, spring and elements of rotary motion drive. Fault diagnosis of various systems of engine, tractor and power tiller, checking of wear and tear, repair of worn out components and maintenance. Routine and preventive maintenance of tractor, repair and maintenance of farm equipment and land reclamation machinery.

(2) AE(FP) - Agricultural Engineering (Food Processing Trade)

(a) Common Engineering Sciences:

(10 questions of 1-mark each & 5 questions of 2-marks each).

Engineering Drawing : Lines, lettering and dimensioning, geometrical construction, scales, Engineering curves, conic sections, cycloid, Projection of points, straight lines, planes and solids, Sectional views, Isometric views, Auxiliary Projections.

Workshop : Hand tools for carpentry and fitting, forging, welding, specification and use; various operations : sawing, planing, chiseling, joining, filing, marking, chipping, gas cutting, maintenance and types of maintenance (preventive and corrective), materials for machine components.

Mechanics : Vector concept, force and force system, static equilibrium, Newton's laws of motions and derived concepts like friction, centroid, area, moment of inertia, work energy principle and application of impulse.

Electricity : Concept of voltage, current, resistance, power and energy, relation between electrical, mechanical and thermal units, temperature coefficient of resistance. Ohm's law, series, parallel, circuits and Kirchoff's law, Capacitance and inductance.

(b) Food Processing Trade:

(20 questions of 1-mark each & 15 questions of 2-marks each).

Food material characteristics and properties. Chemistry and microbiology of food, its processing and preservation. Food additives, Browning reaction. Adulteration and food laws. Nutritive value of foods.

Unit operation in food processing like washing, cleaning, sorting, grading, sizing, screening, heating, cooling, blanching, smoking and material handling etc. and related equipments. Food preservation principles and methods. Food processes such as drying, dehydration, heat treatment, refrigeration, freezing, fermentation, irradiation, evaporation and concentration etc. Food packaging materials and methods.

Processing and preservation methods of fruits and vegetables, milk, fish, meat and egg etc. and manufacture of their different products.

Instrumentation in food industry, Instruments for measurement of process parameters,

Steam generation, refrigeration and plant utilities in a food processing plant, Equipment servicing, repair and maintenance of common post harvest (including pulse and cereal milling), food and milk processing operations. Food grade engineering materials. Cleaning, hygiene, sanitation and sterilization of food processing and handling equipment.

(3) CE(CT) - Civil Engineering (Construction Technology or Draftsman / Surveyor Trade):

(a) Common Engineering Sciences:

(10 questions of 1-mark each & 5 questions of 2-marks each).

Engineering Drawing : Lines, lettering and dimensioning, geometrical construction, scales, Engineering curves, conic sections, cycloid, Projection of points, straight lines, planes and solids, Sectional views, Isometric views, Auxiliary Projections.

Workshop : Hand tools for carpentry and fitting, forging, welding, specification and use; various operations : sawing, planning, chiseling, joining, filing, marking, chipping, gas cutting, maintenance and types of maintenance (preventive and corrective), materials for machine components.

Mechanics : Vector concept, force and force system, static equilibrium, Newton's laws of motions and derived concepts like friction, centroid, area, moment of inertia, work energy principle and application of impulse.

Electricity : Concept of voltage, current, resistance, power and energy, relation between electrical, mechanical and thermal units, temperature coefficient of resistance. Ohm's law, series, parallel, circuits and Kirchoff's law, Capacitance and inductance.

(b) Construction Technology or Draftsmanship / Surveyor Trade:

(20 questions of 1-mark each & 15 questions of 2-marks each).

Construction Material : Rocks, bricks, tiles, sand, cement, lime and cement mortar, concrete, timber, steel, paints and varnishes, distemper, plastics, glasses, asphalt, sound and heat insulating materials.

Construction and Maintenance: Building Construction: Types of Brick and Stone masonry; Types and components of foundations, floors, doors and windows, arches and lintels, walls, stairs and roofs; Roads: Geometric features of road WBM and BBM pavements, Equipments used in road construction; Railways: Components, Construction and maintenance of tracks, Points and Crossings; Hydraulic Structure: Types and construction of Dams and Canals.

