SYLLABUS FOR LIMITED COMPETITIVE DEPARTMENTAL EXAMINATION AGAINST 25% QUOTA FOR PROMOTION TO SDE(T) GRADE

Paper-II: Advanced Technical Paper(Special) Maximum Marks 100
(A candidate can select any one of the seven subjects i.e A, B, C, D, E, F & G.)

A. SWITCHING

Section A: (All subsections under section A are compulsory)

1. Intelligent Network and Services — 10 marks

Basic concepts of Intelligent Network architecture, Functions and role of SSP, SCP, SMP, IP etc., Description of various types of IN services and call flow, Access codes for various services

2. Signalling Systems including CCS#7 — 10 marks

Various signaling systems being used in the department for local and trunk network such as E/M, R2 modified, CCS#7 etc, Concepts of CCS-7 signalling including signalling point (SP), Signal transfer point (STP), Layered structure with reference to OSI-layer architecture, Description of MTP, ISUP, SCCP and TCAP 3, Application of No.7 signalling in PSTN, ISDN, IN and Mobile telephony

3. ISDN — 10 marks

Review of OSI layer, ISDN introduction and services, Customer premises equipment, ISDN implementation strategies etc.

4. Long Distance Switching — 10 marks

Details of national switching / numbering / routing / charging/ transmission and signaling/synchronization plans

5. Earthing etc. — 10 marks

Earthing of Telecom systems, Maintenance of Battery and Power Plants, Fire protection systems- types, use and maintenance schedule, basic maintenance of EA sets and air-conditioning units.

Section B: (Attempt any of the subsection under section B) — 50 marks

1. E-10B Switching System

Introduction to E-10B system, Description of links, connection units, time base, ching network, control units etc., Call set up procedures, OMC are/software, Man-machine communication, OMC restart/system

regeneration/system saving, Peripheral management, Subscriber management, Traffic administration, Trunk administration, Routing administration, Billing management, Faults& alarms management, Periodic tasks, LOCAVARs, Subscriber features, Exchange maintenance, Installation & commissioning activities, A/T procedures, Documentation, Use of various testers, Exchange service quality tests

OR

2. CDOT Digital Switching System (MAX)

System configuration & features, Hardware architecture, Installation practices, Software overview, Equipment planning, Man machine communication, Call processing, Subscriber facilities, Exchange administration, Subscriber administration, Routing administration, Trunk administration, Traffic administration, Billing administration, Patch administration, Maintenance procedures, Alarms and reports and System reconfiguration.

OR

3. EWSD Switching System

Overview of system architecture, Description of various functional units like DLU, LTG, SN, CP, MB, CCG, SYP, CCNC etc., Call Set up procedures, CCS#7, Application Program System (APS), EWSD Operations, Man Machine Communication, System Administration, Subs Administration, ISDN Administration, V5.2, Routing, Charging Administration including IACI/ASTA, Traffic Administration, Network Administration, Physical Installation, APS Loading, Commissioning, A/T, Planning & Dimensioning, Documentation, EWSD Maintenance Philosophy, Line & Trunk Testing, Emergency Concepts, Concept of Telecom Assistance Centre, Charge Band Concept in CCS #7, Patch Implementation Procedures.

OR

4. 5ESS – 2000 Switching System

Basic characteristics & functions of 5ESS switch, Description of SM, SM2000, CM & AM, RSM, Access Interface Unit (AIU), Call set up procedures, Implementation of CCS#7 and ISDN in 5ESS, Documentation structure and use of Master Control Centre, Subscriber and PBX data, Human/machine interface, Reports and alarm handling, Trunk and line maintenance, Routine maintenance, System back up, ODD recent change for trunks and line, 5ESS-2000 database, Analysis of system reports, initialization and recovery, Traffic measurement reports, Installation and commissioning activities, Testing methods, A/T procedures

OR

5. OCB-283 Switching System

OCB-283 system overview, Description of various units viz. SMC, SMA, SMT, STS, SMX, SMM, token ring and CSN, Call set up procedures, CCS#7, OCB-283 system software, OCB-283 operations, Man-machine commands, System administration, Subscriber administration, Routing administration, Charging & Billing administration, Traffic management, Network management, Planning & dimensioning issues, Physical installation and commissioning activities, A/T procedures, OCB-283 maintenance procedures, Patch implementation methods

