SYLLABUS FOR ALL POSTS/ LEVELS FOR ONLINE EXAMINATION

GROUP – I	
S.No.	**Name of Post & Level** · **Syllabus**

S.No.	Name of Post & Level	Syllabus
1.	**Deputy Manager (Tehnical)/ E-1 Level**	**NETWORK** 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 sinusoidalanalysis 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 pointand 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.PN junction diode,Zener diode, tunnel diode, BJT, JFET, MOS capacitor, MOSFET, LED, p-l-n and avalanche photodiode, 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 diodecircuits, 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, 555Timers. 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, z-transform.Sampling theorem.Linear Time-Invariant (LTI) Systems: definitions and properties; causality, stability, impulseresponse, convolution, poles and zeros, parallel and cascade structure, frequency response, groupdelay, phase delay. Signal transmission through LTI systems. **CONTROL SYSTEMS** Basic control system components; block diagrammatic description, reduction of block diagrams.Openloop and closed loop (feedback) systems and stability analysis of these systems. Signal flowgraphs and their use in determining transfer functions of systems; transient

and steady stateanalysis 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, superheterodynereceivers; 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. Digitalcommunication systems: pulse code modulation (PCM), differential pulse code modulation (DPCM), digitalmodulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSIS, FSK), matched filter receivers, bandwidth consideration and probability of error calculations for theseschemes. 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; Sparameters, 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.

| 2. | **Deputy Manager (Electrical)/ E-1 Level** | 1. **Circuit Theory:** Circuit components; circuit analysis; basic network theorems and applications;   resonant circuits;
2. **Signals & Systems:** Continuous-time and discrete-time signals & systems; Sampling and recovery of signals
3. **Analog Electronics:** Characteristics and equivalent circuits (large and small-signal) of Diode, BJT,   JFET and MOSFET. Diode circuits: clipping, clamping, rectifier. Biasing and bias stability. FET amplifiers; Amplifiers: single and multi-stage, differential, operational, feedback and power. OPAMP circuits. Filters; sinusoidal oscillators; Function generators and wave-shaping circuits.
4. **Digital Electronics:** Logic gates; digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinational   circuits: arithmetic circuits, code converters, multiplexers and decoders. Sequential circuits: latches and flip-flops, counters and shift-registers. Comparators, timers, multivibrators. Sample and hold circuits, ADCs and DACs. Semiconductor memories. Logic implementation using programmable devices (ROM, PLA, FPGA).
5. **Energy Conversion**: Principles of electromechanical energy conversion: Torque and emf in rotating   machines. DC machines: characteristics and performance analysis; starting and speed control of motors; Transformers: principles of operation and analysis; regulation, efficiency; 3-phase transformers. 3-phase induction machines and synchronous machines: characteristics and performance analysis; speed control.
6. **Power Electronics and Electric Drives:** Semiconductor power devices: diode, transistor, thyristor, triac, GTO and MOSFET-static characteristics and principles of operation; triggering circuits; phase control rectifiers; bridge converters: fully controlled and half-controlled; principles of thyristor choppers and inverters; DCDC converters; Switch mode inverter; basic concepts of speed control of dc and ac Motor drives applications of variable speed drives.
7. **Analog Communication:** Random variables; Random signals and noise; Amplitude modulation; Modulators and Demodulators; Phase and Frequency modulation, Superhetrodyne receivers, AM receivers, communication receivers, FM receivers, Signal to noise ratio calculation for AM and FM receivers.
8. **Control Systems:** Elements of control systems; block-diagram representation; open-loop & closed loop systems; Control system components. Proportional, PI, PID controllers.
9. **Measurement and Instrumentation:** Measurement of current, voltage, power, energy, power- factor, resistance, inductance, capacitance |

and frequency; bridge measurement. Signal conditioning circuit; Electronic measuring instruments: multimeter, CRO, digital voltmeter, frequency counter, Q-meter, spectrum-analyzer, distortion-meter. Transducers: thermocouple, thermistor, LVDT, strain-gauge, piezo-electric crystal.

10. **Power Systems:** Principles of active and reactive power transfer and distribution; load flow; voltage control and power factor correction; economic operation; symmetrical and unsymmetrical faults. Concept of system stability, Static VAR system. HVDC transmission.

