

PHASE II

SYLLABUS FOR WRITTEN TEST (Objective Type)

NAME OF THE POST:

Sr. Technician (Information Technology / Computer Science / Electrical / ECE)

1. Branch: Information Technology / Computer Science Engg.

- **Introduction to Computer Systems:** History of computers, computer architecture, operating systems, and computer hardware.
 - **Computer Components:** Motherboard, CPU, RAM, Hard Drive, Optical Drive, Power Supply Unit, and other peripheral devices.
 - **Troubleshooting and Repair:** Identifying hardware and software problems, common computer errors, resolving software issues, replacing hardware components, and preventive maintenance.
 - **Networking:** Network protocols, network types, network topologies, network hardware, and network security.
 - **Security:** Cybersecurity threats, network security, data encryption, antivirus software, and firewalls.
 - **Operating Systems:** Windows, Linux, and Mac operating systems, installation, configuration, updates, and maintenance.
 - **Software Applications:** Common applications such as Microsoft Office Suite.
 - **Internet and Web Technologies:** Web technologies such as HTML, CSS, JavaScript, and web development tools, Server Maintenance – Hardware and Installation
 - **Basic Programming Concepts:** Programming languages – data types
 - **Cloud Computing:** Cloud computing basics, cloud storage, and cloud applications.
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2. **Branch: Electrical Engg.**

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<p>1. Basic Electrical Engineering:</p>	<p>Concept of currents, voltage, resistance, power & energy, their units, Ohm's law, electrical symbols.</p>
<p>2. Circuit Laws:</p>	<p>Kirchhoff's law, Superposition, Thevenin, Norton, Star- delta network theorems with simple numerical.</p>
<p>3. Magnetic Circuit:</p>	<p>Concept of flux, EMF, inductance, different kind of magnetic materials, Electro-magnetic induction-Self & Mutual inductance.</p>
<p>4. A.C fundamentals:</p>	<p>Instantaneous, peak, RMS and average values of alternating waves, Representation of sinusoidal wave form, simple series and parallel AC Circuits consisting of RL and C, Resonance, Tank Circuit- Poly Phase system – star and delta connection, 3 phase power, DC and sinusoidal response of RL and R-C circuit Instantaneous, peak, R.M.S and average value of alternating wave, simple Series and Parallel A.C circuits consisting of Resistance, inductance & Capacitance, three-phase Star & Delta connection, Line voltage & phase voltage, current & power in a 3 ph ckt, with balanced and unbalanced load.</p>
<p>5. Electrical Machines:</p>	<p>Basic principles of AC & D.C. machines (Motors & Generators), construction, principles of operation, speed control & Starting, losses & efficiency of AC & D.C. Machines, equivalent circuit, voltage regulation. 3 point & 4 point starters. -Connection, starting, running, speed control of motors. Testing of D.C. motors. D.C. m/c Winding-- pole pitch, coil pitch, back pitch, front pitch , Lap & Wave winding , Progressive and retrogressive winding. Transformers: Working principle of Transformer, classification C.T., P.T. Instrument and Auto Transformer/Variac Construction, Single phase and Poly phase, O.C and SC tests, efficiency, Principle of operation, equivalent circuit, torque speed characteristics, starting and speed control of 3 phase induction motor, Generation of three phase EMF, 3-Phase induction motor, rotating magnetic field. Fractional KW motors, 1- Phase induction motor, Single phase induction motor, Working principle, different method of starting and running (capacitor start/capacitor run, shaded pole technique). FHP motors, DG Sets, operation. Synchronous machines: Generation of 3-phase emf armature reaction, voltage regulation, basic knowledge of AC alternators, synchronizing, control of active and reactive power Starting and applications of synchronous motors</p>
<p>6. Wiring, Estimation and costing:</p>	<p>Electric wirings, importance, I.E.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-Estimation of lighting scheme (domestic as well as industrial wiring), electric installation of machines and relevant IE rules Earthing practices and IE Rules, load calculation. Estimation: Estimation of lighting scheme, electric installation of machine and relevant IE rules. Details of illumination system, details of load distribution, Design of electrical installation & its symbols (internal & external), Energy</p>

