Information to the Candidates eligible for Professional Examination being conducted at NTIPRIT during 6\textsuperscript{th} to 7\textsuperscript{th} September, 2016

- A copy of the approved syllabus as Annexure 1
- Pattern of the question papers as Annexure 2
- Copy of the approved model question papers as Annexure 3.
- Instructions for the candidates as per the Examination Rules attached as Annexure 4
- Do’s and Don’ts for Candidates as Annexure 5
- Qualifying Criteria: Annexure 6
Syllabus for Paper-I: Administrative Subject under Professional Examination for ADEsT

1. ADMINISTRATION & ESTABLISHMENT

- Office Administration and Office Procedures
- Material Management and Procurement
- Tendering
- Work Estimates, Expenditure and Accounting
- Arbitration
- Delegation of Financial Powers Rules
- General Financial Rules
- P&T Financial Handbooks- Rules
- Control of Expenditure
- DGS&D Procedure
- Right to Information Act
- General rules and regulations reg. establishment
- Staff establishment, Appointment and Training
- Promotions, DPC
- Office Inspections and Audit
- Role & Function of CAT
- Rules relating to Unions & Associations
- Fundamental Rules and Supplementary Rules (FR & SR)
- Pay and Allowances
- Leave Rules
- LTC Rules
- Terminal Benefits and Pension Rules
- CGHS and CS(MA) Rules
- Annual Performance Appraisal Reports
- Income Tax

2. VIGILANCE & DISCIPLINARY PROCEEDINGS

- CCS (Conduct) Rules 1964
- CCS (CCA) Rules 1965
- Constitutional provisions
- Principles of Natural Justice
- Disciplinary Proceedings
- Suspension
- Prevention of Corruption Act 1988
- Role of CVC and CBI
3. **DoT FUNCTIONS**

3.1 **TERM Cell Functions**
- Vigilance Functions
- Monitoring Functions
- Security Functions
- Service Testing of various Licensed Service Providers in the License area
- Roll-out obligation testing as per license conditions.
- Registration of OSPs
- Compliance Testing of Electro Magnetic Field (EMF) radiation norms.

3.2 **Licensing Functions**
- Indian Telegraph Act, 1885 and amendments
- Other Telecom Acts and Rules
- Concept of License, drafting and approval procedure
- Existing Licenses (Access services, Data services, Carrier services and others)
- Unified License Regime
- Policy and procedure for grant of licenses

3.3 **Wireless Planning & Spectrum Management**
- Role and Functions of Wireless Planning Cell (WPC)
- Indian Wireless Telegraphy Act, 1933
- Coordination and standardisation interface with ITU
- Standing Advisory Committee on Radio Frequency Allocation (SACFA)
- Wireless Monitoring Organisation

3.4 **Universal Service Obligation Fund (USOF)**
- Background of USO fund: Need and international scenario
- USO Act and Rules
- USO Fund organisational setup
- Activities of USO (Streams) and achievements thereof
- USO subsidy model for Net Cost, Capital Recovery, Operating Expenses and Revenue
- Role of CCAs

3.5 **Telecom Engineering Centre (TEC) Functions**
- Preparation of Generic Requirements (GRs), Interface Requirements (IRs), Service Requirements (SRs), and Standards (SD)
- Study paper and White paper
- System for providing Technical advice to DoT
- Testing & certification of Telecom Equipment
- Type Approval
- Validation testing of telecom equipment
- Concept of National Working Group (NWG)
- Functioning of ITU and ITU study groups
• Conformity Assessment Body (CAB)
• Mutual Recognition Assessment (MRA)

4. REGULATION AND DISPUTE SETTLEMENT

• TRAI Act
• Regulations
• Directions to Telecom service providers
• Tariff Orders
• Quality of Service Audit/Survey
• Performance Indicator reports
• Process of consultation
• Objectives of TDSAT and its Functioning
**List of Codebooks and reference documents/manuals to be used for answering the questions in the Administrative subject paper**

- CCS (CCA) Rules 1965
- CCS (Conduct) Rules 1964
- CCS (Pension) Rules
- CCS (LTC) Rules 1988
- CCS (RSA) Rules 1993
- CGHS Rules and CS (MA) Rules
- FR & SR- All parts
- Guidelines and Rulings on APAR of Govt. employees
- General Financial Rules
- Delegation of Financial Power Rules
- RTI Act 2005
- Prevention of Corruption Act 1988
- Administrative Tribunals Act 1985
- Telecom/Telegraph – Acts and Rules including Amendments, Licenses and Guidelines to TERM Cells

**Note:**

i. The examinees shall have to arrange and bring the codebooks and reference documents/manuals with them, as they will not be supplied by the Department in the examination hall.

ii. The printed copies of online-available prescribed codebooks and reference documents/manuals, as well as their photocopies, are also allowed to be used during the examination.

iii. Handwritten notes and/or browsing of the reference material on mobiles/tablets/laptops shall not be allowed.

iv. The codebooks and reference documents/manuals should not contain any handwritten or typed notes.
Syllabus for Paper-II: Technical Subject under Professional Examination for ADEsT

