Syllabus in respect of recruitment of various post at NIELIT

Evaluations weightage of marks is 15 % for interview & 85 % for written examination for the posts in GP of Rs. 5400/- and below while for the remaining posts it is 50% each for Interview and written examination.

<table>
<tr><th>SR NO</th><th>POST</th><th>SYLLABUS</th><th>REMARKS</th></tr>
<tr><td>1.</td><td>Scientist D
(GP-7600)</td><td>No specific syllabus.</td><td>75 % General aptitude & Numerical ability, 25 % on recent trends in Scientific/Technical areas.</td></tr>
<tr><td>2.</td><td>Scientist C
(GP-6600)</td><td rowspan="2">EC: Electronics and Communication Engg.

CS: Computer Sc. and Information Technology

Syllabus is placed at Annexure -I</td><td rowspan="2">15%General Aptitude 20% Engg. Mathematics , 65 % on subject of respective specialization
Choices are EC / CS& IT

For the post @ 2& 3 different question paper with choice of selection EC/CS&IT</td></tr>
<tr><td>3.</td><td>Scientist B
(GP-5400)</td></tr>
<tr><td>4.</td><td>Sr Tech Asst
(GP-4200)</td><td>Mathematics , Computer , Electronics & IT topics- Refer Annexure –IV A</td><td rowspan="3">15% General Aptitude, 20% Mathematics & 65 % on Computer , IT & Electronics subjects .

There will be option of answering either on CS& IT or EC

Questions papers for posts at Sr no 7 & 8 are different, their levels based on the job requirement.</td></tr>
<tr><td>5.</td><td>Tech Asst
(GP-2400)</td><td rowspan="2">Mathematics , Computer , Electronics & IT topics- Refer Annexure –IV B</td></tr>
<tr><td>6.</td><td>Jr Tech Asst
(GP-1900)</td></tr>
</table>

ANNEXURE –I

Syllabus for the post of Scientist B & Scientist C

EC: ELECTRONICS AND COMMUNICATIONS

Section 1: Engineering Mathematics Linear Algebra: Vector space, basis, linear dependence and independence, matrix algebra, eigen values and eigen vectors, rank, solution of linear equations – existence and uniqueness. Calculus: Mean value theorems, theorems of integral calculus, evaluation of definite and improper integrals, partial derivatives, maxima and minima, multiple integrals, line, surface and volume integrals, Taylor series. Differential Equations: First order equations (linear and nonlinear), higher order linear differential equations, Cauchy's and Euler's equations, methods of solution using variation of parameters, complementary function and particular integral, partial differential equations, variable separable method, initial and boundary value problems. Vector Analysis: Vectors in plane and space, vector operations, gradient, divergence and curl, Gauss's, Green's and Stoke's theorems. Complex Analysis: Analytic functions, Cauchy's integral theorem, Cauchy's integral formula; Taylor's and Laurent's series, residue theorem. Numerical Methods: Solution of nonlinear equations, single and multi-step methods for differential equations, convergence criteria. Probability and Statistics: Mean, median, mode and standard deviation; combinatorial probability, probability distribution functions - binomial, Poisson, exponential and normal; Joint and conditional probability; Correlation and regression analysis.

Section 2: Networks, Signals and Systems Network solution methods: nodal and mesh analysis; Network theorems: superposition, Thevenin and Norton's, maximum power transfer; Wye-Delta transformation; Steady state sinusoidal analysis using phasors; Time domain analysis of simple linear circuits; Solution of network equations using Laplace transform; Frequency domain analysis of RLC circuits; Linear 2-port network parameters: driving point and transfer functions; State equations for networks. Continuous-time signals: Fourier series and Fourier transform representations, sampling theorem and applications; Discrete-time signals: discrete-time Fourier transform (DTFT), DFT, FFT, Z-transform, interpolation of discrete-time signals; LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay, digital filter design techniques.

Section 3: Electronic Devices Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; Generation and recombination of carriers; Poisson and continuity equations; P-N junction, Zener diode, BJT, MOS capacitor, MOSFET, LED, photo diode and solar cell; Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography and twin-tub CMOS process.