OR

6. AXE-10 Switching System

AXE-10 system overview, Description of various subsystems viz. Central Processor Subsystem (CPS), Regional Processor Subsystem (RPS), Input-Output Group (IOG-11B), Subscriber Switching Subsystem (SSS), Group Switching Subsystem (GSS), Trunk and Signaling Subsystem (TSS), Common Channel Signaling Subsystem (CCS), SUS, TCS, CHS & OMS, AXE-10 software organization, Call handling, Documentation, I/O handling, Planning and dimensioning, Installation and testing activities, Construction practice, Management of exchange data related to hundred groups, A-number and B-number analyses, routes, routing, charging, destination codes, EOS codes etc., Installation test of GSS, SSS, TSS, CCS, RPS/ EMS, Start up & test of IOG-11B, Start up and test of APZ 212, Initial loading of APZ, User-authority management (password management) Connection of ats, Management of announcements, Operational quality measurement, A/T procedures, Use of testers, System maintenance philosophy, Subscriber management, Maintenance of subscriber lines, trunks, hardware of SSS, GSS, RPS/ EMS, IOG-11B & CPS, Handling detailed billing data, call meters , system restart, reload & back up, Command & transaction logs, Traffic and service measurements

B. TRANSMISSION

OPTICAL FIBRE COMMUNICATION 55 marks

Basic Concepts and principles of optical communication; Optical fiber cable characteristics and Design features like multimode and single mode fibers, Graded Index Fibers, Dispersion, attenuation, optical fiber design (96 fibre cable), various types of optical sources and detectors; Survey and cable laying practices, Route index diagram, link engineering; Tests and measurements on O.F. Cable, functioning of various meters, their applications and operations like OTDR, DTA, Power meter etc.; Concepts of PDH Hierarchal MUX systems like 2, 8, 34, 140 MB Systems; Basic concepts of SDH, Various types of SDH systems (STM-1/4/16 systems), SDH Multiplexing Techniques, SDH Network Elements & Topology, Network Survivability, SDH Measurements, faults and alarms through NMS, LCT, Element Manager, Synchronisation of SDH networks and measurement of synchronisation; Basic concepts and advantages of DWDM Systems, DWDM components like laser,

detector, Transponders and Optical Amplifiers, DWDM testing-optical analyser; A/T of OF systems.

25 marks

MICROWAVE:

System design objectives, CCITT and CCIR standards, Planning and designing of multichannel microwave system, Choice of Antennas, wave guide, Ducting, fading and fade margin, Path Loss, multipath fading, Microwave devices, travelling wave tube (TWT), Klystron, Semiconductor devices, engineering order wire supervisory, protection switching and remote controls, Measurements of power and frequency, noise figure, group delay, Noise power ratio measurement, standing waves ratio measurement amplitude and frequency response, Equalizers, Microwave site survey and selection, Tower Height Calculation, Critical Tower Height and Block Schematic of high capacity Microwave system. SACFA clearance, A/T of 6Ghz and 2Ghz systems.

Frequency band and capacities of Digital UHF systems, Hop distance.

10 marks

SATELLITE:

Overview of satellite communication, History and evolution, Frequency Bands used for Satellite Communication, C, Ku, and Ka bands, GEO and Non – GEO satellite orbits and systems, INSAT satellite system - purpose and evolution, Space Segment, Attitude and orbit control, Earth Station Configuration and parameters, Antenna Characteristics, LNA and HPA – Types and characteristics, Inter-modulation products and back off, relative comparison of SSPA and TWT power amplifier, elements of satellite link engineering, C/N and BER, Bandwidth and power considerations, Need for VSAT communication, VSAT applications – MCPC VSAT, HVNET, Intermediate Data Rate and Digital Circuit Multiplexing Equipment.

10 marks

Miscellaneous

Earthing of Telecom systems, Maintenance of Battery and Power Plants, Fire protection systems- types, use and maintenance schedule, basic maintenance of EA sets and air-conditioning units, PCM principles and Digital transmission concepts.

C. GSM

15 marks

Overview of GSM Architecture:

Brief History of Development of Mobile Communication, Description of GSM Architecture. Functions of various Network elements of GSM likes BTS, BSC, MSC, VLR, HLR, and OMC etc. Role of IMSI, TMSI, IMEI, MSRN.

05 marks

Security Features in GSM:

Security arrangements in GSM Communication. Functions of A3, A5, A8 Algorithm, Ki, Kc keys. Authentication & Ciphering functions of GSM.

