

**नेपाल दूरसञ्चार प्राधिकरण**  
**प्राविधिक सेवा, इञ्जिनियरिङ्ग समूह, सहायक निर्देशक (अधिकृत स्तर तृतीय श्रेणी) को**  
**खुला प्रतियोगिता र आन्तरिक प्रतियोगिताको लिखित परीक्षाको**  
**पाठ्यक्रम**  
**एवं परीक्षा योजना**

पाठ्यक्रमको रूपरेखा :- यस पाठ्यक्रमको आधारमा निम्नानुसार चरणमा परीक्षा लिइने छ :

प्रथम चरण :- लिखित परीक्षा पूर्णाङ्क :- २००

द्वितीय चरण :- अन्तर्वार्ता पूर्णाङ्क :- ३०

**१. प्रथम चरण : - लिखित परीक्षा**

**पूर्णाङ्क :- २००**

पत्र	विषय	पूर्णाङ्क	उतीर्णाङ्क	परीक्षा प्रणाली	प्रश्नसंख्या X अङ्क	समय
प्रथम	दूरसञ्चार सेवा तथा व्यवस्थापन सम्बन्धी	१००	४०	विषयगत	छोटो उत्तर	१२ प्रश्न X ५ अङ्क
					लामो उत्तर	४ प्रश्न X १० अङ्क
द्वितीय	इलेक्ट्रोनिक्स एण्ड टेलिकम्युनिकेशन इञ्जिनियरिङ्ग	१००	४०	विषयगत	छोटो उत्तर	१२ प्रश्न X ५ अङ्क
					लामो उत्तर	४ प्रश्न X १० अङ्क

**२. द्वितीय चरण : - अन्तर्वार्ता**

**पूर्णाङ्क :- ३०**

विषय	पूर्णाङ्क	उतीर्णाङ्क	परीक्षा प्रणाली
अन्तर्वार्ता	३०	-	मौखिक

**द्रष्टव्य :**

- लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी वा दुवै हुन सक्नेछ ।
- प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।
- लिखित परीक्षामा यथासम्भव पाठ्यक्रमका सबै एकाईबाट प्रश्नहरू सोधिनेछ ।
- विषयगत प्रश्नमा प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन् । परिक्षार्थीले प्रत्येक खण्डका प्रश्नहरूको उत्तर सोही खण्डका उत्तरपुस्तिकामा लेख्नुपर्नेछ ।
- यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरू परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ ।
- प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।
- यस भन्दा अगाडि लागू भएका माथि उल्लिखित सेवा, समूहको पाठ्यक्रम खारेज गरिएको छ ।
- पाठ्यक्रम लागू मिति :-

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प्रथम पत्र : दूरसंचार सेवा तथा व्यवस्थापन सम्बन्धी

**Section (A) – 60 Marks**

- 1. Telecommunications** **40 Marks**
- 1.1 Principles of Telecommunications
  - 1.2 Role of Telecommunications in National Development
  - 1.3 Global Information Network
  - 1.4 Information Superhighway
  - 1.5 Convergence of Technologies and Services
  - 1.6 Satellite System
  - 1.7 Microwave System
  - 1.8 Radio system: GSM, CDMA, DAMPS, PCS, GMPCS, WCDMA, LTE, DECT, Public Switched Telephone Network (PSTN)
  - 1.9 Optical Fiber Communication
  - 1.10 LAN, WAN, MAN
  - 1.11 Broadband Cable
  - 1.12 Frame Relay, MPLS, NGN, IMS
  - 1.13 Multiplexing
  - 1.14 Signaling
  - 1.15 Alerting and Supervision
  - 1.16 Traffic Engineering
  - 1.17 Network Optimization
  - 1.18 ADSL, ATM, SONET, ISDN, BISDN, VOIP
  - 1.19 Internet, Protocols used in network and application, Privacy and security, search engine
  - 1.20 Broadband Technology and Services
  - 1.21 Digital Voice and Video
  - 1.22 Encryption and Security issues in data communications
  - 1.23 OSI model
  - 1.24 R2/SS7 Signaling
  - 1.25 Spectrum Management Principles
  - 1.26 Spectrum Pricing
  - 1.27 Internet and Networking Economics
  - 1.28 Tariff of Data Transfer
  - 1.29 NTA: Establishment, Objectives, Functions, Duties, and Power
  - 1.30 Present status of telecommunications services in Nepal
- 2. Telecom Regulation** **20 Marks**
- 2.1 Regulation of Telecommunications and Broadcasting
  - 2.2 Role of regulator in a competitive market