Section 4: Analog Circuits Small signal equivalent circuits of diodes, BJTs and MOSFETs; Simple diode circuits: clipping, clamping and rectifiers; Single-stage BJT and MOSFET amplifiers: biasing, bias stability, mid-frequency small signal analysis and frequency response;

BJT and MOSFET amplifiers: multi-stage, differential, feedback, power and operational; Simple op-amp circuits; Active filters; Sinusoidal oscillators: criterion for oscillation, single-transistor and opamp configurations; Function generators, wave-shaping circuits and 555 timers; Voltage reference circuits; Power supplies: ripple removal and regulation.

Section 5: Digital Circuits Number systems; Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexers, decoders and PLAs; Sequential circuits: latches and flip-flops, counters, shift-registers and finite state machines; Data converters: sample and hold circuits, ADCs and DACs; Semiconductor memories: ROM, SRAM, DRAM; 8-bit microprocessor (8085): architecture, programming, memory and I/O interfacing.

Section 6: Control Systems : Basic control system components; Feedback principle; Transfer function; Block diagram representation; Signal flow graph; Transient and steady-state analysis of LTI systems; Frequency response; Routh-Hurwitz and Nyquist stability criteria; Bode and root-locus plots; Lag, lead and lag-lead compensation; State variable model and solution of state equation of LTI systems.

Section 7: Communications Random processes: autocorrelation and power spectral density, properties of white noise, filtering of random signals through LTI systems; Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, superheterodyne receivers, circuits for analog communications; Information theory: entropy, mutual information and channel capacity theorem; Digital communications: PCM, DPCM, digital modulation schemes, amplitude, phase and frequency shift keying (ASK, PSK, FSK), QAM, MAP and ML decoding, matched filter receiver, calculation of bandwidth, SNR and BER for digital modulation; Fundamentals of error correction, Hamming codes; Timing and frequency synchronization, inter-symbol interference and its mitigation; Basics of TDMA, FDMA and CDMA.

Section 8: Electromagnetics Electrostatics; Maxwell's equations: differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector; Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth; Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart; Waveguides: modes, boundary conditions, cut-off frequencies, dispersion relations; Antennas: antenna types, radiation pattern, gain and directivity, return loss, antenna arrays; Basics of radar; Light propagation in optical fibers.

CS: COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

Section1: Engineering Mathematics Discrete Mathematics: Propositional and first order logic. Sets, relations, functions, partial orders and lattices. Groups. Graphs: connectivity, matching, coloring. Combinatorics: counting, recurrence relations, generating functions. Linear

Algebra: Matrices, determinants, system of linear equations, eigenvalues and eigenvectors, LU decomposition. Calculus: Limits, continuity and differentiability. Maxima and minima. Mean value theorem. Integration. Probability: Random variables. Uniform, normal, exponential, poisson and binomial distributions. Mean, median, mode and standard deviation. Conditional probability and Bayes theorem. Computer Science and Information Technology

Section 2: Digital Logic Boolean algebra.

Combinational and sequential circuits. Minimization. Number representations and computer arithmetic (fixed and floating point).

Section 3: Computer Organization and Architecture Machine instructions and addressing modes. ALU, data-path and control unit. Instruction pipelining. Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).

Section 4: Programming and Data Structures Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.

Section 5: Algorithms Searching, sorting, hashing. Asymptotic worst case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide-and-conquer. Graph search, minimum spanning trees, shortest paths.

Section 6: Theory of Computation Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and contex-free languages, pumping lemma. Turing machines and undecidability.

Section 7: Compiler Design Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation.

Section 8: Operating System Processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU scheduling. Memory management and virtual memory. File systems.

Section 9: Databases ER-model. Relational model: relational algebra, tuple calculus, SQL. Integrity constraints, normal forms. File organization, indexing (e.g., B and B+ trees). Transactions and concurrency control.

Section 10: Computer Networks Concept of layering. LAN technologies (Ethernet). Flow and error control techniques, switching. IPv4/IPv6, routers and routing algorithms (distance vector, link state). TCP/UDP and sockets, congestion control. Application layer protocols (DNS, SMTP, POP, FTP, HTTP). Basics of Wi-Fi. Network security: authentication, basics of public key and private key cryptography, digital signatures and certificates, firewalls.