(Corresponding to revised syllabus for ITS-2012 & onward batches)

1. SWITCHING

(i) PSTN SWITCHING

- Speech Signal Processing & PCM principles
- PSTN: Overview and Architecture
- PSTN: Access Network, components and management
- Digital Switching Concepts
- Digital Signalling Concepts - CAS, CCS#7
- Traffic Theory and Traffic Engineering
- IN, ISDN Concepts, Services and Applications
- Supplementary Services in PSTN
- NMS & Billing System for PSTN
- National Numbering Plan, International Routing concepts
- Introduction to PSTN NT Switches – OCB-283 and EWSD
- EWSD/OCB switch - Functional Architecture & Units
- Junction Management in the POI scenario
- Traffic reports & analysis

(ii) TELECOM INFRASTRUCTURE

- Power supply arrangements for Telecom Systems:
  - Power plant systems - Conventional and SMPS
  - Indoor / Outdoor Power plants in Wireless networks
  - Storage batteries and VRLA Battery
  - UPS and Inverters
- Electrical installations:
  - General Introduction to electrical infrastructure in Telecom Exchange buildings (E/A, Lighting, Lifts, Electrical installations etc)
  - Air conditioning - requirements and different systems
  - Earthing Types and Methodologies and Lightning Protection
  - Fire detection and Fire-fighting
  - BEE Standards for Electrical Installations, Energy conservation and Energy auditing
- Green technologies
  - TRAI guidelines, Alternative energy sources etc.
- Civil Construction and Maintenance aspects in Telecom Buildings:
  - Telecom buildings- types of buildings- Norms
  - Civil infrastructure in Telephone Exchange buildings
  - Towers- GTT, RTT, RTP, Wall Mounted etc.
  - Smart buildings – concepts
  - Water conservation and water harvesting
2. **TRANSMISSION**

(i) **OPTICAL COMMUNICATION**
- Introduction to Fibre Optics
- Types of Optical Fibre Cables & constructions
- OF Cable splicing theory and techniques
- Survey & Link Engineering
- OF Cable laying techniques & practices
- Testing and Measuring Instruments
- Concepts of PDH
- Introduction to SDH
- SDH multiplexing
- SDH Network Elements and Topologies
- Protection in SDH
- SDH Networks Management System
- SDH Measurements and Performance Parameters
- Synchronization and Timing Principles
- Synchronization of SDH Networks
- SDH over Radio
- Next-Generation SDH
- MSPP
- Overview of DWDM
- DWDM Components and EDFA
- DWDM System Engineering and Planning
- Optical Transport Network/All Optical Network
- Digital Cross-Connect (DXC)
- Fibre in Local loop, FTTH
- Passive Optical Networks- GPON, GEPON
- Free-Space Optics
- Submarine cable system

(ii) **RADIO COMMUNICATION**
- Overview of Microwave and microwave system configuration
- Microwave Antennas and wave-guides
- Site Selection criteria and guidelines
- Installation of Antenna & waveguides, Equipment Installation
- Link engineering and performance objectives
- Frequency plans of Digital Microwave systems.
- Digital Microwave measurements.
- IP-based Microwave systems
- Digital Modulation schemes
- 6 GHz, 7GHz, 13 GHz Systems
- Mini-links for BTS Sites
- PMRTS
- SACFA Clearance
- EMF Radiation: Theory and measurement aspects
• Measuring Instruments and Field Measurements
• SAR

(iii) SATELLITE COMMUNICATIONS

• Overview of Satellite Communications.
• Equipment configuration of a Satellite Earth Station.
• Installation of Earth Station Antennas viz. 11 M antenna (Azimuth, Elevation, Mount), 7.5 M antenna (x-y mount) and 4.5 M antenna (x-y mount).
• High Power Amplifier and RF multiplexers.
• Principles of Low Noise Amplifier
• Principle of Echo Suppressor and Echo Cancellers.
• Up/Down converters and Modulator/ Demodulator
• Inter-Satellite Interference /Freq. coordination.
• NOCC and Earth station Mandatory Tests.
• Antenna Tracking and control equipment
• FDM-FM & MCPC/ IDR Link Engineering.
• Procedures of site selection of Satellite Earth Stations.
• Space segment, features of INSAT III Satellites.
• Meteorological services of INSAT.
• Earth Station Maintenance and Planning
• Time Division Multiple Access Techniques, Digital Speech Interpolation Techniques.
• Code Division Multiple Access Techniques and its application to Very Small Aperture Terminal (VSATs).
• Power Plant for Satellite Earth Station.
• Digital Satellite Phone
• GMPCS