RF Channel Management: 10 marks

Cell layout and frequency planning. Frequency Bands & specifications for GSM-900 system. Multiple Access Methods- FDMA &TDMA; Description of Air Interfaces, like logical channels and traffic Channels. Basic Steps in Call setup like connection request, IMSI attach and IMSI detach; Functions of Handovers and Frequency Hopping during conversation.

GPRS/EDGE/IMT-2000: 10 marks

Brief description of GPRS Architecture and its Network Elements. Key Features and Objectives of IMT-2000. Migration Path from 2G to 3G, GSM to WCDMA. Future Trends in Mobile Communication.

GSM Billing Concept: 10 marks

Billing Concept in GSM network for Pre-Paid & Post-Paid Systems. Role of Mediation of CDRs in Billing System. Brief description of Various Servers in Billing System. Activation of services and facilities in Subs. Mobile.

GSM Services: 10 marks

Description of GSM services like Bearer Services, Tele Services and Supplementary Services. Short Message Services (SMS), Value Aided Services (VAS) like Mobile Messaging, Mobile Internet, Mobile IN Services, configuration of mobile handset for use of value added facilities and GPRS and EDGE features.

Miscellaneous: 10 marks

Earthing of Telecom systems, Maintenance of Battery and Power Plants, Fire protection systems- types, use and maintenance schedule, basic maintenance of EA sets and air-conditioning units.

GSM Technology: 30 marks

(The candidate should attempt one of the following technologies: Nokia or Ericsson or Motorola or Alcatel or Nortel)

Functionalities, Interconnection & configuration of MSC, BSC, BTS. Abis & A link dimensioning, Engineering, Planning & Traffic Measurements. GSM Signaling Model, Um Interface, Abis interface, A interface, Location Update, Handover, Description of NSS measurement & statistics.

D. WLL(CDMA and CorDECT)

Cellular Concepts, Multiple Access Techniques, Duplexing Method, Frequency Band used in CDMA, Channel list. 10 marks.

Spread Spectrum communication and its types, DSSS as used in CDMA cellular systems, codes used in CDMA and their functions, PN offset, Power Control, Soft Hand off, System Capacity, Rake Receives, Multi-path Advantage, Processing Gain and Spreading Rates. 15 marks

IS-95 A and CDMA 2000 1x standards and their features, System Architecture, Network elements – BTS, BSC, MSC, HHTs and FWTs PCF Functionality, Elements of Packet Switch core network – PDSN, AAA server etc. 20 marks.

RF Channel Architecture of IS 95-A, Channel coding and Spreading Rates, Modulation Methods, Function of each channel, call flow, HHT and FWT programming parameters, SID, NID, Channel no. etc. 15 marks.

CDMA RF Planning basics, Various planning parameters – Eb/No, Ec/It FER, Frequency Reuse Factor, Sectorization Gain, Voice Activity factors, cell loading factor, cell breathing, cell capacity and coverage aspects. BTS coverage tests – VSWR Test, RF power measurement and spectrum Analyzers, A/T and billing 15 marks.

Variants of CDMA – CDMA 2000 1x EVDo, WCDMA – Features, CDMA and GSM – brief comparison. 05 marks.

CorDECT: 10 marks

Cor-DECT system architecture, various sub systems of a cor-DECT system and their functions. DIU, CBS, BSD, RBS, FRS functions and features, Frequency spectrum for cor-DECT, no. of carriers and carriers spacing, Access Method, Frame structure, DCS; Internet Access through cor-DECT, access procedure and available bit rates, A/T of Cor-DECT system.

Miscellaneous: 10 marks

Earthing of Telecom systems, Maintenance of Battery, Power Plants and UPS, Fire protection systems- types, use and maintenance schedule, basic maintenance of EA sets and air-conditioning units

E. INTERNET AND BROADBAND

Packet Switching & circuit Switching, OSI Model & TCP/IP Model, Physical Layer Standards- V.35, V.24, G703 , HSSI etc. 10 marks

Datalink layer Protocols- DLC, HDLC, PPP etc, ; PAP, CHAP ; LANs & VLANs ; Ethernet, FastEthernet and GigabitEthernet standards ; CSMA-CD and switched Ethernet networks; Collision Domain and Broadcast Domain; Switched Ethernet Backbones 15 marks

