

Syllabus for the Computer based Assessment Test

Phase II-

1. Assistant General Manager (Electrical / Rolling Stock):

- Electrical Machines/ Pumping systems
- Substation design/Switch gear/Earthing system
- Types of Tariff/Regulatory Commissions/Open access.
- Energy efficiency measures & Green building concept
- Traction System -750 V DC/1500V DC/25 KV AC
- Ventilation & air-conditioning/ HVAC
- Fire safety Norms.
- Lifts/escalators/Travellators
- Illumination design for office buildings/workshops/stations & Smart lighting concept
- Energy management systems.
- Power Electronics and Drives
- General Exposure to Metro Systems
- Awareness of Labour laws/ factor Act/Workman Compensation Act etc
- Indian Electricity Act 2003
- Rolling Stock maintenance
- Testing & commissioning procedures of new Metro trains.
- Role of Commissioner of Metro Rail safety
- Manpower planning & staff training needs.
- Basics of Metro rolling stock.
- Traction transformer/Motors/Inverter/Converter.
- Regenerative braking concept
- Role of IT in asset management

2. Assistant General Manager (Signal & Telecom):

Part A – Signaling

a) Knowledge on Railway Signalling

- Railway Signalling Basics: Signals, Points & Crossings, Relays, Track circuits, Axle counters, etc.
- Interlocking Principles, Control table
- Points & Crossings – Point layouts, Point Machines, Points operation, Point locking and detection, Track locking, Normal and Reverse movements of trains, facing and trailing points
- Signal Operations – Automatic Route setting and locking, Train Operated Route Release, Back locking, Approach locking, Signal Overlap etc.
- Signalling Power Plants (Integrated Power Supply System) at Stations

b) Knowledge on Metro Transit Signalling

- Difference between Mainline and Modern Urban Signalling
- Definition of Headway and Safe Braking distance
- Fixed Block Signalling, 'Distance to Go' (DTG) and CBTC Principles
- Automatic Train Protection (ATP), Automatic Train Operation (ATO) and Automatic Train Supervision (ATS)
- Computer Based Interlocking (CBI)
- Regulation strategies – Headway regulation and Scheduled regulation, Speed profiles, Temporary Speed Restrictions (TSR)
- Scheduled Mode Operations – Delay management, addition and deletion of trips, modification of departure times and train association to trips
- Depot Operations: Stabling, Shunting etc.

c) Advanced Transit Signalling

- Grade of Automation (GOA levels – 1/2/3/4)
- Concept of Driverless Train Operations (DTO) and Unattended Train Operations(UTO)

d) External Interfaces to Signalling

- Master Clock Synchronisation, Tunnel Ventilation Management
- Interface with Platform Screen Doors(PSDs)
- Interface with Train Radio (TETRA), Passenger Information Display
- Announcement Systems (PIDS / PAS)

e) Knowledge on Reliability, Availability, Maintainability and Safety (RAMS) requirements for Signalling

- Definition of Safety Integrity Levels (SIL – 0/1/2/3/4)
- Redundancy to increase Availability
- CENELEC Standards for safety critical systems

Part B – Telecommunication

a) Knowledge on Computer Networks

- Data Communications, Networks, Networks models
- OSI model, Layers in OSI model, TCP/IP protocol suite, Addressing, Guided and Unguided Transmission media
- Switching: Circuit switched networks, Data gram Networks, Virtual circuit networks

b) Data Link Layer

- Data link control: Framing, Flow and Error control
- Protocols for Noiseless and Noisy Channels, HDLC
- Multiple access: Random access, Controlled access
- Wired LANS: Ethernet, IEEE standards, standard Ethernet, changes in the standard, Fast Ethernet, Gigabit Ethernet

c) Wireless LANS

- Wireless LANS: IEEE 802.11– Bluetooth.
- Connecting LANS: Connecting devices, Backbone networks
- Virtual LANS
- Virtual circuit networks: Architecture and Layers of Frame Relay and ATM

d) Network Layer and Transport Layer

- Logical addressing: IPv4, IPv6 addresses. Internet Protocol: Internetworking- IPv4, IPv6
- Process-to-Process delivery, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Congestion Control
- Quality of services (QoS), Techniques to improve QoS