3. MOBILE COMMUNICATIONS

GSM
• GSM/GPRS Network Architecture
• Circuit Switched Core Network of GSM: MSC, HLR, EIR etc.
• Packet Switched Core Network of GSM: SGSN, GGSN etc.
• Mobile Number Portability
• Radio Network of GSM: BSC, BTS, OMC-R etc.
• Planning, engineering, designing principles of GSM RF Network
• Antenna systems, In-building solution etc.
• Applications/ Value Added Services in GSM/ GPRS: IN, SMSC USSD, IN, LBS, LBA, MMSC, Instant Messaging, Presence Service, Push to Talk, CRBT, OTA, GSM PBX etc.
• Advancements in GSM Technology: Evolved EDGE, VAMOS, Abis over IP, disaster Recovery for HLR, IN,
• SIM: Comp-128, H/w, File structure, Applications, ME-SIM Interface, PKI related aspects,
• GSM Mobile end user devices: Components, H/w, S/w, CODEC, Encryption, Modem, MSC, UART, Battery etc.
• Lawful Interception in GSM Mobile networks
- Coverage testing for Roll out Obligation
- Drive Test tools, Planning tools, Post Processing tools
- Billing Support System: CDR generation & Collection nodes, CDR Processing & Analysis
- Operation Support System: Traffic report Analysis
- SACFA related issues: Measurement of BTS Power, Antenna Height measurement, Lat-Long measurement
- Infrastructure Sharing issues
- IMEI and related issues

**CDMA Technologies**

(CDMA family of technologies- CDMA2000 1x, CDMA 2000 EVDO etc.)

- CDMA Network Architecture
- Circuit Switched Core Network of CDMA: MSC, MSC, HLR etc.
- Packet Switched Core Network of CDMA: PDSN, Home Agent, Foreign Agent
- Radio Network of CDMA: BSC, BTS, Coverage, OMC-R
- Planning, engineering, designing principles of CDMA RF Network
- Applications/ Value Added Services in CDMA: SMSC, IN, LBS, LBA, MMSC, CRBT, PTT, OTAP
- CSIM: Security Algorithm, Applications, H/w etc.
- Evolution of CDMA: EVDO etc.
- Lawful Interception in CDMA Networks
- Mobile Number Portability

**UMTS**

- UMTS Network Architecture
- Circuit Switched Core Network of UMTS: MSC-S, Media Gateway, HSS, MSC-Server, IMS etc.
- Fixed Mobile Convergence
- Packet Switched Core Network of UMTS: 3G SGSN, GGSN
- Radio Network of UMTS- RAN, Node-B, RNC
- UMTS-HSPA, evolved HSPA, VoIP over HSPA
- RF Network planning, designing, engineering, optimization principles
- Applications/ Value Added Services in UMTS: Video Telephony, Video Streaming, Mobile to PSTN Multi-Media Call
- UMTS Security: Security algorithms, Authentication, Encryption, UICC, USAT, USIM, ISIM
- Lawful Interception in UMTS Networks
- Mobile Numbering Portability Process
- Coverage testing for Roll out Obligation
Wi-Fi and WiMAX Technologies

(IEEE standards based technologies such as 802.11b, 802.11g and 802.11n, WiMAX 802.16e and WiMAX 802.16m (4G) etc.)

- WiMAX Network Architecture with functions of each node
- Applications/Services in WiMAX
- Wi-MAX Core Network 802.16e based
- Wi-MAX Radio Network 802.16e based
- Security Aspects in WiMAX networks
- Wi-MAX Core Network 802.16m based
- Wi-MAX Radio Network 802.16m based
- Wi-Fi IEEE 802.11 b,g
- Security Aspects in Wi-Fi
- Wi-Fi Hotspot 2.0
- Coverage testing for Roll out Obligation

LTE & LTE Advanced Technologies

- LTE Network Architecture
- Core Network of LTE: SAE/ EPC, MME, Serving Gateway, PDN Gateway, PCRF, IMS etc.
- Radio Network of LTE: E-UTRAN, eNodeB, Air Interface, Relays, Inter-RAT working etc.
- Self Organized Network
- Applications/Services in LTE: VoIP, IP based conferencing, VPN, Emergency Call on IP, eMBMS
- LTE and Wireless Sensor Networks, SUN
- LTE-Advanced, Developments in Release 11 & 12 of 3GPP
- End-User Devices in Wireless Networks: Mobile Handset, Dongle, OS, Applications
- Lawful Interception in Mobile Networks
- Future Networks, SDN, Network Function Virtualization
- Coverage testing for Roll out Obligation
- Drive Test tools, Planning tools, Post Processing tools
- Infrastructure Sharing issues

4. DATA COMMUNICATIONS

- Basic concepts of Data Communication
- OSI Layer
- Physical Layer
- Modems in Data Circuits
- Error Detection and Correction Techniques
- Data Link Control (DLC)
- HDLC & LAP-B
- Packet Switching & Message Switching Concepts
- Frame relay
- ATM Technology
- TCP/IP Protocol Suite: An Overview
- TCP/UDP header Analysis
- Ipv4 and IPv6 Addressing
• Ipv4 and IPv6 Header analysis
• Introduction to LAN & internetworking devices
• WAN
• ARP & RARP along with header analysis
• Point to Point Protocol (PPP)
• Asynchronous PPP Analysis using Protocol Analyser
• IP Routing Principles (Static & Dynamic)
• Routing information Protocol (RIP)
• Open Shortest Path First (OSPF)
• Border Gateway Protocol (BGP)
• Elements of Internet Node (BSNL-NIB)
• NIB Server Features
• Router, RAS & LAN switch Architecture
• Internet services: HTTP/ PROXY
• Internet services: E-mail, SMTP & POP3
• Internet services: FTP/TFTP
• Internet services: DNS, DNS64, DNS6
• IP Multicasting: Layer 2 & 3 Protocols
• Access control list
• DHCP & DHCP6
• Wireless sensor network
• Broadband components
• ICMP, IGMP Protocols
• VLAN