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- 2.3 Licensing & Regulation of Information and Communications Technologies and services
- 2.4 Cyber laws
- 2.5 Interconnection issues
- 2.6 Quality of telecommunications services
- 2.7 ITU's recommendations for numbering system for telephone and voice
- 2.8 National numbering system
- 2.9 International numbering system
- 2.10 ITU, INTELSAT, APT, SATRC, WTO, INMARSAT

**Section (B) – 40 Marks**

**3. Managements**

**10 Marks**

- 3.1 Definitions, the project life cycle
- 3.2 Setting project objectives and goals
- 3.3 Network model: CPM & PERT
- 3.4 Gantt chart
- 3.5 Project scheduling
- 3.6 Resource leveling
- 3.7 Systems of Project control
- 3.8 Cost control
- 3.9 Preparation of operational budget
- 3.10 Introduction to budgetary control
- 3.11 Planning the quality, time and cost dimensions
- 3.12 Negotiating for Materials, Supplies & Services, bringing the project to a Successful conclusion
- 3.13 Vision, Mission, Goal, Objectives, Targets, Strategies
- 3.14 Organization structure
- 3.15 Authority and Power delegation
- 3.16 Leadership
- 3.17 Motivation
- 3.18 Group dynamics
- 3.19 Time management
- 3.20 Conflict Management
- 3.21 MIS
- 3.22 Out sourcing
- 3.23 Inventory control
- 3.24 Job description

**4. Engineering Economics**

**20 Marks**

- 4.1 Demand and Supply

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पाठ्यक्रम

- 4.2 Laws of return
- 4.3 Form of business organization
- 4.4 Taxation
- 4.5 Industrial laws
- 4.6 Cost accounting
- 4.7 Depreciation
- 4.8 Wages and Incentives
- 4.9 Capital budgeting
- 4.10 Capital structure
- 4.11 Financial analysis
- 4.12 Risk analysis
- 4.13 Interest and time value of money
- 4.14 Basic methodology of engineering economic studies
- 4.15 Basic knowledge of trial balance and balance sheet
- 4.16 Income statements
- 4.17 Revenue and capital expenditure
- 4.18 Budgeting and capitalization
- 4.19 Depreciation and subsidy
- 4.20 Procurement procedures (FOB, CIF, LQD, LC, Insurance, Invoice, Bid security, performance bond),
- 4.21 Competitive bidding

### **5. Legislative Provisions**

**10 Marks**

- 5.1 ITU Radio Regulations
- 5.2 Radio Act 2014
- 5.3 National Broadcasting Act, 2047
- 5.4 Telecommunications Act, 2053
- 5.5 Telecommunications, Regulations, 2054
- 5.6 Company Act, 2053
- 5.7 Privatization Act, 2050
- 5.8 Consumer Protection Act, 2054
- 5.9 Competition Promotion and Market Protection Act, 2063
- 5.10 Telecommunication Policy, 2060
- 5.11 Radio Frequency Policy for Telecommunications Services (Distribution & Pricing), 2069
- 5.12 Broadband Policy, 2071
- 5.13 ICT Policy, 2072
- 5.14 Long-term Policy of Information and Communication Sector, 2059 (2003)

