

नेपाल दूरसञ्चार प्राधिकरण
प्राविधिक सेवा, इञ्जिनियरिङ 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 लिह्ने छः

प्रथम चरण :- लिखित परीक्षा पूर्णाङ्क :- २००

द्वितीय चरण :- अन्तर्वार्ता पूर्णाङ्क :- ३०

१. प्रथम चरण : – लिखित परीक्षा पूर्णाङ्क :- २००

| पत्र | विषय | पूर्णाङ्क | उत्तीर्णाङ्क | परीक्षा प्रणाली | प्रश्नसंख्या X अङ्क | समय |
|---------|---|-----------|--------------|-----------------|---------------------|--------------------|
| प्रथम | दूरसञ्चार सेवा तथा व्यवस्थापन सम्बन्धी | 100 | 40 | विषयगत | छोटो उत्तर | १२ प्रश्न X ५ अङ्क |
| | | | | | लामो उत्तर | ४ प्रश्न X १० अङ्क |
| द्वितीय | इलेक्ट्रोनिक्स एण्ड टेलिकम्युनिकेशन इञ्जिनियरिङ | 100 | 40 | विषयगत | छोटो उत्तर | १२ प्रश्न X ५ अङ्क |
| | | | | | लामो उत्तर | ४ प्रश्न X १० अङ्क |

२. द्वितीय चरण : – अन्तर्वार्ता पूर्णाङ्क :- ३०

| विषय | पूर्णाङ्क | उत्तीर्णाङ्क | परीक्षा प्रणाली |
|--------------|-----------|--------------|-----------------|
| अन्तर्वार्ता | 30 | - | 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 प्रश्नहरु सोधिनेछ।
- विषयगत प्रश्नमा प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरु हुनेछन्। परिक्षार्थीले प्रत्येक खण्डका प्रश्नहरुको उत्तर सोही खण्डका उत्तरपुस्तिकामा लेख्नुपर्नेछ।
- यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरु परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्भनु पर्दछ।
- प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई 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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पाठ्यक्रम
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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पाठ्यक्रम

- 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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पाठ्यक्रम
द्वितीय पत्र : इलेक्ट्रोनिक्स एण्ड टेलिकम्युनिकेशन इञ्जिनियरिङ

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-Savart'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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पाठ्यक्रम

- 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, μ -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