5. NEXT GENERATION NETWORKS

• NGN Overview and Architecture
• Convergence through NGN
• NGN Services
• NGN Protocols: SIP, Megaco/H.248, Sigtran, RTP/RTCP, H.323 etc.
• NGN Soft switch: ZTE, CDOT etc.
• Interconnect, operational and security issues in NGN
• IP TAX project of BSNL
• Migration to NGN - issues & techniques.

6. LAWFUL INTERCEPTION AND MONITORING

• Licensing provisions
• TEC GRs on LIM & LIS for mobile, Fixed, ISP, IPLC, ILD
• Centralized Monitoring System
• Concept of LEAs and coordination mechanism
• Introduction to Deep Packet Inspection technologies
• Various types of mobile handsets and features
7. Structure of Networks, interconnection & service provisioning

- Overview of PoI & IUC
- Role of Regulator
- PoI provisioning & billing
- NLD/ILD Traffic engineering
- Leased Circuits and SLAs
- NIXI
- IRINN and APNIC
- International Roaming- Implementation & Issues
- Telecom Order Management System (OSS/BSS)
- Commercial conditions of retail service
- Customer care system- Call centre network
- E-top-up system

8. CYBER SECURITY

- Network Security/ Cyber Security/ Computer security and its attributes
- Encryption
- OS and security
- Application security, SQL Injection & Cross Scripting
- INTRUDER
- IDS & IPS
- Phishing and Identity Theft
- Virus, Worm, Malware, BOTNET and recent vulnerabilities
- Cyber space and different kinds of vulnerabilities
- Cyber crime : Mobile & Wireless Security
- Cyber crime & Cloud Computing
- Tools & methods used in cyber crime: Keyloggers
- Role of ITU, DoT and CERT-IN
- TCP Finite State Machine (FSM): States, Events and Transitions

9. DISASTER MANAGEMENT

- Types of Disasters
- Fundamentals of Disaster Management
- Role of Communication Technologies
- DM framework in India
- Role of DoT
### Pattern of questions in both papers of the Professional Examination

#### Paper-I: Administrative Subject (With books) (Total 100 marks)

The paper will contain 7 questions. **All questions will be compulsory.**

<table>
<thead>
<tr>
<th>Question No.</th>
<th>Marks</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
<td>A combination of -MCQ/ Fill in the blanks/ True-False/ Match the items between two lists: 1 mark each. The combination may be decided by the paper setter</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>5 short-answer type sub-questions (4 marks each)</td>
</tr>
<tr>
<td>3 to 7</td>
<td>12 per question</td>
<td>Each question to have at least two or more short-answer type sub-questions. Choice can be given within a sub-question. Very long answer type questions are generally avoided.</td>
</tr>
</tbody>
</table>

**Grand Total** 100

#### Paper-II: Technical Subject (Without books) (Total 100 marks)

The paper will contain 6 questions. **All questions will be compulsory.**

<table>
<thead>
<tr>
<th>Question No.</th>
<th>Marks</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
<td>A combination of the following may be set - 1 mark each. The combination may be decided by the paper setter, with minimum number of question types as given below- (i) Mark True or False (minimum 10 marks) (ii) Fill in the blanks (minimum 10 marks) (iii) MCQ with single correct choice (minimum 10 marks) (iv) Match the items between two lists (no minimum) (v) Full form of abbreviations/ acronyms (no minimum)</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>6 nos. of - very short-answer type or short numerical type sub-questions (2 marks each)</td>
</tr>
<tr>
<td>3 to 6</td>
<td>12 per question</td>
<td>Each question to have - short-answer/ descriptive/ block-schematic/ numerical type sub-questions. A judicious mix of above types can be set. Number of sub-questions to be decided by the paper setter. Choice can be given within each sub-question. Very long answer type questions generally avoided.</td>
</tr>
</tbody>
</table>

**Grand Total** 100

**Note:** The Model Test papers for both subjects may be seen for reference.
Government of India
Department of Telecommunications

Departmental Examination
Professional Examination for ADEsT Year 20...

Model Paper-I: Administrative Subject (With the aid of Books)

Time Allowed: Three Hours
Maximum Marks-100

Instructions to Candidates:

1. Write your Roll Number on the top of the first or title page of your answer book. DO NOT write your name anywhere in the answer book.
2. Write your answers on both sides of the paper, leaving a quarter margin.
3. All rough work should be done on last page(s) of the answer book. Cancel all such rough work by drawing prominent lines across it.
4. Put the correct number of the questions in the margin at the beginning of each answer.
5. Marks are liable to be deducted for numbering wrongly and for bad handwriting and shabby, slovenly work.
6. Mobile phones/tablets/laptops or such electronic devices are strictly prohibited inside the examination hall.
7. Use of stand-alone calculators is allowed for answering the questions.

