

नेपाल सरकार
गृह मन्त्रालय
प्रहरी प्रधान कार्यालय
(मानवश्रोत एवं प्रशासन विभाग, भर्ना तथा छनौट महाशाखा)
नक्साल, काठमाण्डौ ।

प्राविधिक प्रहरी निरीक्षक (संचार) इन्जिनियरिङ उप-समूह को खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम ।

पाठ्यक्रमको रूपरेखा:- यस पाठ्यक्रमको आधारमा निम्नानुसार तिन चरणमा परीक्षा लिईने छ :-

प्रथम चरण:- लिखित परीक्षा (Written Examination)

पूर्णाङ्क :- २५०

द्वितीय चरण:- प्रयोगात्मक (Practical)

पूर्णाङ्क :- ५०

तृतीय चरण:- अन्तरवार्ता (Interview)

पूर्णाङ्क :- ४०

प्रथम चरण:- लिखित परीक्षा योजना (Examination Scheme)

पत्र	विषय	पूर्णाङ्क	उत्तिर्णाङ्क	परीक्षा प्रणाली	प्रश्न संख्या अङ्कभार	समय
प्रथम	इलेक्ट्रोनिक्स एण्ड कम्युनिकेसन	१००	४०	बहुउत्तर (Multiple Choice)	१००×१=१००	१ घण्टा १५ मिनेट
द्वितीय	इन्जिनियरिङ	१००	४०	विषयगत (Subjective)	१०×१०=१००	३ घण्टा
तृतीय	नेपाल प्रहरी सेवा सम्बन्धी	५०	२०	बस्तुगत बहुउत्तर	१०×१ = १०	१ घण्टा १० मिनेट
				विषयगत	लामो उत्तर १×१० = १०	
					छोटो उत्तर ६×५ = ३०	

द्वितीय चरण – प्रयोगात्मक परीक्षा योजना (Practical Examination)

विषय	पूर्णाङ्क	उत्तिर्णाङ्क	परीक्षा प्रणाली	समय
संचार	५०	२०	प्रयोगात्मक	१ घण्टा

तृतीय चरण – अन्तरवार्ता

विषय	पूर्णाङ्क	परीक्षा प्रणाली
व्यक्तिगत अन्तरवार्ता	४०	मौखिक

- लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुन सक्नेछ ।
- पाठ्यक्रमको प्रथम र द्वितीयपत्रको विषयवस्तु फरक फरक हुनेछन ।
- प्रथम र द्वितीयपत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछन् ।

प्रथम पत्र र द्वितीय पत्रका पाठ्यक्रमको एकाईहरूबाट सोधिने प्रश्नहरूको संख्या निम्नानुसार हुनेछ ।

४.

प्रथम पत्रका एकाई	1	2	3	4	5	6	7	8	9	10
प्रथम पत्रका प्रश्न संख्या	10	15	10	5	10	15	5	10	10	10
द्वितीय पत्रका खण्ड	A		B		C			D		
द्वितीय पत्रका एकाई	1	6	2	3	4	5	7	8		
द्वितीय पत्रका प्रश्न संख्या	3		3		2		2			

५. वस्तुगत बहुउत्तर (Multiple Choice) प्रश्नहरूको उत्तर सहीदिनेमा प्रत्येक सही उत्तर बापत पूर्णाङ्क अङ्कप्रदान गरिनेछ भने गलत उत्तर दिनेमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अङ्ककटौती गरिनेछ । तर उत्तर नदिनेमा त्यस बापत अङ्क दिइने छैन र अङ्क कटौती पनि गरिने छैन ।

६. द्वितीयपत्रको विषयगत प्रश्नका लागि तोकिएका १० अङ्कका प्रश्नहरूको हकमा १० अङ्कको एउटा लामो प्रश्न वा एउटै प्रश्नका दुई वा दुई भन्दा बढी भाग (Two or more parts of a single question) वा एउटा प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरू (Short notes) सोध्न सकिनेछ ।

७. द्वितीयपत्रको पाठ्यक्रमलाई ४ वटा खण्ड/एकाईमा विभाजन गरिएको छ, ४ वटा खण्ड/एकाईको लागि ४ वटै उत्तर पुस्तिका दिइनेछ र परिक्षार्थीले प्रत्येक खण्ड/एकाईका प्रश्नहरूको उत्तर सोही खण्ड/एकाईको उत्तर पुस्तिकामा लेख्नु पर्नेछ ।

