Annexure-'F'

SYLLABUS FOR THE POST OF CT(LINEMAN)

WRITTEN EXAM: (Objective type questions with multiple choice answers to be answered on an OMR answer sheet) Time- 02 Hour

a)	General Intelligence & reasoning	-	20 Questions -	20 Marks
b)	General awareness	-	20 Questions -	20 Marks
c)	General Engineering(Electric)	-	60 Questions -	60 Marks

Standard and syllabus for technical written exam:

a) **General engineering (Elect) ITI Level:** Basic safety introduction, Personal protection, Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message, Use of Fire extinguishers, Visit & observation of sections, Various safety measures involved in the Industry, Elementary first Aid, Concept of Standard Fundamental of electricity, Electron theory- free electron, Fundamental terms, definitions, units & effects of electric Current, Ohm's Law -Simple electrical circuits and problems, Resistors -Law of Resistance, Series and parallel circuits.

Kirchoff's Laws and applications, Explanation of switches lamp holders, plugs and sockets. Developments of domestic circuits, Alarm & switches, with individual switches, Two way switch .Security surveillance, Fire alarm, MCB, ELCB, MCCB, Capacitor Resistance-Different Types of resistors used in electrical circuits. Specification of resistance and tolerance, Effect of variation of temperature on resistance, Different methods of measuring value of resistance, D.C. Machines - General concept of Electrical Machines.

Principle of D.C. generator. Use of Armature, Field Coil, Yoke, and Commutator, slip ring Brushes, Laminated core. Brief description of series, shunt and compound generators. Electric wirings, I.E. rules. Types of wirings both domestic & industrial Specifications for wiring. –Grading of cables and current ratings. Principle of laying out in domestic wiring-testing by Meggar. Voltage drop concept, Wiring system - P.V.C., concealed system. Maintenance & Repairing data sheet preparation, Specifications, standards for conduits & accessories- Power Wiring- Control Wiring- Information Communication Entertainment Wiring Basic principle of energy audit. Earthing - Principle of different methods of earthing. Importance of Earthing, Earth Leakage Relay.Alternating Current -Comparison D.C& A.C. , Advantages of A.C. Alternating current & related terms frequency, Instantaneous value, R.M.S. value Average value, Peak factor , form factor. Generation of sine wave, phase and phase difference, Inductive & Capacitive reactance XL & Xc, Impedance (Z), power factor (p.f) ; Vector diagram. Active and Reactive power, Simple problems on A.C. circuits, single phase & three-phase system etc. Problems on A.C. circuits. Both series & parallel power consumption P.F. etc. Concept three-phase Star & Delta connection Line voltage & phase voltage, current & power in a 3 ph circuits, with balanced and unbalanced load. Harmonics: causes & effects Working principle of Transformer, classification C.T., P.T. Instrument Single phase and Poly phase. E.M.F. equation, parallel operation of transformer, their connections. Regulation and efficiency, Cooling of transformer, protective devices. Specifications, simple problems on e.m.f. Equation, turn ratio, regulations and efficiency. Special transformers. Transformer - construction cores winding shielding, auxiliary parts breather, conservator buckholtz relay, other protective devices cooling of transformer Electrical Measuring Instruments –Multimeter - Wattmeter- P.F. meter-Intergrading type, Digital Energy meter– megger-Energy meter-Frequency meter-Phase Sequence indicator -Multimeter –Analog and Digital

Induction motor – Working principle, Squirrel Cage Induction motor , Slip-ring induction motor- Construction and characteristics, starting and speed control. D.O.L Starter, Star /Delta starter, Autotransformer starter.

