

ELECTRONICS & COMMUNICATION ENGINEERING**Total Marks: 100**

1. **Electrical and Electronics Engineering (08 marks):** Basics of electricity. Ohm's law. Kirchhoff's Current and Voltage law, Combination of resistances, Power, Energy. Laws of electrostatics, capacitors- dielectric, permittivity, charging and discharging of capacitors, combination of capacitors, Electromagnetic induction-Faraday's law and Lenz's law, self and mutual inductance, combination of inductors, energy stored in inductor and capacitor. AC circuits-Resistive, Inductive and Capacitive circuits, R-L, R-C and R-L-C circuits. Transformers-types, EMF equation, losses, regulation, efficiency. Principle of alternators, AC motors, DC motors and generators. Specifications, applications and features of different types of resistors, inductors, capacitors, relays, cells and batteries
2. **Semiconductor Devices (06 marks):** Semiconductors, insulators and conductors. Types and properties of semiconductors. PN junction. Characteristics, principle and applications of Diode and Zener diode. Characteristics, principle, configurations(modes) and applications of BJT. Characteristics, principle and applications of FET, JFET, MOSFET and CMOS. Characteristics, principle and applications of UJT, SCR, DIAC, TRIAC, Varactor diode, tunnel diode, GUNN Diode PIN diode and schottky diode. ICs-classification. Fabrication of monolithic ICs. Opto-electronic devices, Laser and Maser
3. **Analog Electronics (08 marks):** Power supplies -Rectifiers, regulators and filters, SMPS, UPS- BJT Amplifiers -biasing, multistage amplifiers, types of coupling, feed back in amplifiers. Differential amplifier, Op-amp characteristics and its applications- Voltage follower, inverting & non-inverting amplifier, summer & difference amplifier, differentiator & integrator, Schmitt trigger, comparator, Active filters, PLL. Clippers and Clampers. Oscillators-Hartley, Colpitts, RC phase-shift, Wein-bridge and Crystal oscillator.
4. **Measurement and Instrumentation (07 marks):** Measurements- methods, electronic measurement system. Dynamic characteristics of an instrument. Errors-types, statistical analysis of error. Standards. Bridges-DC and AC. PMMC meter, multi range voltmeters and ammeters. Electrodynamic meter -voltmeter, ammeter, wattmeter. CRO, Signal generators & Wave analyzers. Electrical transducers- Strain gauge, Capacitive transducers, Hall-effect, piezoelectric type transducers, LVDT, Thermistors, Thermocouple, Piezoelectric and Proximity sensors. DVM, Electronic counters, Digital frequency meter, digital LCR meter and digital multimeter.
5. **Industrial Automation (07 marks):** SCR as switch, Triggering, Commutation methods. Half wave and Full-wave controlled rectifiers. Choppers- principle, classification and Applications. Inverters -principle, Half and Full-Bridge Inverters, series inverter, Variable DC Link Inverter, Voltage Source and Current Source Inverters, PWM techniques used in inverters, Applications. Cycloconverters - Single phase to single phase midpoint cycloconverter, Applications

of thyristors in speed control of motors, burglar alarm and light dimmers. Relay logic panel, Scanning considerations, Sensors and Actuators. Programming PLC-Relation to Digital Logic Gates - relation to Boolean algebra, PLC Register Basics-General characteristics - Holding Registers, Input & Output Registers. PLC Timer functions, PLC Counter functions, Basic Number Comparison Functions