Annexure –IV (A)

Syllabus for Senior Technical Assistant

MATHEMATICS

(Common for Electronics, Electronics & Communications / Computer Science , Information Technology)

Matrices: Identification of Matrices, Rank, systems of linear equations, consistency, eigen values, eigen vectors, Cayley Hamilton Theorem, adjoint and inverse.

Determinants: Evaluation of second and third order, minors and cofactors, solutions of simultaneous linear equation in three unknown using Cramer's rule.

Coordinate geometry: Equations to a straight line – slope-intercept form, intercept form, Angle between two lines, condition for two lines to be perpendicular, parallel.

Calculus: Mean value theorems, Theorems of integral calculus, Evaluation of definite and improper integrals, Applications of integration, Area bounded by a curve and X or Y axis, solutions of differential equations using the method of variable separable, solutions of linear differential equations of first order, Partial Derivatives, Maxima and minima, Lagrange' s method, Multiple integrals, Fourier series. Vector identities, Directional derivatives, Line, Surface and Volume integrals, Stokes, Gauss and Green's theorems..

Differential equations: First order equation (linear and nonlinear), Higher order linear differential equations with constant coefficients, Method of variation of parameters, Cauchy's and Euler's equations, Initial and boundary value problems, Partial Differential Equations and variable separable method.

Probability and Statistics: Sampling theorems, Conditional probability, Mean, median, mode and standard deviation, Random variables, Discrete and continuous distributions, Poisson, Normal and Binomial distribution, Correlation and regression analysis.

Option – 1 Electronics / Electronics & Communications

Networks: Network graphs: matrices associated with graphs; incidence, fundamental cut set and fundamental circuit matrices. Solution methods: nodal and mesh analysis. Network theorems: superposition, Thevenin and Norton's maximum power transfer, Wye-Delta transformation. Steady state sinusoidal analysis using phasors. Linear constant coefficient differential equations; time domain analysis of simple RLC circuits, Solution of network equations using Laplace transform: frequency domain analysis of RLC circuits. 2-port network parameters: driving point and transfer functions. State equations for networks.

Electronic Devices: Energy bands in silicon, intrinsic and extrinsic silicon. Carrier transport in silicon: diffusion current, drift current, mobility, and resistivity. Generation and recombination of carriers. p-n junction diode, Zener diode, tunnel diode, BJT, JFET, MOS capacitor, MOSFET, LED, p-I-n and avalanche photo diode, Basics of LASERs. Device technology: integrated circuits fabrication process, oxidation, diffusion, ion implantation, photolithography, n-tub, p-tub and twin-tub CMOS process.

Analog Circuits: Small Signal Equivalent circuits of diodes, BJTs, MOSFETs and analog CMOS. Simple diode circuits, clipping, clamping, rectifier. Biasing and bias stability of transistor and FET amplifiers. Amplifiers: single-and multi-stage, differential and operational, feedback, and power. Frequency response of amplifiers. Simple op-amp circuits. Filters. Sinusoidal oscillators; criterion for oscillation; single-transistor and op-amp configurations. Function generators and wave-shaping circuits, 555 Timers. Power supplies.

Digital circuits: Boolean algebra, minimization of Boolean functions; logic gates; digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinatorial circuits: arithmetic circuits, code converters, multiplexers, decoders, PROMs and PLAs. Sequential circuits: latches and flip-flops, counters and shift-registers. Sample and hold circuits, ADCs, DACs. Semiconductor memories. Microprocessor(8085): architecture, programming, memory and I/O interfacing.

Signals and Systems: Definitions and properties of Laplace transform, continuous-time and discrete-time Fourier series, continuous-time and discrete-time Fourier Transform, DFT and FFT, ztransform. Sampling theorem. Linear Time-Invariant (LTI) Systems: definitions and properties; causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay. Signal transmission through LTI systems.

Control Systems: Basic control system components; block diagrammatic description, reduction of block diagrams. Open loop and closed loop (feedback) systems and stability analysis of these systems. Signal flow graphs and their use in determining transfer functions of systems; transient and steady state analysis of LTI control systems and frequency response. Tools and techniques for LTI control system analysis: root loci, Routh-Hurwitz criterion, Bode and Nyquist plots. Control system compensators: elements of lead and lag compensation, elements of Proportional-Integral-Derivative (PID) control. State variable representation and solution of state equation of LTI control systems.