11. **Power System Protection:** Principles of overcurrent, differential and distance protection. Solid state relays, Circuit breakers, line bus, generator, transformer protection; numeric relays

12. **Digital Communication:** Pulse code modulation (PCM), differential pulse code modulation (DPCM), delta modulation (DM), Digital modulation and demodulation schemes: amplitude, phase and frequency keying schemes (ASK, PSK, FSK), Error detection and correction, Data networks.

| 3. | Deputy Manager (Civil)/ E-1 Level | 1. **Building Materials:**
Stone, Lime, Glass, Plastics, Steel, FRP, Ceramics, Aluminum, Fly Ash, Basic Admixtures, Timber, Bricks and Aggregates: Classification, Properties and selection criteria;
Cement: Types, Composition, Properties, Uses, Specifications and various Tests; Lime & Cement Mortars and Concrete: Properties and various Tests; Design of Concrete Mixes: Proportioning of aggregates and methods of mix design.

2. **Solid Mechanics:**
Elastic constants, Stress, plane stress, Strains, plane strain, Mohr's circle of stress and strain, Elastic theories of failure, Principal Stresses, Bending, Shear and Torsion.

3. **Structural Analysis:**
Basics of strength of materials, Types of stresses and strains, Bending moments and shear force, concept of bending and shear stresses; Analysis of determinate and indeterminate structures; Trusses, beams, plane frames; Rolling loads, Influence lines, Unit load method & other methods; Free and Forced vibrations of single degree and multi degree freedom system; Suspended Cables; Concepts and use of Computer Aided Design.

4. **Design of Steel Structures:**
Principles of Working Stress methods, Design of tension and compression members, Design of beams and beam column connections, built-up sections, Girders, Industries roofs, Principles of Ultimate load design.

5. **Design of Concrete and Masonry Structures:**
Limit state design for bending, shear, axial compression and combined forces; Design of beams, Slabs, Lintels, Foundations, Retaining walls, Tanks, Staircases; Principles of pre-stressed concrete design including materials and methods; Earthquake resistant design of structures; Design of Masonry Structure.

6. **Construction Practice, Planning and Management:**
Construction – Planning, Equipment, Site investigation and Management including Estimation with latest project management tools and network analysis for different Types of works; Analysis of Rates of various types of works; Tendering Process and Contract Management, Quality Control, Productivity, Operation Cost; Land acquisition; Labour safety and welfare.

7. **Flow of Fluids, Hydraulic Machines and Hydro Power:**
(a) **Fluid Mechanics, Open Channel Flow, Pipe Flow:**
Fluid properties; Dimensional Analysis and Modeling; Fluid dynamic including flow kinematics and measurements; Flow net; Viscosity, Boundary layer and control, Drag, Lift, Principles in open channel flow, Flow controls. Hydraulic jump; Surges; pipe networks.
(b) **Hydraulic Machines and Hydro power:**
Various pumps, Air vessels, Hydraulic turbines – types, classifications & performance parameters; Power house – classification and layout, storage, pondage, control of supply. |

		8. **Hydrology and Water Resources Engineering:** Hydrological cycle, Ground water hydrology, Well hydrology and related data analysis; Streams and their gauging; River morphology; Flood, drought and their management; capacity of reservoirs. Water Resources Engineers: Multipurpose uses of Water, River basins and their potential; irrigation systems, water demand assessment; Resources – storages and their yields; Water logging, canal and drainage design, Gravity dams, falls, weirs, Energy dissipaters, barrage Distribution works, Cross drainage works and head-works and their design; concepts in canal design, construction & maintenance; River training, measurement and analysis of rainfall. **9.** **Environmental Engineering:** **(a) Water Supply Engineering:** Sources, Estimation, quality standards and testing of water and their treatment; Rural, Institutional and industrial water supply; physical, chemical and biological characteristics and sources of water, Pollutants in water and its effects, Estimation of water demand; Drinking water standards, water treatment plants, water distribution networks. **(b) Waste Water Engineering:** Planning & design of domestic waste water, sewage collection and disposal; Plumbing systems. Components and layout of sewerage system; Planning & design of Domestic Waste-water disposal system; Sludge management including treatment, disposal and re-use of treated effluents; industrial waste waters and Effluent Treatment Plants including institutional and industrial sewage management. **(c) Solid Waste Management:** Sources & classification of solid wastes along with planning & design of its management system; Disposal system, Beneficial aspects of wastes and Utilization by Civil Engineers. **(d) Air, Noise pollution and Ecology:** Concepts & general methodology. **10.** **Geo-technical Engineering and Foundation Engineering:** **(a) Geo-technical Engineering:** Soil exploration – planning & methods, properties of soil, classification, various tests and inter-relationships; Permeability & Seepage, Compressibility, consolidation and Shearing resistance, Earth pressure theories and stress distribution in soil; Properties and uses of geo-synthetics. **(b) Foundation Engineering:** Types of foundation & selection criteria, bearing capacity, settlement analysis, design and testing of shallow & deep foundations; Slope stability analysis, Earthen embankments, Dams and Earth retaining structures: types, analysis and design, Principles of ground modifications. **11.** **Surveying and Geology:** **(a)** Surveying: Classification of surveys, various methodologies, instruments and analysis of measurement of distances, sensing concepts; Survey Layout for culverts, canals, bridges, road/railway alignment and buildings, Setting out of Curves. **(b)** Geology: Basic knowledge of Engineering geology & its application in projects. **12.** **Transportation Engineering:** **Highways** – Planning & construction methodology, Alignment and geometric design; Traffic Surveys and Controls; Principles of Flexible and Rigid pavements design. **Tunnelling** – Alignment, methods of construction, disposal of muck, drainage, lighting and ventilation. **Railway Systems** – Terminology, layouts and planning. **Harbours** – Terminology, Layouts and planning. **Airports** – Layout, planning & design.
4.	**Deputy Manager (Marketing)/**	**1. Concepts of Marketing Management**