Network Layer Protocols- IP, ARP, RARP, ICMP, IGMP, IP Addressing, VLSM, CIDR; Routers and routed networks; IP Routing Principles; Static Routings, Default Routing and Dynamic Routing ; Dynamic Routing Protocols-RIP, OSPF, BGP Etc 15 marks

Transport Layer Protocols- TCP,UDP 05 marks

Multiprotocol Level switching (MPLS)- MPLS, Label Distribution Protocol (LDP), QoS in MPLS Networks, Traffic Engineering in MPLS Network, RSVP
10 marks

MPLS Based VPNs- Virtual Private Networks (VPNs), MPLS based Layer 3 VPNs, MPLS based Layer 2 VPNs
10 marks

Broadband Access technologies- xDSL Technologies, DSLAM & ADSL Modems, BRAS, Tier I & Tier II switch, DMT Modulation technique, PPPoE
10 marks

WiFi & WiMAX
05 marks

Miscellaneous: Earthing of Telecom systems, Maintenance of Battery, Power Plants and UPS, Fire protection systems- types, use and maintenance schedule, basic maintenance of EA sets and air-conditioning units
10 marks

F. COMPUTERS, COMPUTER NETWORKS AND APPLICATION PACKAGES

COMPUTER FUNDAMENTALS 15 Marks

Fundamentals of Personal Computers, use of Windows Operating System; Introduction to software packages like MS Word, MS Excel and MS PowerPoint. Use of Internet for office work like e-mail, web browsing etc.; Features of Linux Operating System, Linux file system, Basic and Advanced Commands, Graphical User Interface (KDE & GNOME), Open Office.

WEB TECHNOLOGIES 15 marks

Creation of Static Web Page, which includes the designing, and developing of Static Web pages using HTML coding and FrontPage, Image processing tool such as Adobe Photoshop; Web Site Designing containing Dynamic Web Pages, Active Server Pages (ASP), VB Script, Java script, Connectivity of the front end web applications (ASP & Java script) with the back end database applications, Hosting of Websites.

NETWORKING 25 marks

Internet Protocols, Network Components and Architecture, IP Addressing and Sub-netting, Network Operating System, Active Directory, DHCP, DNS, Client configuration and User / Group Creation, Sharing of Network Resources, Disk Quota, WLAN, Proxy Server, Firewall.
Network Security Issues, Various types of attacks and their counter measures, Various Security products like Firewall, Antivirus software, IDS, Vulnerability Assessments and Penetration Testing.

RDBMS 20 marks

RDBMS Concepts, SQL, SQL*Plus and PL/SQL.
Oracle Architectural Components, Managing an Oracle Instance, Creating a Database, Data Dictionary Contents and Usage, Maintaining the Control File, Maintaining Redo Log Files, Managing Tablespaces and Data Files, Storage Structure and Relationships, Managing Undo Data, Managing Tables, Managing Indexes, Maintaining Data Integrity, Managing Password Security and Resources, Managing Users, Managing Privileges, Managing Roles, Oracle Recovery Manager.

BSNL Software Applications 15 marks

Familiarization with various departmental applications like DOTSOFT, BRMS, HR package etc.

Miscellaneous: 10 marks

Earthing of Telecom systems, Maintenance of Battery, Power Plants and UPS, Fire protection systems- types, use and maintenance schedule, routine maintenance of EA sets and air-conditioning units

G. EXTERNAL PLANT AND ACCESS NETWORKS

100 marks

WLL- overview of CDMA, CorDECT, installation and maintenance of FWTs and CPE 15 marks

Mobile- Overview of GSM, GPRS and EDGE, configuration of mobile handset for use of value added facilities and GPRS and EDGE features. 15 marks

Fibre- PCM principles, Fibre laying practices, basics of SDH, ADM, SDH rings, FTTH, DLC and MLLN 15 marks

Radio freq planning for mobile and WLL technologies, siting considerations for BTS 05 marks

Broadband access-Copper based access, ADSL technologies, DSLAM 15 marks

JF cables, construction practices for cable external plant, siting of cabinets and pillars, monsoon precautions, preventive and reactive maintenance of external plant, Fault location, Pole-less networks, optimisation of External plant, computerised maintenance of records 20 marks

Measurements- OTDR, DTA set, frequency counters, NEXT/FEXT measurement, Line parameters testing, jitter, BER parameters 05 marks

Earthing of Telecom systems, Maintenance of Battery, Power Plants and UPS, Fire protection systems- types, use and maintenance schedule, basic maintenance of EA sets and air-conditioning units 10 marks