८. यस पाठ्यक्रममा जेसुकै लेखिएको भएतापनि पाठ्यक्रममा परेका ऐन, नियमहरू परीक्षाको मिति भन्दा ३ (तीन) महिना अगाडि (संशोधन भएका वा संशोधन भई हटाइएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा रहेको सम्झनु पर्दछ ।

९. तृतीय पत्रको नेपाल प्रहरी सेवा सम्बन्धी पाठ्यक्रमको एकाईबाट सोधिने प्रश्न संख्या र शिर्षक तृतीय पत्रको पाठ्यक्रममा उल्लेख गरिएको छ ।

१०. प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र द्वितीय चरणको प्रयोगात्मक परीक्षामा सम्मिलित गराइनेछ ।

१०. प्रयोगात्मक परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र अन्तरवार्तामा सम्मिलित गराइनेछ ।

११. अन्तर्वार्ताको अंकभार सम्बन्धमा प्रहरी सेवाको पदमा नियुक्ति र बढुवा गर्दा अपनाउनु पर्ने सामान्य सिद्धान्त, २०६९ को अनुसूची-१९ मा व्यवस्था भए बमोजिम हुनेछ ।

१२. पाठ्यक्रम लागू मिति :-

प्रथमपत्र:- इलेक्ट्रॉनिक्स एण्ड कम्युनिकेशन इंजिनियरिंग

- 1. Electronic Device and Circuit 10%**
Diodes (Tunnel, varactor, zener, diac, Triac, bridge, Impatt, Gunn, photo) and applications, Bipolar transistors switching characteristics, unijunction transistor, MOS transistors switching characteristics, SCR, UJT, TTL logic circuits, NMOS/CMOS logic circuits, memory: RAM, DRAM, PROM, EPROM, operational amplifiers, Butterworth and Chebysev filters, A/D converters, adders, arithmetic operations, digital comparators, parity check generator, multiplexer and demultiplexer, flip-flops, shift register, counters, sequence generators, oscillators (Wien bridge oscillators, tuned, LC oscillators, crystal, Clapp modification), resonant circuits, thyristor, controlled rectifier circuits, 7 segment display, amplifier (Untuned, push-pull, feed back amplifiers, Klystron, Magnetrons) Bode plot analysis, Emitter, clipper, collector, clamper circuits
- 2. Communication Engineering 15%**
Frequency spectrum (discrete and continuous) and bands, Coulomb's law and electric field intensity, electric flux density and Gauss' law, Spectral density, Noises (atmospheric, thermal, partition, white noise, Gaussian noise, Noise ratio(s)), Maxwell's first equation and application, divergence theorem, energy and potential, Fourier series, Laplace equation and Poisson equation, Biot-Savart's law, Ampere's circuital law, curl, wave motion in free space, perfect dielectric and losses, wave medium, skin effect, impedance matching, antenna fundamentals (Horn, slot, parabolic, Yagi, CASS, horn, lens), polarization, radiation from dipole antenna, wave guides (broad-band guides, Cylindrical, ridged)
- 3. Instrumentation & Control System 10%**
Dynamometer, Multimeter, Oscilloscopes, Signal generator, Impedance Bridges (Maxwell, Hay, Schering, Anderson, Desauty), Transducers (Strain Gauges, Thermistor, Piezoelectric tachometer, thermocouple) Open loop and closed loop control system, system stability and sensitivity, system transfer functions and responses, poles and zeros location and their significance, root locus method, frequency response method, Bolometer technique for measurement of power
- 4. Signal analysis and processing 5%**
Discrete probability theory, Information theory, Shannon-Hartley law, transmission of signal, impulse response and convolution, Fourier series, Fourier transform, unit step, delta, sinc and signum function, Hilbert transform, LTI system, system described by differential and difference equations, FIR and IIR filters, discrete Fourier transforms, IDFT, FFT, circular convolutions, Parseval's theorem, energy, power and autocorrelation, Z transform

5. Basic Analog and Digital Communications 10%

Difference between analog and digital communications, basic communication elements, signal and noise in communication system, AM, DSC-SC, PM, FM, Super-heterodyne AM and FM receiver, SSB, D/A and A/D Converters, sampling theorem, sample and hold circuit, A law, m-law, quantizer, coding (NRZ/HDB3/AMI), error detection and correction, Parity check, PCM/ADPCM, digital modulation (ASK/PSK/QPSK/MSK/QAM/CDMA/ FDMA/DSSS), pulse modulation, modulation and demodulation circuits, Frequency hopping, frequency converter and mixers, phase locked loop