Surveying: Various surveying instruments; Methods of chain surveying, compass surveying, plane table surveying, theodolite surveying, leveling and contouring.

Water Supply and Sanitation : Sources of water, pumps, types of distribution systems, appurtenances in distribution system, sanitary system, construction and maintenance of sewers. Different types of water supply and sanitary fittings, Septic tanks.

Civil Engineering Drawings: Signs and symbols used in Civil Engineering Drawings, Drawings related to : Different types of masonry bonds, Sub-structure details, Timber joints, Riveted, Bolted and Welded joints, and Steel and Timber trusses.

Estimation and Quantity Surveying : Types and methods of estimates; Estimation of earthwork, masonry, RCC works, flooring, plastering, white washing and painting, sanitary fittings; Specifications of construction materials and various items of works.

(4) ECE(ET or EM) - Electronics and Communication Engineering (Electronics Technology or Electronics Maintenance Trade):

(a) Common Engineering Sciences:

(10 questions of 1-mark each & 5 questions of 2-marks each).

Engineering Drawing : Lines, lettering and dimensioning, geometrical construction, scales, Engineering curves, conic sections, cycloid, Projection of points, straight lines, planes and solids, Sectional views, Isometric views, Auxiliary Projections.

Workshop : Hand tools for carpentry and fitting, forging, welding, specification and use; various operations : sawing, planning, chiseling, joining, filing, marking, chipping, gas cutting, maintenance and types of maintenance (preventive and corrective), materials for machine components.

Mechanics : Vector concept, force and force system, static equilibrium, Newton's laws of motions and derived concepts like friction, centroid, area, moment of inertia, work energy principle and application of impulse.

Electricity : Concept of voltage, current, resistance, power and energy, relation between electrical, mechanical and thermal units, temperature coefficient of resistance. Ohm's law, series, parallel, circuits and Kirchoff's law, Capacitance and inductance.

(b) Electronics Technology or Electronics Maintenance Trade:

(20 questions of 1-mark each & 15 questions of 2-marks each).

Circuits and Devices: Semiconductors, type of semiconductors, doping, p-n junction diodes and their characteristics, Bipolar transistor, transistor, biasing, CE, CB and CC configurations and their characteristics, principles of class A, AB, B & C amplifier, gain, bandwidth, introduction to feedback amplifiers, Sinusoidal oscillator, clipping and clamping circuits, Mono-stable and Astable multivibrators.

Fundamentals of Communication & Radio Engineering: E.M. wave propagation - ground wave, space wave and sky wave, Antenna radiation, different types of Antenna, Analog communication, AM, FM, principles of multiplexing - FDM & TDM, Introduction to digital communication, Multi - channel telephony, Super heterodyne receiver, typical circuits of various stages of transistorized receivers, working principle, RF and IF alignment, AVC and AGC.

T.V. and Audio System: Monochrome T.V., Interlace scanning, synchronization, blanking pulses, bandwidth requirement, VSB, Picture resolution, typical circuits of the Video amplifier and EHT stages, function of keyed AGC, AFC, various controls in a T.V. receiver, Acoustics, high fidelity and high quality sound, sound recording - Disc and Tape, pool recording systems, equalization, Microphones and speakers, P.A. system, Record player, concept of Hi-Fi stereo.

Instruments : Resistors, capacitors and inductors, Printed circuit board. Ammeter and Voltmeter - different types and their working principle. Analog and digital multimeters, DC power supply, Cathode ray oscilloscope and signal/function generators.

(5) EE(ET or EM) – Electrical Engineering (Electrical Technology or Electrical Maintenance Trade):

(a) Common Engineering Sciences:

(10 questions of 1-mark each & 5 questions of 2-marks each).

Engineering Drawing : Lines, lettering and dimensioning, geometrical construction, scales, Engineering curves, conic sections, cycloid, Projection of points, straight lines, planes and solids, Sectional views, Isometric views, Auxiliary Projections.