NOTES:

1. The Codebooks and reference documents/manuals (can be in book form or as photocopies/printed copies) to be used for answering the questions are:
   CCS (CCA) Rules 1965, CCS (Conduct) Rules 1964, CCS (Pension) Rules,
   FR & SR- All parts, Guidelines and Rulings on APAR of Govt. employees
   Telecom/Telegraph – Acts and Rules including Amendments, Licenses and Guidelines to TERM Cells
2. Handwritten notes are not allowed in the examination Hall.
3. This paper contains 7 questions. All questions are compulsory.
4. Wherever possible, please quote the relevant Rule number(s) in the answers.
Question 1

1(a). State if the following statements are True or False (1 mark each) 1x10 marks

1. No appeal lies against an order of suspension made by the President of India.
2. No cash payment in lieu of any type of leave is admissible to a Govt. servant resigning from service.
3. Maternity leave can be granted to an unmarried female govt servant.
4. Restricted Holidays cannot be suffixed/prefixed to regular leave.
5. Under the RTI Act, the applicant can request for personal examination of the documents instead of written information.
6. Maximum two unions for a distinct category of employees can be recognised under CCS (RSA) Rules, 1993.
7. In the term ‘RE/BE’, RE stands for Revenue Expenditure.
8. It is mandatory for Government to seek recommendations of TRAI on tariff matters.
9. Jurisdiction of civil court is barred for cases handled by TDSAT.
10. An import license is required from WPC to import any GSM BTS equipment.

1(b). Indicate the correct answer from the choices given (One mark each) 1x5 marks

(i) The FR related to pay fixation of government servant is:
   (a) FR 22  (b) FR 35  (c) FR 37A  (d) FR 49

(ii) The maximum pension amount which can be commuted at retirement is:
   (a) 25%  (b) 35%  (c) 40%  (d) 50%

(iii) The permissible period of retention of Govt. quarters in the event of transfer of the Govt. servant to a place outside the station is
   (a) 1 month  (b) 2 months  (c) 6 months  (d) 1 year

(iv) Suspension period is treated as duty if
   (a) official is exonerated  (b) minor penalty is imposed
   (c) major penalty is imposed  (d) both (a) and (b) above

(v) A review petition can be filed by the applicant before the CAT within .......... of the communication of the order.
   (a) 15 days  (b) 60 days  (c) 30 days  (d) 45 days

1(c). Fill in the blanks (One mark each) 1x5 marks

(i) A second appeal under the RTI Act can be preferred to the

(ii) Under CCS (CCA) Rules, the penalty of is ordinarily a bar for future employment under the government.

(iii) is the form used for obtaining sanction of expenditure on local purchase.
(iv) A representation can be made by the concerned officer against the entries in his APAR within ........... days of communication of the APAR to him.

(v) A Group ‘A’ officer can accept gift on the occasion of his marriage from personal friends having no official dealings, limited to a value of Rupees .................

Question 2

(20 marks)

a. What are the circumstances under which a government servant shall be deemed to have been placed under suspension? (4 marks)
b. Explain any two functions each of the TERM Cells with regard to Vigilance and Monitoring. (2+2= 4 marks)
c. Explain the terms ‘Regulation’ and ‘Directive’ in the context of TRAI. (2+2= 4 marks)
d. With reference to tendering process, briefly explain the purpose of Earnest Money Deposit (EMD) and Security Deposit. (2+2= 4 marks)
e. List the conditions when it is necessary to write part APARs. (4 marks)

Question 3

(12 marks)

a. Explain the following in brief: (2.5+ 2.5 = 5 marks)
   (i) Administrative Approval
   (ii) Expenditure Sanction
b. Enumerate the Standards of Financial Propriety. (7 marks)

Question 4

(12 marks)

a. List the steps prescribed to be taken to prevent sexual harassment of working women. (6 marks)
b. Enumerate the various penalties that may be imposed on a Govt. servant. (6 marks)

Question 5

(12 marks)

a. What actions need to be taken by a TERM Cell, if during EMR Testing of a site containing multiple BTSs, the radiation exceeds the prescribed limits? (5 marks)
b. Explain the role of Wireless Monitoring Organisation (WMO). (4 marks)

OR

Briefly explain the process of SACFA Clearance given by WPC. (4 marks)
c. What are the objectives of TDSAT? (3 marks)
Question 6  
(12 marks)  

a. Enumerate the provisions of the Indian Telegraph Act, which deal with powers of the Govt. to grant licences.  
(7 marks)  

b. Briefly describe the process of developing an IR at TEC.  
(5 marks)  

OR  

Briefly describe the process of issuing Type Approval Certificate at TEC.  
(5 marks)  

Question 7  
(12 marks)  

a. When will unauthorised absence from duty be deemed to cause a break in service?  
(2 marks)  

b. Write a note on the introduction of Unified License in India.  
(5 marks)  

c. List any five schemes of the Govt. supported under USOF.  
(5 marks)  