Communications: Random signals and noise: probability, random variables, probability density function, autocorrelation, power spectral density. Analog communication systems: amplitude and angle modulation and demodulation systems, spectral analysis of these operations, superheterodyne receivers; elements of hardware, realizations of analog communication systems; signal-to-noise ratio (SNR) calculations for amplitude modulation (AM) and frequency modulation (FM) for low noise conditions. Fundamentals of information theory and channel capacity theorem. Digital communication systems: pulse code modulation (PCM), differential pulse code modulation (DPCM), digital modulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), matched filter receivers, bandwidth consideration and

probability of error calculations for these schemes. Basics of TDMA, FDMA and CDMA and GSM.

Electromagnetics: Elements of vector calculus: divergence and curl; Gauss' and Stokes' theorems, Maxwell's equations: differential and integral forms. Wave equation, Poynting vector. Plane waves: propagation through various media; reflection and refraction; phase and group velocity; skin depth. Transmission lines: characteristic impedance; impedance transformation; Smith chart; impedance matching; S parameters, pulse excitation. Waveguides: modes in rectangular waveguides; boundary conditions; cut-off frequencies; dispersion relations. Basics of propagation in dielectric waveguide and optical fibers. Basics of Antennas: Dipole antennas; radiation pattern; antenna gain.

Option – II Computer Science / Information Technology

Digital Computer Principles: Number systems – Binary, Decimal, Octal and Hexadecimal Conversion, Arithmetic operations, Boolean algebra, Logic gates, SOP, POS, Minterm and maxterms, Boolean expression, simplification, Postulates and theorems, Simplifications, K-Map, Combinational logic circuits – Adder, Subtractor, Multiplexer, Demultiplexer, Encoder, Decoder, Sequential Circuits – SR, JK, T, D flip flops, Shift registers, Asynchronous, synchronous and Modulo n Counters.

Computer Organization and Architecture: Multiprocessors and microcomputers, Machine instructions and addressing modes, ALU and data-path, CPU control design, Memory interface, I/O interface (Interrupt and DMA mode), Cache and main memory, Secondary storage, Semiconductor memory – Internal organization, SRAM, DRAM, SDRAM, Rambus memory, ROM technology, virtual memory, Instruction sequencing, Instruction execution, Hardwired control and microprogrammed control, micro instructions, Instruction pipelining.

Programming and Data Structures: Programming in C; Functions, Recursion, Parameter passing, Scope, Binding; Abstract data types, Arrays, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary heaps.

Algorithms: Analysis, Asymptotic notation, Notions of space and time complexity, Worst and average case analysis; Design: Greedy approach, Dynamic programming, Divide-andconquer; Tree and graph traversals, Connected components, Spanning trees, Shortest paths; Hashing, Sorting, Searching. Asymptotic analysis (best, worst, average cases) of time and space, upper and lower bounds, Basic concepts of complexity classes P, NP, NP-hard, NP-complete.

Graph Theory: Connectivity, covering, colouring, planarity, isomorphism. Computer Graphics: Line drawing, circle drawing, filling, hatching, 2D/3D transformations, projections, hidden surface removal.

Theory of Computation: Regular languages and finite automata, Context free languages and Push-down automata, Recursively enumerable sets and Turing machines, Undecidability.

Object Oriented Programming: Object oriented design concepts, programming in C++, Java.

Databases: ER-model, Relational model (relational algebra, tuple calculus), Database design (integrity constraints, normal forms), Query languages (SQL), File structures (sequential files, indexing, B and B+ trees), Transactions and concurrency control.

Set Theory: Sets, relations, functions, groups, partial orders, lattice, algebraic structures.

Theory of Computation: Regular languages and finite automata, context-free languages & pushdown automata, recursively enumerable sets & Turing machines, undecidability.

System Software: Compiler design, lexical analysis, parsing, syntax directed translation, code generation and optimization, Assemblers, linkers and loaders, macroprocessors, operating systems – processes, threads, inter-process communication, synchronization, deadlocks, CPU scheduling, memory management and virtual memory, file systems, I/O systems, protection & security. Module

Information Systems and Software Engineering: information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project, design, coding, testing, implementation, maintenance.