	E-1 Level	o 4P and 5C of marketing
		o Porter model
		o Strategic planning process
		o SWOT analysis
		o Value chain
		o Core Competencies
		2. Marketing Environment
		o Marketing Environment
		o Factors Influencing Consumer Buyer Behaviour
		o The Marketing Research Process
		3. Analysing the market
		o Motivation theories: Freud, Maslow, Herzberg
		o Buying Decision Process
		o Market research
		4. Connecting with customers
		o Databases, Data Warehousing, Data Mining and Database marketing
		o Marketing-Mix
		o Marketing Funnel
		o Customer Relationship Management
		5. Developing marketing strategies
		o Positioning and Differentiation
		o Product Mix
		o Market leadership strategies
		o Product Life Cycle
		o Brand Positioning
		o Pricing Strategies
		o Identifying Market Segments and Targets
		6. Communication with customers
		o Market Communication
		o Process for Effective Communication; Advertising
		o Different Advertising Media
		o Communicating the value
		7. Branding
		o Brand equity – Role, scope and models
		o Brand positioning
		o Differentiation Strategies
		o Competitive Strategies for Market Leaders
		o Product Life-Cycle Marketing
		o Pricing strategy
5.	**Deputy Manager (Finance)/ E-1 Level**	**A. Basic Finance Matters**
		1. Cannon of financial propriety
		2. Bank Guarantee, letter of credit and other banking transactions.
		3. Internal Audit and Statutory Audit

		4. Capital and Revenue Budgeting
		5. Corporate Social Responsibility
		6. Role of CAG in PSUs
		B. Core Subjects
		1. Features of Schedule-III of Companies Act 2013
		2. Accounting
		3. Financial Management
		4. Costing and Cost Records
		5. Impairment in Telecom insustry
		6. Income Tax Law
		7. Accounting Standards-IND AS
		8. GST Law
		9. Regulatory requirement
		10. Companies Act 2013
6.	**Deputy Manager (Legal)/ E-1 Level**	1) Constitutional Law with reference to Preamble, fundamental rights, directive principle of state policy, writ petitions, special leave petition 2) Indian Contract Act, 1996- Part-I 3) Arbitration and conciliation Act, 1996 – Part-I 4) Consumet Protection Act, 2019 5) Special relief Act, 1963 6) Important Latin terms and maxims 7) Provisions of companies Act, 2013 with reference to RPT, CSR, Doctrines of Ultra virus/constructive notice/Indoor Management 8) The Right to Information Act, 2005 9) SEBI Act, 1992 10) DPE guidelines with reference to Administrative mechanism for resolution of CPSEs Disputes (AMRCD), CSR and Corporate governance 11) Telecom related laws such as Indian Telegraph Act 1885, TRAI Act 1997 and compliance of Licensing conditions 12) Information Technology Act 2000 13) Intellectual Property Right related Laws such as Trade marks Act, 1999 and Copyright Act, 1957 14) Labour Laws such as contracts labour Regulation and Abolition ACT, 1970 AND SHOPS AND ESTABLISHMENT Act 15) Rules made under Environment related laws to the extent applicable on RailTel such as e-waste Management Rules, 2016 and Battery Management & Handling Rules 2001 16) Drafting of Legal Notice/Affidavit/Civil Petition on some legal issue (case specific)
	GROUP-II	
7.	**Deputy Manager (Database Administration)/ E-1 Level**	Core Database concepts, Introduction to Databases and Transactions, Basics of SQL, DDL, DML, DCL, Mandatory Access Control, Data Encryption, Database objects, data storage, data Backup, Data security, Data Model, Database System Concepts and Architecture, Data Modelling Using the Entity-Relationship Model, The Relational Data Model, Relational Constraints, Entity-Relationship and object Modelling, The Relational Database Standard, Query Processing & Query Optimization Database Design, ER-Diagram and Unified Modelling Language, Transaction management and Concurrency control, Relational Algebra and Calculus, Constraints, Views and SQL, SQL Joins, Normalization, Primary Key v/s Foreign Key.
8.	**Manager (Database Administration)/ E-2 Level**	
9.	**Senior Manager**	