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Government of India  
Department of Telecommunications  

Departmental Examination  
Professional Examination for ADEsT  

Model Paper-II: Technical Subject (Without the aid of Books)

Time Allowed: Three Hours  
Maximum Marks-100

Instructions to Candidates:

1. Write your Roll Number on the top of the first or title page of your answer book. DO NOT write your name anywhere in the answer book.
2. Write your answers on both sides of the paper, leaving a quarter margin.
3. All rough work should be done on last page(s) of the answer book. Cancel all such rough work by drawing prominent lines across it.
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6. Mobile phones/tablets/laptops or such electronic devices are strictly prohibited inside the examination hall.
7. Use of stand-alone calculators is allowed for answering the questions.

NOTE:

1. This paper contains 6 questions. All questions are compulsory.
Question 1

1(a). State if the following statements are True or False (1 mark each) (1x15 marks)

1. In a telephone exchange, the Answer-to-Seizure Ratio (ASR) is generally lower than the Call Completion Ratio (CCR).
2. Directory numbers serve to identify the traffic routes in an exchange.
3. Ka band is presently not in commercial use for satellite-based communication in Indian networks.
4. In India, ISRO decides the frequency allocation to Indian satellites.
5. NIXI is responsible for allocation of IP addresses in India.
6. A company registered with DoT as Infrastructure Provider Category-1 can lease out STM-1 bandwidth.
7. C-Topup can work as a USSD-based model on mobile networks.
8. To maintain the QoS, Packet Loss up to 5% is affordable in NGN.
9. RARP is primarily used to resolve IP addresses to Ethernet MAC addresses.
10. An IP address 127.0.0.1 indicates a local broadcast address.
11. ICMP can provide hosts with information about network problems.
12. If you set your anti-virus software to auto-update then you don't need Windows Automatic Updates.
13. The function of SGSN in Packet switching is similar to circuit switching in MSC.
14. Wi-Max 802.16m uses SC-OFDMA for better UE Power Amplifier performance.
15. Scrambling in LTE is done for suppressing interference through interference randomization.

1(b). Indicate the correct answer from the choices given. Only one choice is correct. (One mark each) (1x10 marks)

(i) Which application does not use TCP at Transport layer:
   (a) FTP         (b) SMTP         (c) TELNET         (d) HTTP

(ii) Which type of addressing is not used in IPv6:
   (a) Unicast     (b) Broadcast    (c) Anycast     (d) Multicast

(iii) Which of the following is a private IP address?
   (a) 12.0.0.1     (b) 168.172.1.39
   (c) 172.15.14.36 (d) 192.168.24.43

(iv) What is the maximum number of E1s (PCMs) that can be mapped in one STM-1 Frame?
   (a) 30          (b) 31          (c) 63          (d) 21
(v) The fuse in the battery sets should be provided at-
   (a) Negative terminal  (b) Positive Terminal
   (c) Either Terminal  (d) it is not to be provided

(vi) In a switching system, TST structure stands for
   (a) Time Space Time  (b) Time Serial Time
   (c) Time Synchronous Time  (d) None of these

(vii) Recommended value of SAR for mobile handsets by DoT is
   (a) 1.0 W/Kg  (b) 2.0 W/Kg  (c) 1.6 W/Kg  (d) 1.8 W/Kg

(viii) The theoretical maximum speed in 2.5G GSM – GPRS is:
   (a) 14.4 Kbps  (b) 64 Kbps  (c) 171.2 Kbps  (d) 2Mbps

(ix) IMS was introduced in which release of 3GPP-
   (a) 3GPP99  (b) 3GPP R4  (c) 3GPP R5  (d) 3GPP R6

(x) GSM uplink frequency in GSM900 and GSM1800 are respectively:
   (a) 890 to 915 MHz and 1805 to 1880 MHz
   (b) 935 to 960 MHz and 1805 to 1880 MHz
   (c) 890 to 915 MHz and 1710 to 1785 MHz
   (d) 935 to 960 MHz and 1710 to 1785 MHz

1(c). Fill in the blanks (One mark each)  (1x10 marks)

(i) Optical density (refractive index) of core of a fiber is generally ……………than the cladding.

(ii) The main benefit for which DWDM is used in Optical fiber networks is ………………………………………………….

(iii) The Ping command uses.......................... protocol which is also used when a packet is dropped by a router.

(iv) The TTL field in an IPv4 packet Header stands for ………………………………………………….

(v) The minimum length of a cipher key should be ……………………… bits.

(vi) An ISDN PRI gives ............... channels of 64Kbps each.

(vii) Minilinks used in mobile BTS backhaul work in the ................. GHz frequency range

(viii) The type of modulation used in CDMA system is ………………………………….

(ix) The total number of Walsh codes in CDMA IS-95A standard are……………….