	efficient equipment, energy audit, protection systems of Electrical circuit, Earthing Systems, Testing of Electrical Installations, types of cables –Overhead & underground.
7. Utilization of electrical energy	White light-illumination factors, intensity of light –importance of light, human eye factor units. Types illumination & lamps -Neon sign, LED Lamps, Mercury vapour, sodium vapour, Fluorescent tube CFL, Solar lamp applications, Concept of Energy - Characters watt ages, fixing places. Types of lighting. Decoration lighting Drum Switches, Direct & indirect lighting-efficiency in lumens per watt, colour available. Thumb rule calculations of lumens. Estimating placement of lights and fans and ratings- Electric heating, Electric welding, Electroplating, Electric drives and motors (three phase and single phase), Basic knowledge of lift and escalators.
8. Generation, Transmission and Distribution	Fuse / cut out / kit Kat – function, characteristics, and materials. H.R.C Fuses – application. Contactors – Miniature circuit breakers. Relays – Thermal, Electromagnetic, solid state relays, Control Relays and Protective Relays. Types of faults – symmetrical and unsymmetrical faults, short circuit current for symmetrical faults, Protection & Switchgear-rating of circuit breakers, principles of arc extinction by oil and air, H.R.C fuses, Protection earth leakage, Lightning Arrestors Different types of power stations, Load factor, diversity factor, demand factor, cost of generation, inter-connection of power stations Power factor improvement, various types of tariffs, types of faults, short circuit current for symmetrical faults Switchgears –Buchholtz relay, Merz-Price system of protection of generators & transformers, protection of feeders and bus bars Lightning arresters, various transmission and distribution system, comparison of conductor materials, efficiency of different system Cable – Different type of cables, cable rating and derating factor
9. Renewable Energy:	Solar Energy – Direct Uses, concept, working principle and application of solar thermal systems, Power Generation (On grid & Off Grid System) with simple numerical, Solar Photovoltaic System (SPV) Applications- Solar Lantern, Solar Home System, SPV Street Light, SPV Pumping systems-wind energy systems-mechanical timers
10. Battery	Battery- construction and operation, battery capacity & ratings. Battery tests Charging System- Applications
11. Electrical measuring Instruments	Deflecting torque, Controlling torque & Damping torque , - Moving coil permanent magnet -Moving iron -Range extension, Multimeter -Wattmeter - P.F. meter -Intergrading type, Digital Energy meter – megger. -Energy meter -Frequency meter - Tri vector meter -Max Demand meter -Phase Sequence indicator - Multimeter –Analog and Digital - C.R.O, classification of instruments Static terms and characteristics: Range and Span, Accuracy and Precision, Reliability, Calibration, Hysteresis and Dead zone, Drift, Sensitivity, Threshold and Resolution, Repeatability and Reproducibility, Linearity.
12. Basic Electronics	Electronics- Atomic structure of elements. The electron Energy of an electron valence electrons , Free electrons,-Semi-Conductor Physics, Semi-conductor Bonds in semiconductor-

	<p>commonly use semiconductors, energy band description of semiconductors-intrinsic semiconductor-extrinsic semiconductor-properties of p-n junction, Semi-conductor diode, logic gates, half wave rectifier-full wave rectifier, 4ener diode, special diodes, LEDs, optical diodes. Transistors: Field effect transistors, Uni-junction Transistor (UJT): Construction, working principle, advantage & application Rectifiers: Silicon Controlled Rectifier (SCR), Triac: Construction, working principle, advantage & application.</p>
<p>13. Regulated D.C. Power Supply:</p>	<p>Ordinary D.C. Power supply, Regulated power supply. Types of voltage regulators - Zenor diode voltage regulator.</p>

3. **Branch: ECE:**

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Practical knowledge in the Electronics and Communication Engineering area related to different areas listed below.

Trouble-shooting, repair and maintenance of experimental trainer kits/modules, devices, Instruments of various labs of Electronics and Communication Engineering.