Computer Networks: ISO/OSI stack, LAN technologies (Ethernet, Token ring), Flow and error control techniques, Routing algorithms, Congestion control, TCP/UDP and sockets, IP(v4), Application layer protocols (icmp, dns, smtp, pop, ftp, http); Basic concepts of hubs, switches, gateways, and routers. Network security basic concepts of public key and private key cryptography, Hash function, Digital signature, Firewalls., User authentication – Token based, Biometric, Remote user authentication, Intrusion Detection Systems, Honey pots, Denial of Service. wireless networks, 2G and 3G networks, Bluetooth.

Web technologies: HTML, XML, basic concepts of client-server computing, web server, proxy server, web application development, MVC architecture, e-commerce, web services.

Annexure –IV B

Syllabus for Technical Assistant & Junior Technical Assistant

MATHEMATICS *(Common for Electronics, Electronics & Communication Computer Science/IT)*

ALGEBRA

Determinants and Matrices : Definition, Order, Expansion of 2^{nd} & 3^{rd} order Determinants, Cramer's rule, Determinant value of a square matrix. Singular and non singular matrices, Adjoint of a matrix. Problems, Cayley – Hamilton's theorem, Inverse of a matrix

Binomial Theorem : Meaning of ${}^{n}Cr$ and its value. Binomial theorem for $(x + a)^{n}$, Expansion. Finding constant term, co-efficient of x^{n} , particular term and middle term(s).

Logarithms : Definition of common and natural logarithms. Laws of logarithms.

Vector Algebra : Magnitude of a vector, Types of vectors. Position vector, Addition and subtraction of vector in terms of line segment. Vector in a plane, Product of vectors. Scalar and vector product. Projection of a vector on another vector. Area of parallelogram and area of triangle.

TRIGONOMETRY

Definition of an angle, radian, Relation between degree & radian, Trigonometric identities. Trigonometric ratios of standard angles, Meaning of allied angles. Trigonometric ratios of allied angles in terms of θ, Complimentary angles and relation between trigonometric ratios of complimentary angles, Express sum or difference of Sine and Cosine of an angles in to product form, Express product of Sine and Cosine of angles in to sum or difference form, relation between sides of a triangle and Sines, Cosines and Tangents of any angle (Sine rule, Cosine rule and Tangent rule), Projection rule, Half angle formulae in terms of sides of a triangle, Inverse Trigonometric functions

ANALYTICAL GEOMETRY :

Defination of a point in a plane, Specification of a point using co-ordinate system, Points on X-axis and Y-axis, Derivation of distance formula. Section formulae, Mid point formula, Centroid, area of a triangle and collinear points, Problems. Locus of a point with respect to a fixed point and with respect to two fixed points and its equations, Inclination of a line with horizontal line and its slope, Intercept of a straight line, Slope of a line parallel to X-axis and Y-axis, Derivation of conditions for two lines to be parallel and perpendicular, Angle between two lines, Point of intersection of lines.

CALCULUS :

Limits : Variables and Constants. Definition of function, Types of function, Direct and Inverse functions, Explicit and implicit function, Odd and even functions, Definition of limit of a function.

Differential Calculus : Increment and increment ratio, Derivatives of functions of x^n, sinx, cosx and tanx with respect to 'x' from first principle method, standard derivatives, Rules of differentiation: Sum, product and quotient of functions, Chain rule, Derivatives of inverse Trigonometric functions, Hyperbolic functions and inverse of hyperbolic functions, Implicit functions, Parametric functions, Logarithmic differentiation, Successive differentiation up to second order. Maxima and minima of a function.

Integral Calculus : Definition of Integration. List of standard integrals. Rules of integration, Integration by substitution method, Integration by parts, Definite integral, Theorems on definite integral, Find area, volume and rm s value of a function.

Differential Equations : Definition, order and degree of differential equation, Formation of differential equation by eliminating arbitrary constants up to second order, Solution of D E of first degree and first order by variable separable method. Solution of differential equations reducible to variable separable form. Linear equations and its solution. Solution of differential equations reducible to linear form-Bernoulli's form. Homogeneous form and its solution. Solution of differential equations reducible to homogeneous form. Exact differential equation and its solution.