Workshop : Hand tools for carpentry and fitting, forging, welding, specification and its use; various operations : sawing, planning, chiseling, joining, filing, marking, chipping, gas cutting, maintenance and types of maintenance (preventive and corrective), materials for machine components & tools

Mechanics : Vector concept, force and force system, static equilibrium, Newton's laws of motions and derived concepts like friction, centroid, area, moment of inertia, work energy principle and application of impulse.

Electricity : Concept of voltage, current, resistance, power and energy, relation between electrical, mechanical and thermal units, temperature coefficient of resistance. Ohm's law, series, parallel, circuits and Kirchoff's law, Capacitance and inductance.

(b) Electrical Technology or Electrical Maintenance Trade:

(20 questions of 1-mark each & 15 questions of 2-marks each).

Basic Electricity: Primary, Secondary cell and charging of lead acid batteries, Capacitance and inductance their series, and parallel connection and energy storage, A.C. fundamental, wave shape, cycle, frequency, time period, peak, average and r.m.s. value, form factor, phase difference, peak factor, power factor, Series A.C. RLC circuit.

Electrical Machine: Magnetic effect of current, Faraday's law of electro-magnetic induction, force acting on a current carrying conductor in a magnetic field and torque production, D.C. machine-working principle of D.C. motor and D.C. generator, D.C. motor starting and speed control, common faults, causes, testing and applications, Single phase transformer - working principle. Turns ratio, voltage, current, power relation and applications, Single phase A.C. motor - commonly used single phase A.C. motors, starting, speed control, installation, testing, common faults and their causes and testing, Universal motor.

Instruments: Permanent magnet moving coil and moving iron, voltmeter and ammeter, Dynamometer type wattmeter, ohm meter, megger, induction type energy meter, their connection and application for measurement.

Electrical Appliances: Construction, principles, connection, common faults their causes and testing of the following equipments, Electric room heater, electric iron, electric stove, geyser, electric kettle, electric fans, (ceiling and table fan).

House Wiring : Cleat wiring, casing and capping wiring, batton wiring, conduit wiring and PVC wiring, controlling of lamps from two or three places. Schematic diagram of service connection.

Testing and connection of domestic wiring installation, Wiring faults and rectification, Installation of plate and pipe earthing, Procedure for measurement of earth resistance.

Electrical Drawing: Symbols used for common electrical equipments/appliances, Simple schematic and wiring – diagrams.

(6) ME(MC) - Mechanical Engineering (Mechanical Craftsmanship Trade):

(a) Common Engineering Sciences:

(10 questions of 1-mark each & 5 questions of 2-marks each).

Engineering Drawing : Lines, lettering and dimensioning, geometrical construction, scales, Engineering curves, conic sections, cycloid, Projection of points, straight lines, planes and solids, Sectional views, Isometric views, Auxiliary Projections.

Workshop : Hand tools for carpentry and fitting, forging, welding, specification and its use; various operations : sawing, planing, chiseling, joining, filing, marking, chipping, gas cutting, maintenance and types of maintenance (preventive and corrective), materials for machine components & tools.

Mechanics : Vector concept, force and force system, static equilibrium, Newton's laws of motions and derived concepts like friction, centroid, area, moment of inertia, work energy principle and application of impulse.

Electricity : Concept of voltage, current, resistance, power and energy, relation between electrical, mechanical and thermal units, temperature coefficient of resistance. Ohm's law, series, parallel, circuits and Kirchoff's law, Capacitance and inductance.

(b) Mechanical Craftsmanship Trade:

(20 questions of 1-mark each & 15 questions of 2-marks each).

Sheet metal operations, Tools and their specifications, carpentry (selection and wood working), pattern making; Various fitting tools and their specifications; Limits, fits and tolerances; Engineering and geometrical drawing; projections; isometric drawing; Reading engineering drawings;

Basic manufacturing processes like casting, forming welding and metal cutting, various casting processes, sand casting, die casting, centrifugal casting. Casting defects, melting furnaces.

Forging hammers and presses and various forging operations like upsetting, drawing, punching, etc. stock calculations.