- 1) **Basic Electronics, Devices and Circuits:** Semiconductor Physics, Diode, Bipolar-Transistors, Transistor Biasing Circuits, FET. Amplifiers and Oscillators, Wave Shaping Circuits, Multivibrator Circuits and Operational Amplifiers. VCO, PLL and their Applications. Knowledge of hardware used in electronics labs multimeter, CRO, signal generator, LCR meter, single phase, three phase and regulated power supply. Cables, connectors and switches.
- 2) **Electrical Circuits:** Familiarisation with active and passive components; Circuit laws and their applications. Fundamentals of DC and AC Circuits, Circuit Theorems, Voltage and Current Sources, EMI, Batteries.
- 3) **Electronic Instruments, Measurement and Medical Electronics:** Basics of Measurements, Sensors & Transducers, CRO, DSO, Voltage, Current and Resistance Measurement Signal Generators and Analytical Instruments, Digital Instruments. Medical Electronics - Micro Electrodes – Skin Surface Electrodes- Needle Electrodes – Reference Electrodes - Digital Thermometer – Sphygmomanometer - Electronic Stethoscope - Recorders and Meters: ECG - EEG - EMG - Cardiac Stress Test - Equipment – Cardio Topography - Electro Oculography - Electro Retinography – Poly Somnography - Spirometer - Blood Flow Meter - Vascular Doppler – Audiometer.
- 4) **Digital Electronics:** Difference between analog and digital signal. Number System , Codes and Parity, Logic Gates and Families , Logic Simplification, Arithmetic circuits, Decoders, Multiplexers and De-Multiplexers, Latches and flip flops, Shift Register, Counters, A/D and D/A converters.
- 5) **Network Filters and Transmission Lines:** Symmetrical Network, Asymmetrical Network, Attenuators, Filters Prototype Filter, M-Derived Filter, Crystal Filters and active filters. Transmission Lines.
- 6) **Power Electronics:** Thyristors and other Power Electronics Devices, SCR, DIAC, TRIAC, UJT, Controlled Rectifiers, Inverters, Choppers, Dual Converters and Cyclo converters. Thyristorised Control of AC & DC Electric drives. UPS.
- 7) **Microprocessors, Microcontrollers and Embedded System:** Architecture of 8085 Microprocessor, Memories and I/O interfacing, Programming, Instruction Timing and Cycles, Interrupts, Peripheral devices, Architecture and instruction set of 8086 Microprocessor. Architecture and instruction set of 8051 Microcontroller. Assembly/C programming (KEIL) for Micro controller, interfacing, PIC, ARDUINO- architecture and programming – Introduction to Raspberry Pi – ARM Controllers.

- 8) **Electronics Design and Simulation Techniques:** Testing of active and passive components, assembly of components, soldering techniques, PCB Fabrication, PSpice/ ORCAD/EDA based Circuit Simulations.
- 9) **Audio and Video Systems:** Microphones and Loudspeakers, Digital Audio Fundamentals, Television fundamentals, colour television, Digital Video, Compression Techniques and Standards, Digital Television-Transmission and Reception, Projection Display Systems and Television. Home Theatre, Smart TV – Bluetooth - OTT (over-the-top) Platform.
- 10) **VLSI Design:** Overview of VLSI, VHDL Programming, Combinational & Sequential circuit design, CPLDs & FPGAs.
- 11) **Principles of Communication Engineering:** Analog and Digital Need for modulation, Amplitude, frequency and phase modulation and demodulation. AM/FM Transmitters, Radio Receivers, Antennas, Different modes of wave propagation and typical areas of application. Digital communication: Coding, Modulation Techniques, Modems, Characteristics and working of data transmission circuits, ISP, Wireless Communication, Mobile Communication Systems, Introduction to 3G, 4G, 5G.
- 12) **Satellite Communications:** Basic idea of passive and active satellites. Meaning of the terms orbit, apogee, perigee, Geostationary satellite and its need. Block diagram and explanation of a satellite communication link. Link losses etc. Transponders multiple access techniques, VSAT & its features - Applications.
- 13) **Microwave & Fiber Optic Communication:** Introduction to Microwaves, Microwave Devices, Wave Guides, Microwave Components, Introduction to Optic fiber - fiber Materials, Optical Sources, and Photo Detectors - fiber Fabrication - Optical Couplers and WDM Concepts - System Design and Optical fiber Applications.
- 14) **Computer Networks and Industry 4.0:** Networking Basics, Cables & Connectors, Network Trouble shooting techniques, Wireless Networking, Industry 4.0 - Internet of Things (IoT) - Wireless Sensor Networks (WSN) – Introduction to Robotics in Automation - Software defined radio (SDR) – Cognitive Radio.

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DIRECTOR