Option -1 Electronics / Electronics & Communication (Diploma Level)

Electronic Circuits : Power Supplies, Half wave, full wave and bridge rectifiers, voltage regulation, Regulators, IC regulators, UPS, types of UPS. Transistor biasing and small signal amplifiers, Transistor CE amplifier, Classification of amplifiers, Classification of FETS, N-channel JFET, MOSFET, UJT, Tunnel diode, Optoelectronic devices, LDR, LED & LCD, photo diode & photo transistor, Feedback & Power amplifiers, Tuned power amplifier, Heat sink, Oscillators, RC phase shift oscillator, Wein bridge oscillator, tuned collector oscillator, Hartley, Colpitts, Crystal oscillator, Sweep circuits & Multivibrators, Boot-strap circuit, Miller sweep circuit, Current sweep circuit. Classification of multi vibrators, Astable, monostable and bistable multivibrators using transistors, Schmitt trigger, clippers and clampers, Operational amplifier, Timers & Phase Locked Loops, Differential amplifier.

Communication Systems: Elements of communication system, TDM, FDM, Noise, Signal to noise ratio, Modulation techniques, AM & FM receivers. Transmission Lines and Wave Propagation, Electromagnetic waves, wave polarization and its types, reflection, refraction, diffraction, ground wave propagation, space wave propagation (LOS), sky wave propagation, ionosphere layers, critical frequency, MUF, virtual height, troposcatter propagation, Digital Modulation, Sampling theorem, pulse modulation, pulse code modulation, delta modulation, data compression, Data coding, asynchronous transmission, synchronous transmission, error detection and correction, Amplitude shift keying(ASK), frequency shift keying (FSK), phase shift keying (PSK), quadrature amplitude modulation (QAM), Multiplexing and multiple access techniques,

Telephone modem, fax modem and data modem, cable modem, digital subscriber lines, ADSL, multiplexing and multiple access, FDM and TDM, FDMA and TDMA, spread-spectrum, code-division multiple access (CDMA). Telephone System. Public switched telephone network(PSTN), manual and electronic equipment, EPABX, digital EPABX, FAX, Internet telephony. Antennas. Isotropic, half wave dipole antennas, Antenna arrays – broadside, end fire, Yagi Uda, log periodic, turnstile antennas, Parabolic reflectors, Dish antennas, VSAT and Cellular antennas. Microwave devices & Radars, Pulsed Radars, Duplexer, CW radar, radar Beacons, instrument landing system, Satellite Communication, Microwave link, classification of satellites, Geo-stationary Satellites, Fibre Optic Communication, Optical fibre, fibre optic cables, Splices, connectors, optical couplers, optical emitters (LED & LASER diode), optical detectors (PIN diode & APD), Submarine cables, Cable television applications,

Mobile Communication: Evolution of Mobile Radio Communication, Cellular systems operation, Digital cellular mobile system, GSM standard, GSM architecture, CDMA systems, EDGE technology.

Networking & LAN Network topologies : bus, star, ring, circuit switching, packet switching, message switching, router, OSI Model, WLAN characteristics, Bluetooth, WAP applications, WAN and WAN Protocols, Internet, internet devices, repeaters, bridges, routers, gateways, ARPA net, www, internal architecture of ISP, high level architecture of an ISP, Ways of accessing the internet, PSTN ISDN, Leased lines, DSL, cable modems, TCP/IP, Use of IP address, IP datagrams, classes of IP addresses, ports and sockets, Web Applications Domain name system (DNS), Electronic mail, FTP, TELNET, proxy server

Digital Electronics : Basics of Digital Electronics Binary, Octal. Hexadecimal number systems. Binary codes, excess-3 and gray codes. Logic gates, Boolean algebra, Demorgan's Theorems. Implementation of logic expressions, Karnaugh maps, Logic families. Combinational logic circuits, Sequential logic circuits, Flip-flops, Synchronous and asynchronous circuits, Shift Registers, Parallel in parallel out, universal shift registers, ring counter and its applications, Binary counter- ripple counter, synchronous counter, up-down counter. Memories, RAM, ROM, EEPROM,UVEPROM, static RAM, dynamic RAM, Flash ROM, NVRAM, A/D and D/A converters.