6. **Digital Electronics (08 marks):** Number Systems, Importance of binary system. Analog and Digital signals. Logic gates- Concept of logic, types, basic gates, universal gates, Boolean algebra, Demorgan's theorems, Boolean/logic expressions, simplification of expressions, K-maps. Combinational logic circuits-Adders, subtractors, encoder, decoder, MUX and DEMUX. Sequential logic circuits-Flip-Flops, Counters and Shift registers. Logic families. D/A converters. A/D converters. Memories-Terminology, classification and features. Programmable logic devices- PLA, PAL. Logic families.
7. **Applications of Electronics (04 marks):** Role and functions of electronics principles and devices used in: **consumer electronic gadgets**-calculator, washing machine, refrigerator, microwave oven, air conditioners, office-automation equipments; **Automobiles**- Electronic ignition, Electronically controlled suspension and Instrument panel displays; **Audio systems**- Microphone and Headphones, Loudspeakers; **Video systems**-Colour TV system and TV displays; **Entertainment**-Electronic music synthesizers; and **Robotics**- Components, Classification and Robotic Control system.
8. **Analog Communication (07 marks):** Superposition theorem, Thevenin's theorem, Norton's theorem and Maximum Power Transfer theorem. Resonance – series and parallel, Passive Filters and Attenuators. Antennas- terminologies, types and applications, antenna arrays. Electromagnetic spectrum and different types of wave propagation. Transmission lines- primary and secondary constants, reflection, standing waves and impedance matching. AM and FM- Modulation and demodulation.
9. **Digital Communication (07 marks):** Comparison of analog and digital communications. Base-band and pass-band transmission. Sampling theorem, Nyquist criterion and aliasing effect, and Quantization. Definition of information capacity, entropy, bit-rate, baud rate and bandwidth of digital data. Encoding- PCM, DPCM, DM and ADM. Line codes. Digital modulation techniques-ASK, FSK and PSK. Multiplexing techniques-FDM and TDM. Multiple access techniques-TDMA, FDMA and CDMA. Transmission media-twisted pair, co-axial and optical fibers.
10. **Advanced Communication (07 marks):** Microwave signal, Waveguides- types, TE and TM modes. Microwave devices- IMPATT, TRAPATT diodes, klystron, reflex klystron, magnetron and TWT. Radar range equation, Pulsed radar, modulators, duplexers and displays. Antenna scanning methods, MTI Radar, CW Doppler radar, FM-CW Radar. Satellite-basic terminology. Uplink and Downlink, Geostationary and polar satellite. LEO, MEO & GEO satellites, Satellite communication system, transponders, frequency allocation, communication satellites, satellite subsystems, earth station. GPS, DTH, VSAT and remote sensing. Features of 1G, 2G, 2.5G, 3G, 4G cellular networks, Cellular concept, Frequency reuse, features of GSM, CDMA, LTE. Wifi, Bluetooth and Zigbee.

11. **Data Communication and Networking (05 marks):**-Categories of computer network, switching techniques, layers of OSI model, LAN -Ethernet, virtual LAN, GSM/CD access methods, token passing, FDDI, wireless LAN. TCP/IP-IP addresses, address mapping, ARP. Ports and sockets- DNS, Email, IMAP, FTP frame relay and ATM. Different methods of accessing internet, Modems, Routers, Bridges, Switches and Gateways, network security.
12. **C-Programming (03 marks):** Definition, need, and types of programming languages. Character set, Variables, Identifiers and Key-words. Data-types: Built-in, derived and user-defined. Constants and Literals. Operators and their Precedence. I/O statements. Control structure- loops and branching statements. Arrays, structures, unions, strings and pointers. User defined and library functions
13. **MATLAB (03 marks):** Features and applications of MATLAB, Character set, Variables, Identifiers and Key-words. Data-types: Built-in, derived and user-defined. Constants and Literals. Operators and its Precedence. I/O statements. Control structure- loops and branching statements. Concept of built-in functions.
14. **Microcontrollers (07 marks):** Features of RISC, CISC, Harvard and Von-Neumann architectures. Microprocessors and microcontrollers. variants of MCS-51. Architecture of 8051, Memory organization, 8051 Addressing modes, Instruction set, I/O ports, Embedded C, Interrupts of 8051, timers and counters of 8051, serial I/O. Interfacing of displays, ADC, DAC, Stepper motor and DC motor
15. **ARM Controller (05 marks):** Embedded system hardware- AMBA bus protocol, ARM core data flow model, Processor modes, Pipelining, ARM and thumb, Instruction Set, Assembler directives, Exception and Interrupt handling in ARM, LPC2148 CPU, Features and Applications of pin connect block, GPIO, PLL and Timers.
16. **Embedded Systems (05 marks):** Embedded systems and General Computing system, Characteristics and quality attributes of Embedded System, Hardware and Software architecture of Embedded Systems, architecture of MSP430, Exceptions, Addressing Modes and Instruction Set of MSP430. MSP430 GPIO, Timer and On-chip Peripherals, MSP430 mixed Signal Systems
17. **Verilog (03 marks):** Concept of HDL, Program Structure of Verilog- Lexical Tokens, Data types, Operators, Operands, Modules, procedures Behavioral Modeling, Structural Modeling, Gate-Level Modeling, Dataflow Modeling, Switch-Level Modeling.