

Syllabus for the post of Technician Gr.-IV
Notification Sl. No. 9
Qualification – ITI/NCVT in Electrical Trade

- Introduction to National Electrical Code-2011
- Fundamentals of electricity, definitions, units & effects of electric current
- Conductors and insulators. Conducting materials and their comparison
- Joints in electrical conductors
- Techniques of soldering. Types of solders and flux
- Underground cables: Description, types, various joints and testing procedure. Cable insulation & voltage grades
- Precautions in using various types of cables
- Ohm's Law; Simple electrical circuits and problems
- Kirchoff's Laws and applications
- Series and parallel circuits. Open and short circuits in series and parallel networks
- Laws of Resistance and various types of resistors. Wheatstone bridge; principle and its applications. Effect of variation of temperature on resistance. Different methods of measuring the values of resistance. Series and parallel combinations of resistors
- Magnetic terms, magnetic materials and properties of magnet. Principles and laws of electro-magnetism. Self and mutually induced EMFs. Electrostatics: Capacitor - Different types, functions, grouping and uses
- Inductive and capacitive reactance, their effect on AC circuit and related vector concepts. Comparison and Advantages of DC and AC systems. Related terms frequency, Instantaneous value, R.M.S. value Average value, Peak factor, form factor, power factor and Impedance etc. Sine wave, phase and phase difference. Active and Reactive power. Single Phase and three-phase system. Problems on A.C. circuits
- Advantages of AC poly-phase system. Concept of three-phase Star and Delta connection. Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load. Phase sequence meter
- I.E. rules on electrical wiring. Types of domestic and industrial wirings. Study of wiring accessories e.g. switches, fuses, relays, MCB, ELCB, MCCB

- etc. Grading of cables and current ratings. Principle of laying out of domestic wiring. Voltage drop concept
- PVC conduit and Casing capping wiring system. Different types of wiring - Power, control, Communication and entertainment wiring. Wiring circuits planning, permissible load in sub-circuit and main circuit
 - Estimation of load, cable size, bill of material and cost. Inspection and testing of wiring installations. Special wiring circuit e.g. godown, tunnel and workshop etc
 - Importance of Earthing. Plate earthing and pipe earthing methods and IEE regulations. Earth resistance and earth leakage circuit breaker
 - Laws of Illuminations. Types of illumination system. Illumination factors, intensity of light. Type of lamps, advantages/ disadvantages and their applications. Calculations of lumens and efficiency
 - Classification of electrical instruments and essential forces required in indicating instruments. PMMC and Moving iron instruments. Measurement of various electrical parameters using different analog and digital instruments. Measurement of energy in three phase circuit. Automatic meter reading infrastructures and Smart meter. Concept of Prosumer and distributed generation. Electrical supply requirements of smart meter, Detecting/clearing the tamper notifications of meter
 - Working principles and circuits of common domestic equipment and appliances
 - Concept of Neutral and Earth
 - Working principle, construction and classification of transformer. Single phase and three phase transformers. Turn ratio and e.m.f. equation. Series and parallel operation of transformer. Voltage Regulation and efficiency. Auto Transformer and instrument transformers (CT & PT)
 - Method of connecting three single phase transformers for three phase operation. Types of Cooling, protective devices, bushings and termination etc. Testing of transformer oil. Materials used for winding and winding wires in small transformer

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- General concept of rotating electrical machines. Principle of DC generator. Use of Armature, Field Coil, Polarity, Yoke, Cooling Fan, Commutator, slip ring and Brushes, Laminated core etc. E.M.F. equation Separately excited and selfexcited generators. Series, shunt and compound generators
- Armature reaction, Commutation, inter poles and connection of inter poles. Parallel Operation of DC Generators. Load characteristics of DC generators. Application, losses & efficiency of DC Generators. Routine & maintenance
- Principle and types of DC motor. Relation between applied voltage back e.m.f., armature voltage drop, speed and flux of DC motor. DC motor Starters, relation between torque, flux and armature current. Changing the direction of rotation. Characteristics, Losses & Efficiency of DC motors. Routine and maintenance
- Methods of speed control of DC motors. Lap and wave winding and related terms
- Working principle of three phase induction motor. Squirrel Cage Induction motor, Slip-ring induction motor; construction, characteristics, Slip and Torque. Different types of starters for three phase induction motors, its necessity, basic contactor circuit, parts and their functions
- Single phasing prevention. No load test and blocked rotor test of induction motor. Losses & efficiency. Various methods of speed control. Braking system of motor. Maintenance and repair
- Concentric/ distributed, single/ double layer winding and related terms
- Working principle, different method of starting and running of various single-phase AC motors. Domestic and industrial applications of different singlephase AC motors. Characteristics, losses and efficiency
- Concentric/ distributed, single/ double layer winding and related terms. Troubleshooting of single-phase AC induction motors and universal motor
- Principle of alternator, e.m.f. equation, relation between poles, speed and frequency. Types and construction. Efficiency, characteristics, regulation, phase sequence and parallel operation. Effect of changing the field excitation and power factor correction



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- Working principle of synchronous motor. Effect of change of excitation and load. V and anti V curve. Power factor improvement
- Rotary Converter, MG Set description and Maintenance
- Resistors – colour code, types and characteristics. Active and passive components. Atomic structure and semiconductor theory
- P-N junction, classification, specifications, biasing and characteristics of diodes. Rectifier circuit - half wave, full wave, bridge rectifiers and filters. Principle of operation, types, characteristics and various configuration of transistor. Application of transistor as a switch, voltage regulator and amplifier
- Basic concept of power electronics devices IC voltage regulators Digital Electronics - Binary numbers, logic gates and combinational circuits
- Working principle and uses of oscilloscope. Construction and working of SCR, DIAC, TRIAC and IGBT
- Study and understand Layout drawing of control cabinet, power and control circuits. Various control elements: Isolators, pushbuttons, switches, indicators, MCB, fuses, relays, timers and limit switches etc.
- Wiring accessories: Race ways/ cable channel, DIN rail, terminal connectors, thimbles, lugs, ferrules, cable binding strap, buttons, cable ties, sleeves, gromats and clips etc. Testing of various control elements and circuits
- Working, parameters and applications of AC / DC drive. Speed control of 3 phase induction motor by using VVVF/AC Drive
- Basic concept, block diagram and working of voltage stabilizer, battery charger, emergency light, inverter and UPS. Preventive and breakdown maintenance
- Conventional and non conventional sources of energy and their comparison. Power generation by thermal and hydel power plants
- Various ways of electrical power generation by non-conventional methods. Power generation by solar and wind energy. Principle and operation of solar panel

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- Transmission and distribution networks. Line insulators, overhead poles and method of joining aluminum conductors
- Safety precautions and IE rules pertaining to domestic service connections. Various substations. Various terms like – maximum demand, average demand, load factor, diversity factor, plant utility factor etc
- Types of relays and its operation. Types of circuit breakers, their applications and functioning. Production of arc and quenching
- EV scenario in India and EV Charging basic theory. EV Charging safety requirements