	(Database Administration)/ E-3 Level	
10.	**Deputy Manager (System Administration)/ E-1 Level**	Server Planning, Installation, Migration, Configuration, Mail servers, Database servers, Collaboration servers, Monitoring servers, Threat management, Different Type of Operating System Management, Cloud Administration, Understanding of Web services- IIS, WWW, and FTP, installing from Server Manager, separate worker processes, adding components, sites, ports, SSL, certificates. Understanding of file, print services, accounts, groups, Active Directory infrastructure, different storage topologies, local storage, network storage, Fibre Channel, iSCSI hardware, RAID redundancy- RAID 0, RAID 1, RAID 5, RAID 10 and combinations, hardware and software RAID, Solid State Drive (SSD) and Hard Disk Drive (HDD), ATA basic disk, dynamic disk, mount points, file systems, mounting a virtual hard disk, distributed file systems, performance monitoring, logs and alerts, Event Viewer, BIOS, UEFI, TPM, boot sector, bootloader, MBR, boot.ini, POST, Safe Mode, Backup and restore, disaster recovery planning, clustering, AD restore, folder redirection, data redundancy, Software, driver, operating systems, applications, Windows Update, Windows Server Update Service (WSUS), Introduction to Linux, Open Source Development, Linux Security Fundamentals, File System Management, Run levels, Network file system (NFS), XINETD, Domain naming service, Logical volume manager, Package Manager (RPM), Automation of jobs, Fundamentals of APACHE, SQUID, SAMBA.
11.	**Manager (System Administration)/ E-2 Level**	
12.	**Senior Manager (System Administration)/ E-3 Level**	

13.	**Deputy Manager (Security)/ E-1 Level**	• **Physical Security:**
		   • Perimeter Security
		   • Building security
		   • BMS
		   • IOT Security
		
		• **Hacking**
		   • Types – Script kiddies, Cyber terrorists, White, Grey and Black Hat hackers, Spy hackers, State sponsored hackers, hacktivist
		   • Motives of Hackers: Financial gain, political, causing damage, vendetta by ex-employees, curiosity etc
		   • Vulnerabilities, Exploits, Payloads, backdoors, shells
		   • CVE – Common Vulnerabilities and exposures
		   • CWE – Common Weakness enumeration
		   • Phases of hack – Reconnaissance, Scanning, Enumeration, Gaining access, Maintaining access, Clearing tracks
		   • OSINT Framework
		
		• **Network Security**
		   • OSI Model
		   • Topologies
		   • Threat sources – Internal (Employees, accidents, policies), External (Hackers, script kiddies etc)
		   • Types of attacks – DoS, Buffer overflows, Malwares, Social engineering, brute force
		   • Steps in a network attack – Information gathering, Port scanning, Network enumeration, Gaining and keeping admin access, Using the access/information, leaving a backdoor, covering tracks
		   • Security Policy
		   • Audits – Risk assessment, physical security audit, network configuration audit, pen-testing, Backup audit, employee awareness audit
		   • Firewalls, Types of firewalls – packet filtering, application proxy firewalls, Stateful firewall

14.	**Manager (Security)/ E-2 Level**	
15.	**Senior Manager (Security)/ E-3 Level**	

- VPNs
- IPS/IDS
- Spoofing – TCP, DNS, email
- Denial of Service attacks – SYN floods, UDP floods DDoS, Smurf attacks,
- Virus Scanners – Host based, Network based
- Wireless security

- **Introduction and Overview of Cyber security**
    - Layers of Security – Physical, Personal, Operations, Communications, Computer, Network and Information Security
    - Vulnerabilities, threats and controls
    - CIA – Confidentiality, Integrity and Authentication
    - Software Vulnerabilities – Logic Bomb, Trojan Horse, Virus, Trapdoor, Worm etc
    - Risk Mitigation techniques
    - Controls– Encryption, Software, Hardware, Policies, and Physical securities. Types of Controls – preventive, detective, corrective, recovery, deterrent, compensating.
    - Cyber defense – Network Security Gateway, Firewalls, IDS/IPS, Honeypots, Hardening of Systems with EDR
    - Password policies
    - Cryptography – Hashing, Digital Signatures, Digital Certificates
    - Social Engineering and its types like Phishing, Vishing, Impersonation