Various welding processes and equipments, Arc welding, gas welding, electrode specification and IS codes, Arc characteristics, TIG, MIG welding, soldering and brazing.

Various machine tools like lathe, milling, shaping, drilling machines, simple calculations, Various operations like turning, facing, threading, knurling, groove cutting etc., Taper, thread cutting calculations, gear cutting on milling machine; different Grinding methods;

Materials for machine tool components and cutting tools, cutting fluid, lubricants.

Measuring Tools (i.e. vernier, micrometer, gauges, comparators etc.).

(7) ME(AT) - Mechanical Engineering (Automobile Technology Trade):

(a) Common Engineering Sciences:

(10 questions of 1-mark each & 5 questions of 2-marks each).

Engineering Drawing : Lines, lettering and dimensioning, geometrical construction, scales, Engineering curves, conic sections, cycloid, Projection of points, straight lines, planes and solids, Sectional views, Isometric views, Auxiliary Projections.

Workshop : Hand tools for carpentry and fitting, forging, welding, specification and its use; various operations : sawing, planing, chiseling, joining, filing, marking, chipping, gas cutting, maintenance and types of maintenance (preventive and corrective), materials for machine components.

Mechanics : Vector concept, force and force system, static equilibrium, Newton's laws of motions and derived concepts like friction, centroid, area, moment of inertia, work energy principle and application of impulse.

Electricity : Concept of voltage, current, resistance, power and energy, relation between electrical, mechanical and thermal units, temperature weft of resistance. Ohm's law, series, parallel, circuits and Kirchoff's law, Capacitance and inductance.

(b) Automobile Technology Trade:

(20 questions of 1-mark each & 15 questions of 2-marks each).

Different types of automobiles, types of IC engine and their components, auto cycle and diesel cycle, IHP, BHP and FHP and their calculations, cooling system, lubrication system, differential, transmission system, braking system, and lighting system, Two stroke/four stroke engines, valve timing diagrams, carburetor and injector repairing of trouble shooting and remedial measures, servicing of a vehicle, repairs, functions of gear box of scooter, car or truck, working of dynamo, fuel pumps, function of clutches, motor cycles or scooters, steering mechanism, wheels and tyres and their repairs.

(8) ME(RAC)- Mechanical Engineering (Refrigeration & Air Conditioning Trade):

(a) Common Engineering Sciences:

(10 questions of 1-mark each & 5 questions of 2-marks each).

Engineering Drawing : Lines, lettering and dimensioning, geometrical construction, scales, Engineering curves, conic sections, cycloid, Projection of points, straight lines, planes and solids, Sectional views, Isometric views, Auxiliary Projections.

Workshop : Hand tools for carpentry and fitting, forging, welding, specification and its use; various operations : sawing, planning, chiseling, joining, filing, marking, chipping, gas cutting, maintenance and types of maintenance (preventive and corrective), materials for machine components.

Mechanics : Vector concept, force and force system, static equilibrium, Newton's laws of motions and derived concepts like friction, centroid, area, moment of inertia, work energy principle and application of impulse.

Electricity : Concept of voltage, current, resistance, power and energy, relation between electrical, mechanical and thermal units, temperature coefficient of resistance. Ohm's law, series, parallel, circuits and Kirchoff's law, Capacitance and inductance.

(b) Refrigeration & Air Conditioning Trade:

(20 questions of 1-mark each & 15 questions of 2-marks each).

Refrigeration systems, Air cycle refrigeration, vapor compression cycle, deviation of actual cycle from the theoretical cycle, study of charts and tables for refrigerants. Refrigeration of refrigeration processes on temperature - entropy and pressure - enthalpy diagrams. Absorption - compressor, evaporator, pumps, valves. Components of air conditioning, humidification and dehumidification, drying, evaporative cooling, comfort charts, year round air conditioning, air conditioning of cold storage, auditorium, aircrafts, locomotives. Sensible and latent heat, heat load calculation, Psychrometry, use of psychrometric chart, air distribution and Ventilation systems, Types of fans and their ratings and mountings.