6. Telecommunications and advanced communications 15%

Difference between Telecommunications and Radio Communications, return loss transformer and hybrid circuit, signal and noise measurements, echo and singing, space/time/frequency/wave length division multiplexing, Erlang B formulae, queuing theorem, OSI layers, telephony, functions of switching, electro mechanical switches, stored programmed controlled switch (TS/ST/TST/STS switching, no. 5 and no. 7 control signaling), general concept of ISDN, BISDN, ATM, PDH/SDH, DSL, HDSL, ADSL, numbering, routing and channeling plans; UMTS, IMT-2000, NGN (Next Generation Network), real time protocol, VoIP, IP/PSTN platform, Overview to IN (Intelligent Network), Basics of GIS (Geographical Information System)

7. Optical Sytem 5%

Laser, Photocell, photo device (LED, CRT, photovoltaic, photo-multipliers, APD's PCN), Principle of optical communication, Total internal reflection, Snell's law, Chemical vapour Deposition, optical fibers types, capacity and properties, optical transmission, optical transmitters and receivers, interconnected and switched, Joining techniques, splices, connectors and coupling, fiber optics networks, optical switching, underground cabling (Route and ambient consideration, tension prediction)

8. Wireless Communications 10%

Radio frequency band, Propagation theory (groundwave, spacewave, tropospheric, ionospheric), Euler-Larmour theory, LOS (line of sight) and non- LOS model, Okumara and Hata model, Mobile Technologies (DECT, GSM, CDMA2000-1x and etc.), Fundamental of satellite communication (tracking, Satellite orbits and Radio spectrum, satellite wave propagation and satellite antennas), digital satellite communication system, earth stations, Kepler's laws of orbital motion, signal to noise ratio, interference between different wireless systems. Antennas (Directional, Non-directional, reflective), impedance and effective length of antenna as transmitter & receiver, Radiation pattern, broad-side pattern, End-fire pattern, Pattern synthesis

9. Computers and Network 10%

Difference between analogue and digital computer, Binary system and Boolean algebra, Gates, Computer structure (I/O devices, Storage devices, Memories) and typical processor architecture, CPU and memory organization, buses, Characteristics of I/O and storage devices, Processing unit and controller design, hardware and micro

program control, Instruction sets and addressing modes, memory systems (main, auxiliary, virtual, cache), assembly language programming, I/O and interrupt servicing, Multiplexing, (time, frequency and code division multiplexing), Digital networks: ISDN, frame relay and ATM. Protocols: (such as ISO/OSI reference model, X.25, IP), LAN/WAN topologies, access schemes, medium access and logic layers; CSMA/CD and token ring protocols; segmented and hubbed LANs, Operating system principles, components, and usage (Multitasking and/or multiprocessing, Real-time aspects), CCTV Networks,

10. Information and Communications Technology ICT) 10%

Computer architecture, microprocessor fundamental, microcomputer systems, parallel and serial interfaces, RS-232 standards, flow charts, algorithms, variables, constants, data types, arithmetic expressions, arrays, concept of Operating System, Basic concept on internet, e-mail and web -page (such as DNS, IP, URL, http, ftp, IRQ, Routers). Server (Web, email, printer), General concept of Cyber security (digital signature, SPAM, VIRUS, WORM, hacking, cracking), Unicode

द्वितीयपत्र :- इलेक्ट्रॉनिक्स एण्ड कम्युनिकेशन इंजिनियरिंग

Section A- 30 Marks

1. Electronics Device, Circuit and Techniques

Use, operation and characteristics of Diode, triode, pentode, Transistors, thyristor; measurement of resistance, capacitance, inductance, current, voltage in different R-C-L circuit, different types of amplifiers and rectifiers' usage and characteristics, Strain gauge and application, SCR (simple, phase control, temperature control, light control), close/open loop control and choppers, Boolean algebra, Logical gates and switching algebra, Memory (statics, volatile), A/D & D/A converter circuits, Sampling theory

Section B- 30 Marks

2. Information Technology

Computer, Microprocessor, Signal processing, Database Management, Computer Architects and computer Graphics, Internet, email and Web-pages, e-strategies (e-government, e-business, e-learning, e-health, e-employment, e-environment, e-agriculture, e-science), Tele-culture (Tele-education, Tele-medicine, tele-centre, Telephony, and etc.)

