नेपाल सरकार
गृह मन्त्रालय
नेपाल प्रहरी प्रधान कार्यालय
(मानवश्रोत विकास विभाग, भर्ना छनौट शाखा)
नक्साल, काठमाण्डौ।

प्राविधिक प्रहरी निरीक्षक (बायोमेडिकल इन्जिनियर) पदको खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

सेवा: नेपाल प्रहरी
समूह: प्राविधिक प्रहरी
उपसमूह: स्वास्थ्य
श्रेणी: राजपत्राङ्कित तृतीय

परीक्षा योजना (Examination Scheme)

क्र.सं.	परीक्षा चरण	विवरण	पूर्णाङ्क
१.	प्रथम चरण	प्रारम्भिक तथा विस्तृत स्वास्थ्य परीक्षण	-
२.	द्वितीय चरण	लिखित परीक्षा	२००
३.	तृतीय चरण	विशेष स्वास्थ्य परीक्षण	-
४.	चतुर्थ चरण	अन्तरवार्ता	३०

प्रथम चरण:- प्रारम्भिक तथा विस्तृत स्वास्थ्य परीक्षण

- प्रहरी सेवाको पदमा नियुक्ति र बढुवा गर्दा अपनाउनु पर्ने सामान्य सिद्धान्त, २०६९ को अनुसूची-६ र ८ बमोजिम हुने।

द्वितीय चरण:- लिखित परीक्षा योजना (Written Examination Scheme)

पत्र	विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्न संख्या अङ्कभार	समय
प्रथम	Professional and Service Specific Test (PSST)	१००	४०	वस्तुगत बहुवैकल्पिक प्रश्न (Multiple Choice)	१०० प्रश्न×१ अंक = १००	१ घण्टा १५ मिनेट
द्वितीय		१००	४०	विषयगत (Subjective)	छोटो उत्तर ४ प्रश्न×५ अंक = २० लामो उत्तर ८ प्रश्न ×१० अंक = ८०	३ घण्टा

तृतीय चरण:- विशेष स्वास्थ्य परीक्षण

- प्रहरी सेवाको पदमा नियुक्ति र बढुवा गर्दा अपनाउनु पर्ने सामान्य सिद्धान्त, २०६९ को अनुसूची-९ बमोजिम हुने।

चतुर्थ चरण:- अन्तरवार्ता (Interview)

विषय	पूर्णाङ्क	परीक्षा प्रणाली
अन्तरवार्ता	३०	मौखिक

१. यो पाठ्यक्रमको योजना अनुसार दुई पत्रको लिखित परीक्षा हुनेछ।

२. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुनेछ।

३. पाठ्यक्रमको प्रथम र द्वितीय पत्रको विषयवस्तु एउटै हुनेछ।

४. प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ।

५. लिखित परीक्षाको प्रथम तथा द्वितीय पत्रको पाठ्यक्रमका प्रश्नहरुको संख्या निम्नानुसार हुनेछ।

प्रथम पत्रका इकाइ		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
प्रथम प्रश्न संख्या		4	8	6	6	4	6	16	6	6	4	5	5	5	2	5	2	10
द्वितीय पत्रका खण्ड		**खण्ड-क (A)**							**खण्ड-ख (B)**									**खण्ड-ग (C)**
द्वितीय पत्रका इकाइ		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
द्वितीय पत्रका प्रश्न संख्या	छोटो	1							1									2
	लामो	4							4									-

६. यस पाठ्यक्रममा जे सुकै कुरा लेखिएको भए तापनि पाठ्यक्रममा परेका ऐन नियमहरु तथा नीतिहरु परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा रहेको सम्झनु पर्छ।

७. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरुको उत्तर सही दिएमा प्रत्येक सही उत्तर बापत १ (एक) अंक दिईने छ भने गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २०% अंक कट्टा गरिने छ। तर उत्तर नदिएमा त्यस बापत अंक दिईने छैन र अंक कट्टा पनि गरिने छैन।