SYLLABUS FOR THE POST OF CT (GENERATOR MECHANIC)

WRITTEN EXAM: (Objective type questions with multiple choice answers to be answered on an OMR answer sheet) Time- 02 Hour

a) General Intelligence & reasoning- 20 Questions- 20 Marks
b) General awareness - 20 Questions- 20 Marks
c) General Engineering(Electric) - 60 Questions- 60 Marks

Standard and syllabus for technical written exam:

a) **General engineering ITI Level:** Basic safety introduction, Personal protection, Basic injury prevention, Basic first aid, Importance of Safety and general Precautions to be observed in the shop. safety signs - for Danger, Warning, caution & personal safety message. Safe handling of Fuel Spillage, Fire extinguishers used for different types of fire. Safe disposal of toxic dust, safe handling and Periodic testing of lifting equipment, Authorization of Moving & road testing vehicles. Energy conservation-Definition, Energy Conservation Opportunities (ECOs)-Minor ECos and Medium ECOs, Major ECOs), Safety disposal of Used engine oil, Electrical safety tips. Hand & Power Tools:- Marking scheme, Marking material-chalk, Prussian blue. Cleaning tools- Scraper, wire brush, Emery paper, Description, care and use of Surface plates, steel rule, measuring tape, try square. Calipers-inside and outside. Dividers, surface gauges, scriber, punches-prick punch, center punch, pin punch, hollow punch, number and letter punch. Chisel-flat, cross-cut. Hammer-ball pein, lump, mallet. Screw drivers-blade screwdriver, Phillips screw driver, Ratchet screwdriver. Allen key, bench vice & C-clamps, Spanners- ring spanner, open end spanner & the combination spanner, universal adjustable open end spanner. Sockets & accessories, Pliers - Combination pliers, multi grip, long nose, flat-nose, Nippers or pincer pliers, Side cutters, Tin snips, Circlip pliers, external circlips pliers. Air impact wrench, air ratchet, wrenches- Torque wrenches, pipe wrenches, car jet washers Pipe flaring & cutting tool, pullers-Gear and bearing. Systems of measurement, Description, care & use of - Micrometers- Outside and depth mirometer, Micrometer adjustments, Vernier calipers, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge. Fasteners- Study of different types of screws, nuts, studs & bolts, locking devices, Such as lock nuts, cotter, split pins, keys, circlips, lock rings, lock washers and locating where they are used. Washers & chemical compounds can be used to help secure these fasteners. Function of Gaskets, Selection of materials for gaskets and packing, oil seals. Cutting tools :- Study of different type of cutting tools like Hacksaw, File- Definition, parts of a file, specification, Grade, shape, different type of cut and uses., OFF-hand grinding with sander, bench and pedestal grinders, safety precautions while grinding.

Limits, Fits & Tolerances:-Definition of limits, fits & tolerances with examples used in auto components Basic electricity, Electricity principles, Ground connections, Ohm's law, Voltage, Current, Resistance, Power, Energy. Voltmeter, ammeter, Ohmmeter Mulitmeter, Conductors & insulators, Wires, Shielding, Description of internal & external combustion engines, Classification of IC engines, Principle & working of 2&4-stroke diesel engine (Compression ignition Engine (C.I)), Principle of Spark Ignition Engine(SI), differentiate between 2-stroke and 4 stroke, C.I engine and S.I Engine, Direct injection and Indirect injection, Technical terms used in engine, Engine specification. Study of various gauges/instrument on a dash board of a vehicle- Speedometer, Tachometer, Odometer and Fuel gauge, and Indicators such as gearshift position, Seat belt warning light, Parking-brake-engagement