e) Mobile Communication

- Evolution of Mobile Radio Communication, Trends in Cellular Radio & Personal Communication.
- Modern Wireless Communication System: Second Generation (2G), Third Generation (3G) and Fourth Generation (4G) Cellular networks.
- Cellular Concepts: Introduction, Frequency reuse, Channel Assignment, Handover, Interference & System capacity, Trunking & Grade of Service, Improving coverage & capacity
- Train Radio (TETRA)

f) Coding and Multiple Access techniques for Mobile Communications

- Coding: Vocoders, Linear Predictive Coders, Selection of Speech Coders for Mobile Communication, GSM Codec.
- Multiple Access: FDMA, TDMA, FHMA, CDMA, SDMA, OFDM, Packet Radio
- Capacity of Cellular Systems

g) Global System for Mobile (GSM) Communications

- System Overview, the air interface, Logical & Physical channels
- Synchronisation, Coding, Equalizer
- Circuit Switched data transmission
- Establishing connection and handover, GSM services

h) IS-95 CDMA and CDMA 2000

- System overview, Air interface
- Coding, Spreading and modulation
- Logical and physical channels, Handover

3. Assistant General Manager (Civil):

- Basic Civil Engineering
- Survey and Building Materials & Construction - (10)
- Structural Engineering - (5)
- Geotechnical Engineering - (15)
- Railway Engineering - (15)
- Tunneling - (15)
- Estimate & Costing - (5)
- Construction Safety - (5)

4. Assistant General Manager (Finance):

- Accounting Standards, IFRS & GAAP
- Vendor Payment & Accounting
- Auditing
- Financial Reporting
- Taxation (Direct & Indirect)
- Project Finance & Risk Analysis
- Budgeting & Forecasting
- Financial Mathematics
- Asset Accounting
- Lease Financing
- Cash Flow & Fund Flow Forecasting
- Time Value of Money

5. Deputy Engineer (Electrical/ Rolling Stock):

- Electric Circuits and Fields
- Signals and Systems
- Electrical Machines
- Power Systems
- Control Systems
- Electrical and Electronic Measurement
- Analog and Digital Electronics
- Power Electronics and Drives
- General Exposure to Metro Systems

6. Deputy Engineer (Signal & Telecom):

a) Diodes and Field Effect Transistors

- Diode Circuit Analysis: Small signal and large signal diode models, DC load line
- Analysis of DC circuits using diodes. Photo diodes and applications. Switching diodes, Fast recovery diodes.
- MOSFETs: Basics of MOS Transistor Operation, Construction of n-channel E-MOSFET, E-MOSFET
- Introduction to MOSFET as basic element in VLSI.

b) Bipolar Junction Transistor and their applications

- BJT Biasing: Integrated Circuit biasing, Thermal stabilization, Thermal Runaway
- BJT Small Signal Low Frequency Amplifiers: Small Signal Amplifier Performance in terms of h-parameters,
- Comparison of CE, CC & CB Amplifier's performance parameters, need of multistage amplifiers
- Selection of configuration of transistors in multistage amplifiers, Multistage Amplifiers.
- Oscillators

c) Digital Electronics

- Logic Gates and fundamentals – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, Boolean algebra. Review of Number systems. Binary codes: BCD, Excess-3. Gray codes.
- Combinational Design - Multiplexers and De-multiplexers, decoders, Adders/Subtracters. BCD arithmetic Circuits, Encoders, Decoders / Drivers for display devices.
- Sequential Circuits - Flip Flops: S-R-, J-K. T. D, master-slave, edge triggered, Shift registers, Counters.
- Asynchronous and Synchronous Ring counters and Johnson Counter, Design of Synchronous and Asynchronous sequential circuits.

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- Structural Engineering- (10)
- Geotechnical Engineering and Foundation Engineering- (15)
- Transportation Engineering and Railway Engineering- (15)
- Tunneling- (10)
- Engineering Mechanism and Costing- (10)

8. Deputy Accountant:

- Accounting Standard
- Bank Reconciliation
- Tax Accounting
- Time Value of Money
- Auditing
- Banking Operations