८. द्वितीय पत्रको विषयगत प्रश्नका लागि तोकिएका १० अङ्कका प्रश्नहरुको 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 टिप्पणीहरु (Short notes) सोध्न सकिनेछ।

९. द्वितीय पत्रको पाठ्यक्रमलाई ३ वटा खण्डमा विभाजन गरिएको छ। ३ वटा खण्डको लागि ३ वटै उत्तर पुस्तिका दिईनेछ र परीक्षार्थीले प्रत्येक खण्डका प्रश्नहरुको उत्तर सोही खण्डको उत्तर पुस्तिकामा लेख्नुपर्नेछ।

१०. यस भन्दा अगाडि लागू भएको माथि उल्लेखित समूहको पाठ्यक्रम खारेज गरिएको छ।

पाठ्यक्रम लागू मिति:- २०७९/१०/१९ गते।

लिखित परीक्षा (Written Examination)

प्रथम र द्वितीय पत्र :- Professional and Service Specific Test (PSST)

खण्ड "क" (Section-A)

1. Cell Biology, Immunology & Tissue Device Interaction

1.1 Cell biology: Cell growth, apoptosis and oncogenic transformation, cell signaling
1.2 Biomolecules: Proteins, carbohydrates, lipids, nucleic acid
1.3 Molecular biology and genetics: DNA, RNA and Protein synthesis; Techniques of genetic engineering
1.4 Immunology: Types of immunity, Antigen and antibody, Antigen-Antibody reactions
1.5 Tissue Device Interactions: Inflammation, wound healing and foreign body response; Endothelial cells & ECM-Biomaterial interaction; Blood-biomaterials interaction Bacteria and biomaterials

2. Human Anatomy and Physiology

2.1 Introduction to Human Body: Understanding of body design at structure-function level; Interpretation of the molecular cell biology to the development of body organs & system; Appreciation of the Control & regulation of body function; The Cells, Tissues & Organization of the Body; Understanding of structure & function of different types of cells & tissues; Cell to cell transport mechanisms
2.2 Blood: Composition of Blood; Erythrocytes (RBCs), leukocytes (WBCs) and platelets and their functions; Clotting factors; Haematopoesis; Haematopoetic stem cell; Differentiation and maturation of haematoblast into RBCs, WBCs and Platelets; Hemostasis, Components of coagulation cascades; Extrinsic, intrinsic and common pathway of coagulation cascades
2.3 The Cardiovascular System: Understanding of Anatomy of heart & blood vessels; Study of blood supply of heart or coronary circulation; Blood circulation from different organs to the heart & from the heart to different organs; Outline the heart functions; Understanding of cardiac cycle, cardiac output & blood pressure; Learning of conduction system of heart
2.4 The Respiratory System: Understanding of Anatomy-physiological relationship of upper respiratory tract; Lungs & its topography. Pleura & pleural cavity; Learning of lung functions; Mechanism of breathing, types of breathing & control of respiration; Understanding of Ventilation & Lung volumes Gas transfer & diffusion
2.5 The Digestive System: Structure of oral cavity & underlying glands; Teeth systems, functions & abnormalities of teeth; Structure of alimentary system; Functions of stomach, intestine & role of smooth muscle of gut; Understanding of digestion, secretion & absorption capacity of gut; Structure-function relationship of liver, biliary tract & gall bladder; Pancreas & its functions; Revision of Metabolic functions of body
2.6 The Urinary System: Topography of Kidneys; Microanatomy of kidney; Role of kidney in salt-water balance Structure-function relationship of ureter, bladder & urethra; Control of bladder function Renal & urinary diseases
2.7 The Skin. Structure, Function & Disorder of Skin
2.8 The Skeleton, Axial Skeleton & Appendicular Skeleton Bones. Diseases Related to Bones. Healing of Bones
2.9 The joint. Types of Joints. Main synovial Joints of the Limbs. Disorders of Joints
2.10 The Muscular System. Muscles of Face, Neck, Back, Abdominal Wall & Pelvic Floor. Diseases of muscles. Healing of muscle, Repair of Nerves Supplying Muscles
2.11 The Nervous System. Neurons, CNS, Brain, Spinal Cord, Peripheral Nervous system. Autonomic Nervous System. Disorders of Brain, Spinal Cord & Peripheral Nervous System. Responses of Nervous Tissue to Injury
2.12 The Special Senses. Hearing & Balance of Ear, Sight & Eye, Sense of Smell, Sense of Taste, Disease of Ear & Eye
2.13 The endocrine system. pituitary, thyroid, adrenal, pancreas, pineal & thymus gland
2.14 Reproductive system. male & female reproductive organs. diseases related to sex organs