Circuit Theory : Behaviour of Passive Components and Resonance in A.C. Circuits Active and passive elements, Mesh Current and Node Voltage Analysis, Kirchoff‟s laws, Mesh currents, Network theorems. Thevenin's theorem, Norton's theorem, superposition theorem, reciprocity theorem and Maximum power transfer theorem, Coupled circuits, Transient Analysis & Linear wave shaping circuits, Mutual inductance, Transient Analysis at RC & RL circuits, Transient analysis of series and parallel RLC circuits for over damping cases, pulse wave form, differentiating and integrating circuits.

Microprocessors, Microcontrollers : Microprocessor, Basic Microprocessor instructions, Addressing modes, instruction format, RISC verses CISC, Architecture of 8086, minimum and maximum modes, flag register, interrupts, Super scalar architecture, Architecture of 8051, registers, timers, interrupts, fetch cycle, execution cycle, machine cycle, state, Instruction set of 8051, instruction format, classification of instructions, addressing modes- Groups of instructions,

data transfer, arithmetic, logical, branch, Data transfer, single and multi byte addition and subtraction, subroutines, nesting, multiple ending and common ending, use of Input output and machine related statements, debugging, time delay program.

Electronic Measuring Instruments : Analog instruments, PMMC Instrument, extending the range of instruments, series and shunt type ohmmeter, FET input voltmeter, differential voltmeter, Wheatstone, Maxwell, Schering Bridge. Q meter, Distortion Factor Meter, Digital Instruments, Digital voltmeter, Digital Multimeter, Digital frequency meter, Digital LCR Meter. digital IC tester, Logic analyser, spectrum analyser, Cathode Ray Oscilloscope, XY Plotter and Recorders. Signal Generators & Power meters,

Audio and Video Systems : Audio Systems, Hi-Fi and stereo systems, disc recording and reproduction, magnetic recording and reproduction, optical recording, CD player, MP3 player, DVD player, TV Picture & Composite Video Signal Picture elements, Horizontal and vertical scanning, frame and field frequencies, Horizontal and vertical synchronisation, Horizontal and vertical blanking, T.V. Channel standards, Construction of composite Video signal, Linear scanning, standard scanning pattern. Flicker, sync Pulses, blanking signals. Monochrome and Colour Television, Additive and subtractive mixing of colours, Colour systems like NTSC, PAL, and SECAM. Colour TV Transmitter block diagram. Colour TV receiver block diagram (PAL). Colour video signal processing, operating and service controls, colour picture tube, degaussing. Satellite and Cable TV Cable TV, DTH system, DTH receiver, HD TV.

Industrial Electronics :. Power Electronic Devices, SCR, Triac, Power BJT, IGBT, triggering of SCR using UJT, protection of power devices. Converters, AC Regulators & Choppers, Inverters, AC motors, DC motor control, Introduction-Speed control of DC shunt motor by using converters and choppers, speed control of induction motor by using AC voltage controllers, V/F control (Converters and invertors control). Transducers, strain gauge, variable resistance transducer, capacitive, inductive, piezoelectric, LVDT. Thermocouples, Transducer applications, accelerometers, Tachogenerators, Servomotors

Computer Hardware : Motherboard, component layout, chip set, slots, serial port, parallel port, USB port, connectors, RAM, cache memory, HDD, FDD, sound card, Video grabber card, network card, Peripherals - Monitor, Keyboard, and mouse, Working of dot matrix, Laser and inkjet printers, Scanner – JPEG, MPEG – digital camera, CD writer, DVD player, Flash Drive, Windows Operating System, Power On Self Test, BIOS, Booting, autoexecutable batch file, config.sys file, windows registry, Device manager, control panel, viruses, PC assembly and Software Installation, Assembling PC, CMOS set up, Installation of OS, Installation of device drivers, system tools.