- **Cryptography**
    - Need for cryptography – CIA, Non repudiation and Key exchange
    - Types of cryptography – Symmetric, Asymmetric
    - Ciphers, Traditional Ciphers – Substitution Ciphers & transposition ciphers
    - DES – Data encryption standard
    - AES – Advanced encryption standard
    - One time pad (OTP)
    - RSA
    - DIFFIE-HELLMAN Key exchange
    - Hash, Digital Signature,
    - Public Key Infrastructure - Certification authority, Registration Authority, Certificate Database, Certificate store
    - Steganography
    - IPSec, SSL/TLS, PGP

- **IT and Cyber Laws**
    - IT Act 2008 – background, Civil and Criminal IT offences, Adjudication process, Law of evidence, Cases
    - IT Act 2000 and further amendment in 2008
    - Scope of IT Act – application & legal recognition of electronic documents, Licensed certifying authorities, Jurisdictions, Cyber Appellate Tribunal, Digital Contracts,
    - Civil Liabilities under Chapter IX – Sec 43 – damages to Computer Systems, Sec 43 A – Compensation, Sec 44 & 45 that deal with penalties

- Nature of Cybercrimes – Section 66, Section 66A (now scrapped), Section 66B(stolen computer, Section 66C(Identity theft), Section 66 D(impersonation), 66F(Cyber terrorism), Section 66E(Video voyeurism) Section 67(obscenity)
- Digital Signature related – Section 71 – penalty for misrepresentation, Section 73, Section 74
- Preserving Evidence - Sec 65 (tampering with computer source documents), Section 67C
- Privacy Related   - Sec 72
- Provisions related to Empowering central agencies – Sec 69, 69A, 69B, 70B
- Power of Police officers – Sec 80
- Cognizability, Bailability, Compundability
- Offences by Companies – Sec 85
- Personal Data Protection Bill 2019 – Data fiduciary, rights of individual, restrictions on data transfer outside India

- **Cloud Security**
  - Cloud computing and its types
  - Cloud Infra – computing, network and storage
  - Data Security in cloud
  - CIA in Cloud
  - Cloud OWASP Top 10
    - R1 – Accountability and data risk
    - R2 – User identity Federation
    - R3 – Legal and regulatory compliance
    - R4 – Business Continuity & Resiliency
    - R5 – User Privacy & Secondary Usage of Data
    - R6 – Service and Data integration
    - R7 – Multi tenancy & Physical Security
    - R8 – Incidence Analysis & Forensics
    - R9 – Infrastructure Security
    - R10 – Non production environment exposure

- **Risk Management**
  - Steps – Identify, Analyse, Evaluate, Treat, Monitor & Review risk
  - Considerations regarding Risk Management – Culture, Information Sharing, Priorities, Resilience, Speed, Threat Environment, Cyber Hygiene
  - Risk Calculation – Hazard * Vulnerability * Elements at risk
  - Risk matrix
  - Risk rating = likelihood*Severity.

- **Application Security**
  - Types – Data center, Desktop, Cloud, Mobile, Web applications
  - Data Centre applications – Custom apps or third party apps
  - Third party application security & risks
  - Application Security Testing – DevOps, Soruce code security

- Cloud application security
  - Threats – misconfigurations, unauthorized access, insecure APIs, account hijacking
  - Tools for cloud application management
  - NGFW
  - SAAS Security
  - Encryption in cloud
- Web Application Security
  - WAF
  - API Security
  - SQL Injections, Cross site Scripting, Cross site Request forgery
  - Packet sniffing, Man in the middle attacks, DNS attacks
  - Denial of Service, Phishing, Key-logging
  - Steps to secure – Authentication, Access control, Confidentiality, Integrity, Non-repudiation
  - Session management – implementing timeouts, session id management, cookie management

- **NIST Cybersecurity Framework**
  - Risk Management
    - Identify: Asset Management, Business environment, Governance, Risk assessment, Risk management strategy
    - Protect: Access Control, Awareness and Training, Data Security, Information protection and procedures, Maintenance, Protective technology.
    - Detect: Anomalies and Events, Continuous monitoring, Detection process
    - Respond: Response planning, communications, analysis, mitigation, improvements
    - Recover: recover planning, improvements, communications

  - Establishing and Improving Organization's Cybersecurity Program
    - Step 1: Prioritize and Scope. Align with organization's objectives and priorities.
    - Step 2: Orient. Identify related systems and assets, regulatory requirements and overall risk approach.
    - Step 3: Create a current profile. It should give the current compliance and baseline for further actions
    - Step 4: Conduct a risk assessment.
    - Step 5: Create a target profile.
    - Step 6: Determine, Analyze and Prioritize Gaps.
    - Step 7: Implement Action plan to fill gaps.