3. Implantable Devices

3.1 Introduction to Implants and Their Necessity in Human Life
3.2 Cardiovascular Implants: Heart valves: Single leaflet, Bi-leaflet, Bioprosthetic; Vascular grafts: Artificial and biological; Stents, catheters and cannulas; Pacemakers; Inferior venacava filters; Intraaortic balloon pump; Ventricular assist device
3.3 Orthopedic Implants: Biomaterials used in orthopedic implants; Total hip Replacement; Total Knee Replacement
3.4 Urology Implants: Materials used in urology implants; Urethral catheters; Urology stents
3.5 Plastic Surgery implants: Materials used in plastic surgery implants; Types and procedures of breast implants; Gels and fillers in plastic surgery
3.6 Tissue Engineering: Introduction; Basic procedure of cell culture
3.7 Dental Implants
3.8 Plastic Surgery Implant
3.9 Catheters
3.10 Prosthesis for Drug Delivery
3.11 Different Kinds of Artificial Organs
3.12 Implants and Device Failure

4. Bio-engineering Materials and Components

4.1 Biomaterials: Introduction to Bio-materials and biocompatibility; Classes of materials used in medicine.
4.2 Metals: Introduction, structure, chemistry, mechanical properties and applications of various metals relating to biomaterials.
4.3 Polymers: Introduction, Types of polymers used in medicine Hydrogel
4.4 Ceramics, Glasses and Composites: Structure, chemistry and properties of ceramics and glasses used in medical devices; Types of bio-ceramics.
4.5 Natural Materials: Different types of natural materials; Collagen: Structure, Physical modification, Chemical Modification; Proteoglycans and glycosaminoglycans
4.6 Bioresorbable and Bio erodible Materials
4.7 Biologically Functional Materials
4.8 Degradation of Materials in Biological Environment
4.9 Perspectives and Possibilities in Biomaterials Science

5. Biomechanics

5.1 Skeletal Biology
5.2 Human joints: Classification and forces in joints (elbow, shoulder, hip, knee, spine, ankle, wrist)
5.3 Mechanics of hard tissues: Bone growth and development, fracture mechanics, mechanical properties of cortical and cancellous bones
5.4 Mechanics of soft tissues: Mechanical properties of ligaments &tendons, collagen, elastin; Muscle Mechanics-skeletal and cardiac muscles
5.5 Bio-fluid Mechanics: Basics of blood rheology; Blood flow and measurement
5.6 Muscle Mechanics
5.7 Modalities of Elastic and Viscoelastic Solids, Constitutive Equations

6. Medical Imaging

6.1 Basic Principles of Medical Imaging
6.2 Radiation Physics
6.3 X-ray Equipment: X-ray production and methods; X-ray tubes: Stationary and Rotating anode; X-ray control and indicating equipment; Filters and grids; Fluoroscopy: Introduction; Biological Effects of X-rays
6.4 Computed Tomography (CT): Introduction; Basic Principles of CT; Generation of CT; System Components

6.5 Magnetic Resonance Imaging (MRI): Fundamental Concepts; Principles of Parameters of MRI; Basic Principles of MR Imaging and Related Parameters Image formation; Contrast Enhanced MRI; Clinical Application

6.6 Ultrasonography (USG): Physics of Ultrasound; Construction and Properties of Ultrasound Transducer Ultrasonic Beam; Modes of Ultrasound Imaging; Doppler Ultrasound; Clinical Application; Biological Effects of Ultrasound