(x) In WCDMA, one frame of common control physical channel has .......... slots.
1(c). What do these abbreviations/ acronyms stand for, with reference to Telecom Technologies and networks (write the full form). (1x5 marks)

(i) MPLS  

(ii) SDCCH  

(iii) GPON  

(iv) ISUP  

(v) VSAT  

Question 2 (12 marks)

a. In an exchange, the average holding time of a call is 55 seconds. If the BHCA is 180000, calculate the total traffic handled by the exchange during the busy hour. (2 marks)

b. List any four hardware units of either EWSD or OCB-283 switch. (2 marks)

c. How much propagation delay would be suffered by a light signal travelling for 1000km in an optical fiber? (2 marks)

d. How many hosts will each subnet support if class B address 132.2.0.0 is sub netted with a 29 bit subnet mask? (2 marks)

e. Calculate the uplink and downlink frequencies in MHz, for ARFCN-6 in GSM 900 band. (1+1 =2 marks)

f. List two advantages of C-band over Ku-band. (2 marks)

Question 3 (12 marks)

a. Write measures that can be taken by telecom service providers for reducing telecom sector carbon footprint. (4 marks)

b. What are the main features of IPv6? Explain any four. (4 marks)

OR

Bring out any four differences between IPv4 and IPv6 Header Structure. (4 marks)

c. Explain the function of RAKE receiver in WCDMA. (4 marks)

OR

Explain the benefits of using MIMO technique in LTE. (4 marks)

Question 4 (12 marks)

a. Explain these four terms in respect of PoI / IUC- Forbearance, port charges, origination charges and termination charges. (1x4 = 4marks)
b. List any two differences in the role of MSC-S in 3GPP R4 architecture with that of a monolithic MSC. (2 Marks)

c. Consider a point-to-point optical transmission link to be designed with following parameters:
- Laser source Output Power : 0 dBm
- Receiver Sensitivity : -31dBm
- Source to fiber coupling loss: 2 dB
- Fiber loss : 0.25dB/Km
- Splice loss : 0.1 db/splice
- Connector loss : 1.0dB/connector
- OF Cable length : 2km/ drum

Also take a System Margin of 6 dB for the link, for ageing factors and future cable route maintenance.
With the given optical link power budget, calculate the maximum fiber length possible for the link (in km).

Question 5 (12 marks)

a. Write a note on Central Monitoring System (CMS) project. (5 marks)

OR

What are points of interception in a telecom network? What is the importance of interception at ILD Gateway? (3+2=5 marks)

b. Explain (i) SIP and (ii) H.248, in reference of NGN. (2+2=4 marks)

c. In secure cyber applications, what is SSL and how is it used? (1+2=3 marks)

OR

Briefly explain any three cyber security threats. (3 marks)

Question 6 (12 marks)

a. Draw all the main blocks of UMTS Architecture and name their interfaces. (6 marks)

OR

Name the three types of RNCs available in WCDMA and explain the functions of each type of RNC. (6 marks)

b. Explain the steps involved in a typical PSTN to Mobile-terminated call scenario with the help of a network block diagram. (6 marks)

OR

Explain in brief the functions of any three of the following entities with respect to GSM system. (2+2+2 = 6 marks)

(i) Transcoder
(ii) Transceiver Unit (TRX/TRU)
(iii) AuC
(iv) HLR
Annexure 4

Rules Relating to Departmental Examinations

INSTRUCTIONS FOR CANDIDATES

1. Bringing of books etc. to the Examination Hall - candidates should bring their own pens, pencils, etc. (as laid down in Rule 9 under Part I) into the Examination Hall. Any other books, note books etc., brought by them should be left outside the Examination Hall.

2. Reference books should not have notes - In the reference books used by the candidates in the Examination Hall (where the use of books is allowed), there should be no notes or other irrelevant matter. Notes of the nature of cross-references, glossary, or index of references to orders of the Government of India may be allowed, but notes of the nature of solutions to questions will not be allowed in any case.

NOTE - "The candidates will be permitted to bring to the examination hall either Chaudri's Compilation of the Civil Service Regulations or Swamy's Pension Compilation of the Civil Service Regulations and Liberalized Pension Rules, at their option, in addition to the official publication on C. S. Rs., as a book of reference in the examination hall in respect of all P&T examinations in which the Civil Service Regulations and Liberalized Pension Rules have been included in the syllabus and the questions are allowed to be answered with the aid of books. The candidates will provide themselves with a copy of the above compilation at their own cost and they may use it at their own risk regarding the accuracy, completeness or up-to-dateness of the publication."

3. What to write on answer books - (a) The candidates should -

(i) write only their respective Roll Numbers and the Circle index letter, as allotted by the Head of the Circle or Office, on the top of the title page of their answer books on each subject, they should NOT write their names anywhere on or in their answer books. They will be penalized for writing the name.

(ii) write the subject of the Examination and other particular on the top of the title page of their answer books;

(iii) write on both sides of the paper, leaving a quarter margin. The margin should be on the left hand on the front side and on the right hand on the back side;

(iv) NOT write any irrelevant matter or anything else except the actual answers in their answer books; and

(v) NOT write anything on the question paper or on the sheet of blotting paper supplied to them.