- **Cybersecurity Best practices**
  - Breaches and their impacts
  - Cyber resilience: Identify, Prevent, Detect and respond
  - SOC – Security Operations centre
  - Incident response plan
  - Practicing Cyber hygiene
  - Data security – full disk encryption, backups, data masking, data erasure
  - Governance Framework, Involvement of senior management
  - Personnel screening and insider threats

- Physical security of assets
- Cybersecurity awareness and training
- Network security
- Information system protection
- Account management and access controls
- Asset management
- Endpoint Detection & Response

- **Security Operations Centre and SIEM:**
  - SIEM comprises of gathering, analysing, presenting information from wide range of network and security devices, identify and access management applications, vulnerability management, policy compliance tools, operating systems, database and application logs, external threat data.
  - SIEM is used to identify, document and respond to security events
  - SIEM consists of Log management, IT regulatory compliance, Event correlation, active response and endpoint security
  - Structure of SIEM: Source device -> Log collection -> Parsing -> Rule Engine/Correlation – Monitoring and Storage of logs
  - SOC is a team of security analysts to detect, analyse, respond to, report on and to prevent cyber security incidents.
  - SOC team must perform advanced forensic analysis, packet captures, malware reverse engineering on artefacts collected during an incident.
  - Basic Attacks can be mitigated using IDS/HIPS/NIPS but manual intervention is required to resolve major incidents
  - Security Orchestration Automation and Response (SOAR): SOAR refers to technologies that enable organizations to collect inputs monitored by the security operations team. For example, alerts from the SIEM system and other security technologies — where incident analysis and triage can be performed by leveraging a combination of human and machine power — help define, prioritize and drive standardized incident response activities. SOAR tools allow an organization to define incident analysis and response procedures in a digital workflow format.

- **Cyber Security Incident Management:**
  - Incident types can be Denial of Service, Malicious code executions, Unauthorized access, Phishing, Man in middle etc
  - Incident response team
  - Elements of Incident response plan - Mission, Strategies and goals, Senior management approval, organizational approach, incident communication, metrics for measuring response effectiveness, roadmap for maturing the plan etc.
  - Incident response lifecycle: Preparation, Decision and analysis, Containment, Eradication, Recovery, Post incident activity
  - Tracking and reporting all incidents

- **Malwares**
  - Types: adwares, spyware, virus, Trojan, worm, rootkit
  - Analysis: Static and dynamic
  - Debugger

- **Digital Forensics**
  - Network Forensics
    - Steps in network forensics

		▪ Digital forensic methods for network layers – Data link & physical layers, TCP/IP, Internet, Wireless, ▪ Tools – tcpdump, wireshark, xplico, netsnif etc • Motivations – Blackmailing, fake profiles, Intellectual Property thefts • Uses – Criminal and Civil investigations, Administrative requirements, • Computer forensics – Intellectual Property theft, espionage, Regulatory compliance etc. • Roles of Forensic Investigators – Collection and Preservation of data, reporting • Forensic Toolkit • Autopsy tool
16.	**Deputy Manager (Network)/ E-1 Level**	1. **Optical Fibre Communication:** Total Internal Reflection, Snell's Law, Critical Angle, Core & Cladding, Acceptance Cone, Numerical Aperture, Step Index Fibre, Graded Index Fibre, Attenuation, Dispersion, Optical Source and Detector, Optical Amplifier, Optical Power Budget, Fibre Splicing, Fibre Coupler & Connectors, Optical Receiver, PIN Photodiode, Avalanche Photodiode, Concept of SDH/SONET, SDH framing structure, E1/11,E2,E3, STM1,STM-4,STM-16,STM-64, Section Overhead, Path Overhead. Wavelength Division Multiplexing concept of CWDM, DWDM, 1TU-T Grid, ILA and EROADMs, Transponder/Muxponders. 2. **Digital Electronics:** Number System-Decimal, Binary, Octal & Hexadecimal, Number system-Addition & Subtraction, Boolean Algebra, Truth Table, Multiplexer &Demultiplexer, Different logic gates, Encoder & Decoder, Registers, Flip-Flop, Digital Memory- RAM, ROM etc. 3. **Communication System:** Types of communication system, Analog and Digital system, Amplitude Modulation, Frequency Modulation, Pulse Modulation, Pulse code modulation, Demodulation, Wave propagation, Satellite Communication. 4. **Basic Concept of Computer Networking:** Different layer in OSI and TCP/IP, Protocols and Purposes, Circuit Switching vs Packet switching, IPv4 and IPv6 addressing, MAC addressing Transport layer protocol TCP vs UDP, ICMP, Unicast vs Multicast vs Broadcast , Anycast routing, Error Correction and Detection, Basic routing operations, IPv4/IPv6 addressing, Static and dynamic routing, Class of Service, QoS. 5. **Switching, Routing & MPLS Protocol :** Spanning Tree Protocol, MAC address, VLAN, Trunk Port vs Access Port, STP, 802.1q, Port channels, Neighbour discovery — CDP, LLDP, Storm control, Concept of MPLS , OSPF,IS-IS, BGP, LDP, RSVP, DHCP, PPPoE vs IPoE, Virtual Routing and Forwarding (VRF), Route-Distinguisher(RD) vs Route-Target(RT), MPLS-VPN, VPLS, L2 VPN, L3 VPN, Carrier Ethernet , lPSec vs GRE Tunnel, PIPE routers, MPLS Traffic Engineering, Attributes of BGP , IBGP,EBGP, MP-BGP, First Hop Redundancy Protocols — VRRP/HSRP. 6. **Internet Service:** IPv4 to IPv6 transition method, NAT 44, NAT64, CDN, Peering and Caching, PE-CE Connectivity, BNG/BRAS, Radius/AAA server, DNS-Domain Name System. 7. **Access Technology & Wireless Communication :**DSLAM, GPON, EPON, Ethernet, RF communication, CPE Routers, L2 & L3 manageable Switches, Wireless LAN- IEEE 802.11b/g/n & 802.11ac , Wi-Fi 6, Wireless on frequency band 2.4GHz & 5GHz, Wireless Frame, Bluetooth, Wireless Security WEP/WAP/WPS, CSMA/CD.
17.	**Manager (DevOps)/ E-2 Level**	**Familiarity with modern Application architecture using CI/CD, Infrastructure-as-Code** - Deploying Applications on Cloud Platform (VMware, Azure, Google Cloud, AWS) - Hands-On experience in developing and deploying Applications using 12-Factor App Methodology - Challenges and Design Principles of Cloud-Native App - Developing Resilient & Scalable Application based on Microservices Architecture **Familiar with Version Control Management and functionalities of Git** - Create and copy Git repositories using git commands - Understanding of Tagging, Branching and Merging