6.7 Digital Imaging: Introduction; Digital Radiography; PACS (Picture Archiving and Communicating System)

7. Biomedical Instrumentation

7.1 Fundamental of Medical Instrumentation: Sources of Biomedical Signals; Basic Medical Instrumentation System; Performance Requirements of Medical Instrumentation Systems; Intelligent Medical Instrumentation Systems; General Constraints in Design of Medical Instrumentation; Systems Regulation of Medical Devices

7.2 Signals and Electrodes: Bioelectric potential; Resting potential; Action potential; Propagation of action potential; Biological signals; Electrodes; Bio-potential electrodes; Microelectrodes; Skin surface electrodes

7.3 Physiological Transducers: Introduction; Classification of Transducers: Active and Passive; Performance Characteristics of Transducers; Displacement, Position and Motion Transducers; Pressure Transducers; Transducers for Body Temperature Measurement; Photoelectric Transducers; Optical Fiber Transducers; Optical Fiber Sensors; Biosensors; Smart Sensors

7.4 Biomedical Recorders: Electrocardiograph (ECG); Electroencephalograph (EEG); Electromyograph (EMG); Biofeedback Instrumentation

7.5 Patient Monitoring System: System Concept; Cardiac Monitor; Beside Patient Monitoring Systems; Central Monitors; Measurement of Heart Rate; Measurement of Pulse Rate; Blood Pressure Measurement; Measurement of Temperature; Measurement of Respiration Rate; Catheterization Laboratory Instrumentation

7.6 Arrhythmia and Ambulatory Monitoring Instruments: Cardiac Arrhythmias; Arrhythmia Monitor; QRS Detection Techniques; Exercise Stress Testing; Ambulatory Monitoring Instruments

7.7 Fetal Monitoring Instruments: Cardiotocograph; Methods of Monitoring Fetal Heart Rate; Monitoring Labor Activity; Recording System

7.8 Biomedical Telemetry and Telemedicine: Wireless Telemetry; Single Channel Telemetry Systems; Multi-patient Telemetry; Multi-channel Wireless Telemetry Systems; Implantable Telemetry System; Transmission of Analog Physiological Signals; Telemedicine

7.9 Oximeters: Ear Oximeter; Pulse Oximeter; Skin Reflectance Oximeters; Intravascular Oximeter

7.10 Blood Flowmeters: Electromagnetic Blood Flowmeter; Types of Electromagnetic Blood Flowmeter; Ultrasonic Blood Flowmeters; NMR Blood Flowmeters; Laser Doppler Blood Flowmeter

7.11 Cardiac Output Measurement: Indicator Dilution Method; Dye Dilution Method; Thermal Dilution Techniques; Measurement of Continuous Cardiac Output Derived from Aortic Pressure Waveform; Impedance Technique; Ultrasound Method

7.12 Pulmonary Function Analyzers: Pulmonary Function Measurements; Spirometry; Pneumotachometers; Measurement of Volumes; Pulmonary Function Analyzers

7.13 Clinical Laboratory Equipment: Medical Diagnosis with Chemical Tests; Spectrophotometry; Spectrophotometer type Instruments; Colorimeters; Biochemistry Analyzers; Electrolyte Analyzers; Microscope; Centrifuge; ELISA reader and washer; Biosafety Cabinet; Autoclave

7.14 Blood Gas Analyzers: Acid Base Balance; Blood pH Measurements; Measurement of Blood PCO2; Blood pO2 Measurement; Intra-Arterial Blood Gas Monitoring; A Complete Blood Gas Analyzer

7.15 Blood Cell Counters: Methods of Cell Counting; Coulter Counters; Automatic Recognition and Differential Counting of Cells

7.16 Audiometers and Hearing Aids: Mechanism of Hearing; Measurement of Sound; Basic Audiometer; Pure Tone Audiometer; Speech Audiometer; Audiometer System Bekesy; Evoked Response Audiometry System; Calibration of Audiometers; Hearing Aids

7.17 Cardiac Pacemakers: Need for Cardiac Pacemaker; External Pacemaker; Implantable Pacemakers; Recent Development in Implantable Pacemakers; Pacing System Analyzer