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द्वितीय पत्र : इलेक्ट्रोनिक्स एण्ड टेलिकम्युनिकेशन इञ्जिनियरिङ्ग

**Section (A) – 50 Marks**

**1. Digital Electronics**

- 1.1 Bipolar transistors switching characteristics
- 1.2 MOS transistor switching characteristics
- 1.3 TTL logic circuits
- 1.4 NMOS/CMOS logic circuits
- 1.5 Memory: RAM, DRAM, PROM, EPROM
- 1.6 Operational amplifiers
- 1.7 S&H circuits
- 1.8 Adders, Arithmetic operations
- 1.9 Digital comparators
- 1.10 Multiplexer & Demultiplexers
- 1.11 Flip-flops
- 1.12 Shift register
- 1.13 Counters
- 1.14 Sequence Generators
- 1.15 Power electronics: Thyristor, Controlled rectifier circuits, 7 segment display, Untuned amplifier
- 1.16 Push-pull amplifier
- 1.17 Tuned power amplifiers
- 1.18 Feedback amplifiers
- 1.19 Bode plot analysis
- 1.20 Wien bridge oscillators
- 1.21 Tuned LC oscillators
- 1.22 Crystal oscillator

**2. Electromagnetic Field and Waves**

- 2.1 Coulomb's law and Electric field intensity
- 2.2 Electric Flux Density and Gauss' law
- 2.3 Maxwell's first equation and application
- 2.4 Divergence theorem
- 2.5 Energy and potential
- 2.6 Laplace equation and Poisson equation
- 2.7 Biot-Svart's law
- 2.8 Ampere's circuital law
- 2.9 Curl, Wave motion in free space
- 2.10 Perfect dielectric and losses

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- 2.11 Wave medium
- 2.12 Skin effect
- 2.13 Impedance matching
- 2.14 Antenna fundamental
- 2.15 Polarizations
- 2.16 Radiation from dipole antenna
- 2.17 Wave guides and Mixtures

**3. Signals and Systems and Processing**

- 3.1 Information theory
- 3.2 Shannon-Hartley law
- 3.3 Transmission of signals
- 3.4 Impulse response and convolution
- 3.5 Fourier series
- 3.6 Fourier Transform
- 3.7 Unit step
- 3.8 Delta, Sinc and Signum function
- 3.9 Helbert transform
- 3.10 LTI system
- 3.11 System described by Differential and Difference equations
- 3.12 FIR & IIR Filters
- 3.13 Discrete Fourier Transforms, IDFT, FFT
- 3.14 Circular convolutions
- 3.15 Parseval's theorem
- 3.16 Energy and power and auto correlation
- 3.17 Z - transform

**4. Communications Engineering**

- 4.1 Difference between analog and digital communications
- 4.2 Basic communications elements
- 4.3 Signal and noise in communication system
- 4.4 AM, DSC-SC, SSB-SC, PM, FM
- 4.5 Super heterodyne AM and FM receiver
- 4.6 Digital to analog and analog to digital conversion
- 4.7 Sampling theorem
- 4.8 Sample & hold Circuit
- 4.9 A law,  $\mu$ -law
- 4.10 Quantizer
- 4.11 Coding: NRZ/HDB3/AMI
- 4.12 Error detection and correction

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- 4.13 PCM/ADPCM
- 4.14 Digital Modulation: ASK/PSK/FSK /QPSK /MSK / QAM
- 4.15 Modulation and demodulation circuits
- 4.16 Frequency converter and Mixers
- 4.17 Phase locked loop

