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

पाठ्यक्रमको रूपरेखा:- वस पाठ्यक्रमको आधारमा निम्नानुसार तिन चरणमा परीक्षा लिङ्छे:

प्रथम चरण:- लिखित परीक्षा (Written Examination)  
पूर्णाङ्क :- २५०  
प्रथम चरण:- प्रयोगात्मक (Practical)  
पूर्णाङ्क :- ५०  
तृतीय चरण:- अन्तरवात (Interview)  
पूर्णाङ्क :- ४०

प्रथम चरण: लिखित परीक्षा योजना (Examination Scheme)

<table>
<thead>
<tr>
<th>पाठ</th>
<th>विषय</th>
<th>पूर्णाङ्क</th>
<th>उत्तिराङ्क</th>
<th>परीक्षा प्रणाली</th>
<th>प्रण संख्या अभियुक्त</th>
<th>समय</th>
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<tbody>
<tr>
<td>प्रथम</td>
<td>इलेक्ट्रॉनिक्स एन्ड कम्यूनिकेशन</td>
<td>१००</td>
<td>४०</td>
<td>बहुउत्तर (Multiple Choice)</td>
<td>$100 \times 1 = 100$</td>
<td>१ घण्टा १५ मिनेट</td>
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<tr>
<td>द्वितीय</td>
<td>इन्जिनियरिङ</td>
<td>१००</td>
<td>४०</td>
<td>विषयकत (Subjective)</td>
<td>$10 \times 10 = 100$</td>
<td>३ घण्टा</td>
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<tr>
<td>तृतीय</td>
<td>नेपाल प्रहरी सेवा सम्मान</td>
<td>२०</td>
<td>२०</td>
<td>विषयकत बहुउत्तर</td>
<td>लामो उत्तर $1 \times 10 = 10$</td>
<td>१ घण्टा १० मिनेट</td>
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| द्वितीय चरण - प्रयोगात्मक परीक्षा योजना (Practical Examination)

<table>
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<th>उत्तिराङ्क</th>
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<tr>
<td>संचार</td>
<td>१०</td>
<td>२०</td>
<td>प्रयोगात्मक</td>
<td>१ घण्टा</td>
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तृतीय चरण - अन्तरवात

<table>
<thead>
<tr>
<th>विषय</th>
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<th>परीक्षा प्रणाली</th>
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<tr>
<td>विषयकत अन्तरवात</td>
<td>४०</td>
<td>मात्रक</td>
</tr>
</tbody>
</table>

१. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अवध नेपाली र अंग्रेजी दुबै हुन सम्मेच।
२. पाठ्यक्रमको प्रथम र द्वितीययक्रमको विषयवस्तु फरक फरक हुनेछ।
३. प्रथम र द्वितीययक्रमको लिखित परीक्षा छुट्टाछछु हुनेछ।
4. | प्रथम पत्रका एकाई | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>प्रथम पत्रका प्रश्न संख्या</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>5</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>द्वितिय पत्रका खण्ड</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
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<td>6</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>7</td>
<td>8</td>
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</tr>
<tr>
<td>द्वितिय पत्रका प्रश्न संख्या</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

5. वस्तुनिष्ठ वहु-उत्तर (Multiple Choice) प्रश्नहरूको उत्तर सहीप्रत्येक सही उत्तर वापन पृष्ठाङ्क अझङ्कार गरिनेछ भने गलत उत्तर विचार प्रत्येक गलत उत्तर वापन २० प्रतिशत अझङ्कार गरिनेछ। तर उत्तर निर्दिष्ट त्यस वापन यङ्ग दिनने छैन र यङ्ग कहा पनि गरिने छैन।

6. द्वितीयपत्रको विषयगत प्रश्नका लागि ताकिएका १० अझङ्का प्रश्नहरूको हकमा १० अझङ्का एउटा लागो प्रश्न र एउटै प्रश्नका दुई र दुई भन्दा बढी भाग (Two or more parts of a single question) र एउटा प्रश्न अन्तगत दुई र बढी दिशातीति (Short notes) सोजन सकिनेछ।

7. द्वितीयपत्रको पाठ्यक्रमलाई ४ बटा खण्ड/एकाइमा विभाजन गरिएको है, ४ बटा खण्ड/एकाइमा लागि ४ बटा उत्तर पृष्ठका दिनने र परिवाध्य गरेका प्रत्येक खण्ड/एकाइकारणको उत्तर सोही खण्ड/एकाइको उत्तर पृष्ठक्रममा लेखन पनेछ।

8. यस पाठ्यक्रममा यसौभै लेखिएको भएतापन पाठ्यक्रममा परेका ऐन, नियमित परीक्षाको मिति भन्दा ३ (तीन) महिना अगाडि (संशोधन भएका र संशोधन भएका हटाइएका र परी गरी संशोधन भएका) काममा रहेकालाई यस पाठ्यक्रममा रहेको समक्नु पर्दछ।

9. तृतीय पत्रको नेपाल प्रहरी सेवा सम्बन्धी पाठ्यक्रमको एकाइस्तर सोधिने प्रश्न संख्या र श्रेणी तृतीय पत्रको पाठ्यक्रममा उलेख गरिएको है।

10. प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र द्वितीय चरणको प्रयोगलेखक परीक्षामा सम्मिलित गराइएको है।

11. प्रयोगलेखक परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र अन्तर्धाता सम्मिलित गराइएको है।

12. अन्तर्धाताको अन्तर्मार्ग सम्बन्धमा प्रहरी सेवाको पदमा निर्युक्ति र बढ़वा गए अपनाउनु पनि सामान्य सिद्धांत, २०९९ को अनुसूची-१९ मा व्यवस्था भए बमोजिम हुनेछ।

13. पाठ्यक्रम लागू मिति :-
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 dimultiplexer, flip-flops, shift register, counters, sequence generators, oscillators (wien bridge oscillators, tuned, LC oscillators, crystal, clap 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-Sevart’s law, Aampere’s circuital law, curl, wave motion in free space, perfect dielectric and losses, wave medium, skin effect, impedance matching, antenna fundamental (Horn, slot, parabolic, yagi, CASs grain, 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 signup 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 System**  
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, hiking, cracking), Unicode

द्वितीययांश :- 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


3. Communication

Radio propagation in different waves (long wave to SHF), propagation characteristics, frequency availability, limitation element at VHF, UHF, discrete and continuous spectrums, stay 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

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

..............................
Practical for Inspector of Police

<table>
<thead>
<tr>
<th>SN</th>
<th>Topic</th>
<th>Marks</th>
<th>Time</th>
<th>Remarks</th>
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<tr>
<td>1.</td>
<td>Measuring Equipments (Analogue and digital)</td>
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<td>2.</td>
<td>Component Testing</td>
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<td>10 Minutes</td>
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<td>10 Minutes</td>
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<td>4.</td>
<td>Power supply</td>
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<td>5 Minutes</td>
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<tr>
<td>5.</td>
<td>Computer and Network</td>
<td>5</td>
<td>10 Minutes</td>
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<td>6.</td>
<td>Optical fiber</td>
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<td>5 Minutes</td>
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<td>7.</td>
<td>CCTV</td>
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<td>5 Minutes</td>
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<tr>
<td>8.</td>
<td>Radio receiver And Transmitter</td>
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<td>5 Minutes</td>
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<td>Total</td>
<td></td>
<td>50 marks</td>
<td>1 hours</td>
<td></td>
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</tbody>
</table>
(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

(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]

-समाल-