7.18 Cardiac Defibrillators: Need for a Defibrillator; DC Defibrillator; Pacer – cardioveter-defibrillaror; Defibrillator Analyzers

7.19 Instruments for Surgery: Principle of Surgical Diathermy; Surgical Diathermy Machine: Monopolar and Bi-polar; Safety Aspects in Electro-surgical Units

7.20 Laser Applications in Biomedical Field: Principle of Laser; Pulsed Ruby Laser; Nd-YAG Laser; Helium-Neon Laser; Argon Laser; CO2 Laser; Excimer Lasers; Semiconductor Lasers; Laser Safety

7.21 Physiotherapy and Electrotherapy Equipment: High Frequency Heat Therapy; Short-ware Diathermy; Microwave Diathermy; Ultrasonic Therapy Unit; Electrodiagnostic/ Therapeutic Apparatus; Pain Relief Through Electrical Stimulation

7.22 Hemodialysis Machines: Function of the Kidneys; Artificial Kidney; Dialyzers; Membranes for Hemodialysis; Hemodialysis machine

7.23 Lithotripters: The Stone Disease Problem; Conventional Lithotripter Machine; Modern Lithotripter Systems; Extra-corporeal Shock-wave Therapy

7.24 Anesthesia Machine: Need for Anesthesia; Anesthesia Machine: Introduction and Electronics parts in Anesthesia Machine

7.25 Ventilators: Mechanisms of Respiration; Artificial Ventilation Ventilators; Types of Ventilators; Ventilator Terms; Classification of Ventilators; Pressure-volume-flow Diagrams; Modern Ventilators; High Frequency Ventilators Humidifiers, Nebulizers and Aspirators

7.26 Automated Drug Delivery Systems: Components of Drug Infusion Systems; Closed-loop Control in Infusion Systems; Examples of Typical Infusion Pumps and syringe pumps

7.27 Patient Safety: Electric Shock Hazards; Leakage Currents; Safety Codes for Electromedical Equipment; Electrical Safety Analyzer

खण्ड "ख" (Section-B)

8. Basic Electrical and Electronic Devices and Circuits

8.1 Basic Electrical: Basic Concept of DC and AC Circuit, Circuit Analysis, Three Phase AC Circuit

8.2 Theory of Metal, Free Electron Theory of Conduction in Metals, Conduction in Liquid and Gases, Magnetic Materials and Superconductivity, Dielectric and Semi-Conducting Materials

8.3 Integrated Circuit Technology and Device Models

8.4 Overview of DC and AC diode models, JFET models, bipolar transistor models, MOS transistor models.

8.5 Operational Amplifier Circuits

8.6 Bias circuits suitable for IC design.

8.7 The differential amplifier

8.8 Active loads

8.9 Power Supplies and Voltage Regulators

8.10 Half-wave and full-wave rectifiers

8.11 Capacitive filtering

8.12 Zener diodes, bandgap voltage references, constant current diodes.

8.13 Zener diode voltage regulators.

8.14 Untuned and Tuned Power Amplifiers

8.15 Amplifier classification.

8.16 Direct-coupled push-pull stages.

8.17 Transformer-coupled push-pull stages.

8.18 Tuned power amplifiers.

8.19 Oscillator Circuits and Filter Circuits:
8.20 CMOS inverter relaxation oscillator.
8.21 Operation amplifier-based relaxation oscillators.
8.22 Voltage-to-frequency converters.
8.23 Filter Circuits, LC Filters, RC Filters, Active Filters