		- Troubleshoot and remediate Merge conflicts
		Core Concepts of Containerization using Docker - Understanding of Containerization and Docker Architecture - Write and Build Dockerfiles to create Docker Images - Understanding of Namespaces, Port binding and starting Containers in different Modes - Setting up Docker Hub and Docker Registry - Storing data in Container Volumes for persistent storage **Configuration Management using Ansible/SaltStack** - Automate tasks using Ansible playbooks - Hands-on knowledge on Ansible CLI and use of Variables - Inventory Management and Ad-Hoc Commands execution using Ansible - Familiar with Architecture of SaltStack Config - Configure roles and users in SaltStack Config - Install Salt minions using cloudConfig - Orchestration using Beacons and Reactors **Knowledge on Kubernetes based Application Development and Security Operations** - Core Concepts of Container Orchestration - Creating deployments to manage pods - Scale containerized Applications - Understanding of ConfigMaps, SecurityContexts, ServiceAccounts and Multi-Container Pods design - Configuring Quotas and Limits on Namespaces - Building and Deploying Helm Charts - Perform cluster upgrades and rollbacks - Understanding of Labels, Selectors and Annotations - Create and Manage PersistentVolumeClaims for Storage - Knowledge on Services & NetworkPolicies. - Using Prometheus to monitor services and deploying Grafana dashboards - Extending Prometheus with AlertManager

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19.
	Manager (IT)/ E-2 Level
	
	Sr. Manager (IT)/ E-3 Level
		1. **Expert knowledge of professional java frameworks like Spring, hibernate etc.**
		   Spring-Architecture, environment, IoC containers, bean scope, bean lifecycle, bean post processors, dependency injection, beans auto wiring, event handling, JDBC framework, transaction management, web MVC framework, Log4j, etc.
		   Hibernate-Architecture, environment, configuration, sessions, persistent class, mapping files, O/R Mappings, Query language, Native SQL, caching, batch processing, interceptors, etc.
		2. **Expert knowledge in build automation tools like maven.**
		   Maven- Environment, POM, build life cycle, build profiles, repositories, plug-ins, creating project, snapshots, build automation, deployment automation, etc.
		3. **Experience in Async job scheduling platforms like Kafka/RabbitMQ**
		   Kafka-fundamentals, cluster architecture, workflow, simple producer, consumer group, tools, etc.
		   RabbitMQ- overview, messaging model, producer, consumer, exchanges, queues, bindings, connections, channels, etc.
		4. **Experience in SQL, NoSQL databases systems like MySQL, elasticsearch, redis, etc.**

SQL- RDBMS concepts, syntax, operators, expressions, create/drop/select/insert commands, result sorting, contraints, joins, unions, indexes, alias syntax, alter command, truncate table, views, transactions, wildcards, date functions, temporary tables, clone tables, sub queries, etc.