(b) A second (third etc.,) answer book will not be supplied so long as any blank page remains unused at the end of the first (second etc.) answer book.
(c) Candidates may use, for rough notes or calculations, the inner side of the cover and, if necessary, a page or pages of the answer books. The rough notes should be crossed through afterwards.

(d) They will not use pencil in writing their answers. Pencil may, however, be used for mathematical drawings, rough work etc.

(e) They will not take any article or any book with them to their table which they are not authorized to take with them.

4. Directions on Question papers - The candidates should read the directions on question papers and should be fully observe them.

5. No leaves to be torn - Candidates should NOT tear off any leaves from the answer books.

6. Indication of number of answer books used - If a candidate uses more than one answer book, he should state, on his first answer book, the total number of books he has used and fasten all the answer books securely together. In the supplementary answer script given to a candidate (after he has used up the main answer book) the candidate will write the number of the supplementary scripts used by him.

7. Instructions on answer book - The candidates should carefully read and follow the instructions on the cover of the answer book.

8. Signal of time limits - A signal will be given at the beginning of the examination in each paper. A signal will also be given fifteen minutes before closing time and again at the closing time, when the candidates must stop writing or revising their answers.

9. Handing over of answer books to Supervising Officers - Every candidate should hand over his answer books personally to the Supervising Officer or one of the Invigilators on duty, if he leaves before the expiry of the time for the paper.

10. Candidates who stay till the end - If a candidate stays till the end, he must remain at his seat until his answer books have been collected by the Supervising Officer/Invigilator.

11. Excess answers - If a candidate answers more questions than the number required to be attempted, only those attempted first (up to the prescribed number) will be taken into account for valuation, and the remaining answers will be ignored.

12. Candidates using unfair means - If a candidate is found to be using or attempting to use unfair means in the examination hall, he will be treated in accordance with Rule 18 under Pt. I.

13. Instructions of the Supervising Officer - Every candidate must obey all instructions and directions given by the Supervising Officer/Invigilator in the examination hall. If a candidate fails to do so or indulges in disorderly or improper conduct, he will render himself liable to expulsion from the examination, and in addition to such disciplinary action as may be deemed necessary.

NOTE - "The candidates will be permitted to bring to the examination hall either Chaudri's Compilation of Civil Service Regulations or Swamy's Pension Compilation of the Civil Service Regulations and Liberalized Pension Rules, at their option, in addition to the official publication on
C. S. Rs. as a book of reference in the examination hall in respect of all P&T examinations in which the Civil Service Regulations and Liberalized Pension Rules have been included in the syllabus and the questions are allowed to be answered with the aid of books. The candidates will provide themselves with a copy of the above compilation at their own cost and they may use it at their own risk regarding the accuracy, completeness or up-to-dateness of the publication."

14. Silence to be observed - Silence must be observed in the Examination Hall.

15. Smoking prohibited - Smoking in the examination hall is strictly prohibited.
Annexure-5

Do's and Don’ts

Instructions

Candidates will be penalized for failure to comply with the following instructions.

**DON’T’s**

1. Do not write your name or anything else except the actual answers to the questions anywhere inside your answer book.

2. Do not leave any pages unused except at the end of the answers.

3. Do not tear off any leaves from your answer book.

4. Do not leave behind your answer book on your table.

5. Do not answer a question twice.

**DO’s**

1. Do write your Roll number and other particulars in the space provided above.

2. Do use both sides of the paper in the answer book leaving a quarter margin on the left hand on the front side and on the right hand on the back side. (You may use, for rough notes or calculations, the inner side of the cover and, if necessary a page or pages of the answer book. The rough notes should be crossed through afterwards.)

3. Do put the correct number of the question on the margin at the beginning of each answer.

4. Do draw a line at the end of each answer, and do start the next question on a new page.

5. If any right-hand page is accidentally left blank, do write on it "Please Turn Over".
6. Do not keep any book, article etc. with which you are not authorized to keep.

6. If you wish to cancel any work, do draw your pen through it or write "cancelled" across it; otherwise it may be valued.

7. Do not leave your seat without the permission of the supervisor.

7. If you have used more than one answer book, do tie them together securely with a tag provided for the purpose, and do indicate on the cover of the first book, the total number of books used.

8. Do not write any irrelevant matter such an appeal to Examiner for marks.

8. Do hand over your answer book personally to an invigilator before leaving the examination hall.

9. Do not write on the blotting paper or Hall permit or on the question paper.

9. Do attach all loose sheets, such as maps, graphs, etc., inside the cover of your answer book.

10. Do not write or revise your Answers after the expiry of the allowed time.

10. Do write in ink. Pencil may however be used for mathematical drawings, rough work etc.


NOTE - Any attempt on your part to copy from the answer paper of a neighbouring candidate or from any written paper of document brought by you, or in any other way to obtain help by irregular or illegal means in writing your answers will result in your immediate expulsion from the Examination Hall.
Qualifying Criteria:

Minimum qualifying marks in each paper in Professional Examination for other category officers will be 50% and for Scheduled Castes/Scheduled Tribes Category Officers, the same will be 33% in each paper.