3. Communication

Radio propagation in different waves (long wave to SHF), propagation characteristics, frequency availability, limitation element at VHF, UHF, discrete and continuous spectrums, stray capacitance, internal load inductance, dummy load, Traveling and standing waves, match and mismatch lines, distribution component of line, Variable

impedance along a mismatched line, Tune circuit and filters, Phase velocity, phase shift, group velocity, wave guides, antenna fundamentals (types, characteristics, pattern, matching), Modulation & demodulation types and techniques for analogue and digital system, different types of Noise and calculation, frequency generation, counters. Random signal theory (Ergodic processes, correction function, white noise)

Section C- 20 Marks

4. Navigation, surveillance, Avionics

Radar range equation, Radar direction indication, Radar Display, different between PAR, SSR, Doppler effect, MTI Radar, HF-SSB communication, General concept of Navigation system (MLS, ILS, Radio Beacons and determinations, VOR, DME, GPS) and Airborne equipment (FIS, altimeter,), ICAO Annex 11

5. Frequency Management & Monitoring

Radio Frequency band and allocation, Frequency Channel plan (as per separation and system), spurious emissions, system (Simplex, duplex, dual) Type of radio services, Terrestrial line-of-sight communication links (propagation, effects of atmosphere, interference, fading) Broadcasting band, Frequency monitoring systems (techniques and procedures, scanning, location & direction finding), Satellite communication (orbital locations, choice of frequency, modulation techniques) and earth station (antenna, terminal equipment, ground networking, earthling) National Frequency Allocation Plan

6. Power supplies

Single phase and Polyphase AC power supply systems, Electrical motors, AC/DC generators, Rectifiers and filters, Regulator power supply system, Uninterruptible Power Supply Systems.

Section D- 20 Marks

7. Management Concepts

Role of Science and technology in development, Parameters of development, Measurement of Development, Targeting Vision, mission, goal and objectives; strategies and work description of organization and its' structures, authority and power delegation, leadership, motivation, group's dynamics, time management, conflict management, use of MIS, decision support system, customer care, out sourcing, use of inventory and training, service port folio

8. Rules, Regulations & Policy

ITU overview, ICAO Overview, ICT policy, Telecommunication Policy, Telecommunication Act & Regulations, Radio Act & Regulations, National Broadcasting Act & Regulation, Cyber-law, National Frequency Allocation Plan

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Practical for Inspector of Police

SN	Topic	Marks	Time	Remarks
1.	Measuring Equipments (Analogue and digital)	10	10 Minutes	
2.	Component Testing	5	10 Minutes	
3.	Antenna	10	10 Minutes	
4.	Power supply	5	5 Minutes	
5.	Computer and Network	5	10 Minutes	
6.	Optical fiber	5	5 Minutes	
7.	CCTV	5	5 Minutes	
8.	Radio receiver And Transmitter	5	5 Minutes	
Total		50 marks	1 hours	

वस्तुगत बहुउत्तर नमूना प्रश्नहरू (Sample questions)

1. In which configuration do you get maximum power amplification?
(A) Common Base (B) Common Collector
(B) Common emitter (D) Common field effect
2. The quality of sound is very good in
(C) Common Base (B) Common Collector
(D) Common emitter (D) Common field effect
3. Mobile cellular communication uses
(A) SW Band (B) MW band
(C) LW band (D) SHF band
4. Which of the following is related to computer
(A) C⁺⁺ (B) B⁺ (C) D⁻ (D) F⁺
5. Signal to noise ratio is very good in
(A) Analog Communication (B) Digital Communication
(C) SSB Communication (D) DSB Communication

विषयगत नमूना प्रश्नहरू (Sample Questions)

1. Why do we need frequency planning and allocation? Which organization provides guidelines on frequency management? [10]
2. In which type of modulation, signal to noise ratio is the best? Explain with necessary justifications. [10]
3. How can you use ICT for realizing the concept of telemedicine? Explain with necessary block diagram. [10]
4. What do you mean by RADAR? Where is it used? How does it work? [10]
5. Explain what are the parameters of fifth generation computers. Show how can you use computer for controlling the quality of industrial product. [10]