Option -2: Computer Science/Information Technology (Diploma Level)

Digital logic design : Digital circuits, Digital ICs, Comparison of TTL, CMOS and ECL logic Families, Number System - Binary, Octal, Decimal, Hexadecimal number system, BCD code, BCD arithmetic (addition, subtraction), Logic gates, Basic laws of Boolean algebra, Duality theorem, De Morgan's theorem, Combinational Logic Design, K-map representation of logical functions and minimization, standardization of SOP & POS, Half adder and full adder,

Half subtractor and full subtractor, Binary parallel adder, BCD adder, Multiplexers (4:1 and 8:1), Demultiplexer (1:4; 1:8; 1:16), Encoders and Decoder, Design of different code converter, BCD to 7 segment decoder, Comparator, Parity Checker and Generator, Flip Flops And Sequential Logic Design, One-bit memory cell, concept of clock signal, Triggering : edge triggering and level triggering, Excitation table of different Flip-Flop, Asynchronous counter (3 bit, 4 bit), mod N-counter, Synchronous counter, Shift register: SISO, SIPO, PISO, PIPO (4-bit) and Universal Shift register (4-bit), Classification of memories RAM, ROM, PROM, EPROM, EEPROM, Static and Dynamic RAM, A-D And D-A Converters

Computer Organisation and Architecture : Basics of Computer system, Von Neumann Architecture and its features, Structure of CPU, function of Memory unit and IO unit, Concept of PC, Laptop, workstation, Server, Super Computer, Instruction structure and addressing modes, Execution steps of a typical instruction through different parts of CPU and memory, Different addressing modes, Memory and IO devices, Memory Hierarchy model, Cache memory, Mapping technique, Hit ratio, Replacement algorithm, virtual memory technique, address translation method, TLB, Programmed IO or Status check IO, Interrupt Mechanism, DMA data transfer, IO processor, Different types of interrupt, Priority interrupt, Simultaneous interrupt, DMA transfer modes, Control unit design issue, Hardwired Control unit design, Microprogrammed Control unit design, Horizontal and vertical microprogramming, RISC, CISC architecture and pipelining, instruction pipelining.

Computer Networks : Network Models, Data and Signals, Bandwidth Utilization, Transmission Media, Switching, Error Detection and Correction, Data Link Control, Multiple Access, Wired LANs:Ethernet, Connecting LANs,Backbone Networks and Virtual LANs, Network Layer: Logical addressing, Network Layer : Internet Protocol, Network Layer :Delivery, forwarding and routing, Process to process Delivery : UDP, TCP, Congestion Control, Domain Name System, Remote Logging, Electronic Mail and File Transfer.

Data Structures using C : Pointers, Dynamic Memory allocation, Files, data structures, The Stack, Queues, Linked lists, Trees, Sorting, Searching.

Database Management Systems : Databases and database users, Database System Concepts and Architecture, Data Modeling Using the Entity-Relationship(ER) Model, Relational Data Model and Relational Database Constraints, The Relational Algebra, SQL: Schema Definition, constraints, queries and views, Functional Dependencies and normalization for relational databases, transaction processing concepts and theories, Concurrency Control Techniques, Database Recovery Techniques.

Object Oriented Programming with C++ : Object Oriented Programming, C++ Additional features, Classes and Objects, Operator Overloading, Inheritance, Virtual functions, Managing Console I/O Operations, Files, Templates.

Operating System : Process management, Synchronization, Deadlocks, Memory management, Virtual memory management, File system.

Software Engineering : Software Process, Software Requirements Analysis and Specifications, Software Architecture, Planning a Software Project, Design, Coding, Testing.

Programming with Java : Classes, Objects and Methods, Strings and String Buffer Classes, Interface: Multiple Inheritance, Packages: Putting Classes Together, Multithreaded Programming, Managing Errors and Exceptions, Applet Programming, Graphics Programming.

Web Programming : JavaScript & XHTML Documents, Dynamic Documents with JavaScript, XML, PHP, Database Access through the Web, Ruby.

Software Testing : Testing levels and types, Static testing techniques, Dynamic testing, Managing the testing process, Software testing tools, Code of ethics for software professionals.

Network security and Management : Organizational Policy and Security, Security infrastructure, Cryptography, Hardware & Software Security, Intrusion Detection System, Network Security, Wireless Security, Security & law, Internet governance and electronics mail policy.

Information Storage and Management : Information Storage and Management, Direct-Attached Storage & Introduction to SCSI, Storage System Environment, Data Protection: RAID, Intelligent Storage System, Storage Area Networks, Network-Attached Storage, Content Addressed Storage, Storage Virtualization, Backup and Recovery.