Elasticsearch- API conventions, aggregations, index APIs, CAT APIs, search APIs, Cluster APIs, Query DSL, mapping, analysis, index module, ingest node, index lifecycle, frozen indices, kibana dashboard, filtering by field, data tables, region maps, pie charts, area and bar charts, time series, tag clouds, heat maps, canvas, logs UI, etc.

Redis- commands, keys, strings, hashes, lists, sets, sorted sets, HyperLogLog, publish subscribe, transactions, scriptingbackup, security, client connections, pipelining, partitioning, etc.

5. **Good hands-on knowledge of Configuration Management and Deployment tools like Jenkins, Ansible, chef etc.**

Configuration Management- Configuration Identification, Baselines, Change Control, Configuration Status Accounting, Configuration Audits and review, etc.

Jenkins- unit testing, automated testing, reporting, code analysis, distributed builds, automated deployment, metrics and trends, server maintenance, continuous deployment, plugins, security, etc.

Ansible- environment setup, yaml basics, ad hoc commands, playbooks, roles, variables, advanced troubleshooting, etc.

Chef-architecture, version control system setup, workstation setup, client setup, kitchen setup, knife setup, solo setup, cookbooks, dependencies, roles, environment, chef shell, foodcritic, chefspec, nodes, etc.

6. **Proficient in scripting, Git and Git workflows.**

Environment, lifecycle, branches, conflicts, pull request, commands, distributed version control, undo, Create and copy Git repositories using git commands, Troubleshoot and remediate Merge conflicts etc.

7. **Knowledge of web development in node.js, javascript, html.**

Node.js- REPL terminal, callback concept, event loop, event emitter, buffers, streams, file system, global objects,utility module, web module, express framework, RESTFul API, application scaling, etc.

Javascript - Cookies, Page redirects, dialog boxes, page printing, HTML DOM, error handling, validation, animation, multimedia, debugging, image map, JavaScript libraries (e.g. ExtJS, Backbone JS, and Angular JS), browser rendering behavior and performance, front-end tools (e.g. Grunt and Gulp JS.), asynchronous request handling, partial page updates, and AJAX; cross-browser compatibility issues and ways to work around such issues, JavaScript module loaders, such as Require.js and AMD, browser rendering behaviour and performance, Javascript Web APIs, Ajax, JSON, etc.

HTML and HTML5- tags, elements, attributes, formatting, embed multimedia, marquees, header, style sheet, entities, MIME media types, url encoding, character encodings, web forms 2.0, SVG, MathML, Web storage, Web SQL databases, server-sent events, WebSocket, Canvas, audio and video, Geolocation, microdata, web workers, IndexDB, web messaging, Web CORS, Web RTC, etc.

8. **Expert knowledge in Rest APIs**

RESTful web APIs, rest constraints, concept of serialization, concept of deserialization, Richardson maturity model, Environment, messages, addressing, methods, statelessness, caching, security, etc.

9. **System admin knowledge (Windows/Linux)**

Linux- File management, directories, file permission, environment, basic utilities, pipes, filters, processes, communication, vi editor, shell scripting, special variables, shell loops, loop control, shell substitutions, quoting mechanisms, IO redirections, shell functions, manpage help, regular expressions, file system basics, user administrations, system performance, system logging, signals and traps, etc.

Windows- server roles, powershell, remote management, Windows firewall, remote desktop management, resource monitor, active directory, DC Accounts, File System, Group Managed service accounts, group policy overview, DHCP role, DNS role, primary zones, manage records, IIS overview, IIS Security, Hyper-V, advanced configuration, WSUS, WSUS policies and tuning, sharing of files, file manager, print server, network services, backup management, nano server, containers, nested virtualization, etc.

10. **Knowledge of scripting language -Python/Perl/shell/PHP.**

Python-classes, objects, reg expressions, data types, type casting, CGI programming, database access, networking, sending email,

		multithreading, xml processing, GUI programming, etc. Perl- scalars, arrays, hashes, loops, subroutines, file I/O, error handling, special variables, regular expressions, coding standard, sending email, socket programming, object oriented, database access, CGI programming, package and modules, process management, etc. Shell- special variables, shell loops, loop control, shell substitutions, quoting mechanisms, IO redirections, shell functions, manpage help, etc. PHP-web concepts, GET & POST, file inclusion, Files & I/O, functions, cookies, sessions, sending emails, file uploading, coding standard, predefined variables, regular expressions, error handling, bugs debugging, form introduction, validation, etc.