**5. Modern Telecommunications**

- 5.1 Telecommunication network
- 5.2 Transmission media
- 5.3 Transmission lines
- 5.4 Transformer and hybrid circuit
- 5.5 Signal and noise measurements
- 5.6 Echo and singing
- 5.7 Space/time/frequency/wave length division multiplexing
- 5.8 Packet, Message and circuit switching
- 5.9 X.25 Protocol, Frame relay, TCP/IP Protocol
- 5.10 Functions of switching
- 5.11 Electromechanical switches
- 5.12 Stored Programmed Controlled switch
- 5.13 TS/ST/TST/STS switching
- 5.14 No 5 and No 7 signaling
- 5.15 ISDN, BISDN, ATM, PDH/SDH, DSL
- 5.16 Radar system, Navigational systems
- 5.17 Numbering, Routing and charging plans
- 5.18 LTE, UMTS, IMT-2000, IMS, NGN, MPLS, Real time protocol, Voice over IP, IP/PSTN Platform, IN, SSP, SCP, SCP, SSP, SMS
- 5.19 Basics of GIS

**Section (B) – 50 Marks**

**6. Fiber Optic System**

- 6.1 Introduction to optical fibers
- 6.2 Optical fiber as communication channels
- 6.3 Electro-Optic components
- 6.4 Total internal reflection
- 6.5 Snell's law
- 6.6 Optical Fiber types and properties
- 6.7 Optical transmission
- 6.8 Optical transmitters and receivers
- 6.9 Splices, connectors and coupling

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- 6.10 Fiber Optics Networks
- 6.11 Optical switching
- 6.12 Submarine cable
  
- 7. Wireless Communications**
  - 7.1 Evolution from 1G to 4G
  - 7.2 Propagation theory
  - 7.3 FSL
  - 7.4 NLOS model
  - 7.5 Okumura and Hata Model
  - 7.6 GMSK, OQPSK, BPSK, FDMA, TDMA, CDMA technologies (DECT, GSM, CDMA 2000)
  
- 8. Satellite Communications**
  - 8.1 Fundamental of satellite communication
  - 8.2 Stabilization
  - 8.3 Tracking
  - 8.4 Satellite orbit and radio spectrum
  - 8.5 Satellite wave propagation and satellite antennas
  - 8.6 Digital satellite communication systems
  - 8.7 Earth stations
  - 8.8 Kepler's laws of orbital motion
  - 8.9 Signal to noise ratio
  - 8.10 Interference between different wireless systems
  - 8.11 Level diagram
  - 8.12 Link budget calculation
  - 8.13 VSAT, Iridium, Global Star, GMPCS, GPS system and INTELSAT/INMARSAT
  
- 9. Error Control Coding**
  - 9.1 Block codes and their implementation
  - 9.2 Linear block codes, cyclic codes, Quadratic residue codes, Golay code, Hadamard codes, Reed-Muller codes, BCD codes
  - 9.3 Introduction to Cryptography
  - 9.4 Convolution codes
  - 9.5 Viterbi algorithm
  - 9.6 Fano Algorithm
  - 9.7 Punctured Convolutional codes
  - 9.8 Trellis coded modulation



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- 9.9 OFDM, COFDM
- 9.10 Turbo Coded Modulation

**10. Data Communications**

- 10.1 Introduction
- 10.2 OSI Model
- 10.3 Data transmission
- 10.4 Data encoding by Line coding
- 10.5 Asynchronous and Synchronous Transmission
- 10.6 Error detection
- 10.7 Interfacing
- 10.8 Data link layer
- 10.9 Routing in Packet switched Networks
- 10.10 Flow and Congestion control
- 10.11 LAN and MAN
- 10.12 Computer communications architecture

**11. Tele-traffic Engineering**

- 11.1 Traffic units and parameters
- 11.2 Holding time and call intensity
- 11.3 Offered traffic and carried traffic
- 11.4 Congestion and delay
- 11.5 Traffic variation
- 11.6 Subscriber behavior
- 11.7 Distribution of traffic
- 11.8 Full and restricted availability
- 11.9 Full availability loss system (Erlang and Engset)
- 11.10 Lost call theory for restricted availability
- 11.11 Full availability delay system
- 11.12 Grade of service
- 11.13 Traffic measurements
- 11.14 ISDN traffic considerations