warning light and an Engine-malfunction light. Different type of starting and stopping method of Diesel Engine Procedure for dismantling of diesel engine from a vehicle.. Diesel Engine Components: Description and Constructional feature of Cylinder head, Importance of Cylinder head design, Type of Diesel combustion chambers, Effect on size of Intake & exhaust passages, Head gaskets. Importance of Turbulence Valves & Valve Trains- Description and Function of Engine Valves, different types, materials, Type of valve operating mechanism, Importance of Valve seats, Valve seats inserts in cylinder heads, importance of Valve rotation, Valve stem oil seals, size of Intake valves, Valve trains, Valve- timing diagram, concept of Variable valve timing. Description of Camshafts & drives , Description of Overhead camshaft, importance of Cam lobes, Timing belts & chains, Timing belts & tensioners. Description & functions of different types of pistons, piston rings and piston pins and materials. Used recommended clearances for the rings and its necessity precautions while fitting rings, common troubles and remedy. Compression ratio. Description & function of connecting rod, importance of big- end split obliquely, Materials used for connecting rods big end & main bearings. Shells piston pins and locking methods of piston pins. Overhauling of Description and function of Crank shaft, camshaft, Engine bearings- classification and location – materials used & composition of bearing materials- Shell bearing and their advantages- special bearings material for diesel engine application bearing failure & its causes-care & maintenance. Crank-shaft balancing, Firing order of the engine. Description and function of the fly wheel and vibration damper. Crank case & oil pump, gears timing mark, Chain sprockets, chain tensioner etc. Function of clutch & coupling units attached to flywheel. Description of Cylinder block, Cylinder block construction, and Different type of Cylinder sleeves (liner). Engine assembly procedure with aid of special tools and gauges used for engine assembling. Introduction to Gas Turbine, Comparison of single and two stage turbine engine, Different between gas turbine and Diesel Engine. Intake & exhaust systems Intake system components Exhaust system components Diesel Fuel Systems Electronic Diesel control Marine & Stationary Engine, Emission Control:- Vehicle emissions, Standards- Euro and Bhart II, III, IV, V Sources of emission, Combustion, Combustion chamber design. Types of emissions.

SYLLABUS FOR THE POST OF CT (GENERATOR OPERATOR)

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b) General awareness - 20 Questions- 20 Marks
c) General Engineering(Electric) - 60 Questions- 60 Marks

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open end spanner & the combination spanner, universal adjustable open end spanner. Sockets & accessories, Pliers - Combination pliers, multi grip, long nose, flat-nose, Nippers or pincer pliers, Side cutters, Tin snips, Circlip pliers, external circlips pliers. Air impact wrench, air ratchet, wrenches- Torque wrenches, pipe wrenches, car jet washers Pipe flaring & cutting tool, pullers-Gear and bearing. Systems of measurement, Description, care & use of - Micrometers- Outside and depth mirometer, Micrometer adjustments, Vernier calipers, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge. Fasteners- Study of different types of screws, nuts, studs & bolts, locking devices, Such as lock nuts, cotter, split pins, keys, circlips, lock rings, lock washers and locating where they are used. Washers & chemical compounds can be used to help secure these fasteners. Function of Gaskets, Selection of materials for gaskets and packing, oil seals. Cutting tools :- Study of different type of cutting tools like Hacksaw, File- Definition, parts of a file, specification, Grade, shape, different type of cut and uses., OFF-hand grinding with sander, bench and pedestal grinders, safety precautions while grinding.

Limits, Fits & Tolerances:-Definition of limits, fits & tolerances with examples used in auto components Basic electricity, Electricity principles, Ground connections, Ohm's law, Voltage, Current, Resistance, Power, Energy. Voltmeter, ammeter, Ohmmeter Mulitmeter, Conductors & insulators, Wires, Shielding, Length vs. resistance, Resistor ratings Fuses & circuit breakers, Ballast resistor, Stripping wire insulation, cable colour codes and sizes, Resistors in Series circuits , Parallel circuits and Series-parallel circuits, Electrostatic effects, Capacitors and its applications, Capacitors in series and parallel. Introduction to welding and Heat Treatment , Welding processes – Principles of Arc welding, brief description, classification and applications. Manual Metal Arc welding -principles, power sources, electrodes, welding parameters, edge preparation & fit up and welding techniques; Oxy – Acetylene welding - principles, equipment, welding parameters, edge preparation & fit up and welding techniques; Heat Treatment Process– Introduction, Definition of heat treatment, Definition of Annealing, Normalizing, Hardening and tempering. Case hardening, Nitriding, Induction hardening and Flame Hardening process used in auto components with examples. Description of internal & external combustion engines, Classification of IC engines, Principle & working of 2&4-stroke diesel engine (Compression ignition Engine (C.I)), Principle of Spark Ignition Engine(SI), differentiate between 2-stroke and 4 stroke, C.I engine and S.I Engine, Direct injection and Indirect injection, Technical terms used in engine, Engine specification.