9. Digital Electronics and Microprocessors

9.1 Introduction to computer and programming
9.2 Logic Gates: truth tables and Boolean expressions
9.3 Universal gates and gate conversion
9.4 DeMorgan's theorem
9.5 Combinational Logic Devices
9.6 Encoder and Decoder
9.7 Multiplexer and Demultiplexer
9.8 Half and Full: Adder and Subtractor
9.9 Sequential Logic Devices
9.10 Counters: types and characteristics
9.11 Registers: SISO, SIPO, PISO, PIPO
9.12 Digital clocks and frequency counter
9.13 Bus Structure and Memory Devices
9.14 Bus structure, synchronous and asynchronous data bus, address bus, bus timing
9.15 Static and dynamic RAM, ROM, PROM, EPROM, EEPROM
9.16 Input/Output Interfaces for serial communication
9.17 Asynchronous interface: ASCII code, baud rate, start bit, stop bit, parity bit Synchronous interface
9.18 Physical communication standard
9.19 Interrupt vector and descriptor table
9.20 Interrupt service routine requirements
9.21 Interrupt priority: Maskable and Non-maskable interrupts, software interrupts, traps and exceptions
9.22 Thyristors and Other Devices
9.23 Stability and Oscillators
9.24 Waveguides and Components
9.25 Nanoelectronics
9.26 Introduction to DBMS, Concepts of Database systems, SQL& Normalization Steps

10. Digital Signal Processing

10.1 Introduction to Discrete Signal and Systems
10.2 Discrete signals – unit impulse, unit step, exponential sequences.
10.3 Linearity, shift invariance, casualty.
10.4 Convolution summation and discrete systems, response to discrete inputs.
10.5 Stability, sum and convergence of power series.
10.6 Sampling continuous signals – spectral properties of sampled signals.
10.7 General Introduction of various filters
10.8 Data Reduction Techniques
10.9 Real Time Biomedical System

11. Control Systems

11.1 System Modeling
11.2 Differential equation and transfer function
11.3 State-space formulation of differential equations, matrix notation
11.4 Mechanical components and Electrical components: mass, spring, damper, inductance, capacitance, resistance, sources, motors, tachometers, transducers, operational amplifier circuits

11.5 Linearized approximations
11.6 Frequency domain characterization of systems
11.7 Bode amplitude and phase plots, Effects of gain and time constants on Bode diagrams, Stability from the Bode diagram
11.8 Nyquist plots, Correlation between Nyquist diagrams and real time response of systems: stability, relative stability, gain and phase margin, damping ratio
11.9 Computer Simulation of Control Systems
11.10 Performance Specifications for Control Systems

12. Communication Systems

12.1 Analog and digital communication sources, transmitters, transmission channels and receivers.
12.2 Types and reasons for modulation.
12.3 Representation of Communication Signals and Systems
12.4 Frequency Modulation (FM) and Phase Modulation (PM)
12.5 Distortion, noise, and interference.
12.6 Nyquist sampling theory, sampling of analog signals, spectrum of a sampled signal.
12.7 Sampling theorem for band-limited signals, effects of aliasing, reconstruction of sampled signals.
12.8 Protocol Architecture
12.9 Transmission Media
12.10 Signal Encoding Techniques
12.11 Digital Data Communication Technique
12.12 Data Link Control
12.13 Multiplexing
12.14 General Concept of Wireless Communication System

13. Engineering Professional Practice, Project Planning and Medical Industry Management

13.1 Engineering Professional Practice, Project Planning and Engineering Economics
13.2 Codes of ethics and guidelines for professional engineering practice
13.3 Relationship of the engineering profession to basic science and technology
13.4 Relationship of the engineering profession to other professions
13.5 Introduction to Medical Industry concept: Classification of medical devices: Class I, IIa, IIb, III; Introduction to ISO, CE marking, FDA
13.6 Selection and purchase and management of medical equipment: Need analysis; Specification preparation
13.7 Various procurement methods: Direct purchase, Sealed quotation, Tender; Incoming inspection and commissioning
13.8 Preventive maintenance; Corrective maintenance; AMC (Annual Maintenance Contract); CMC (Comprehensive Maintenance Contract); Decommissioning
13.9 Basics of hospital management: Hospital traffic flow; Architectural planning of hospital
13.10 Basics of Patient Management system and Laboratory management system
13.11 Project Planning, Monitoring and Evaluation and Control, Capital Planning and Budgeting
13.12 Cost Classification and Analysis, Interest and the Time Value of Money
13.13 Cash/Benefit Analysis, Risk Analysis, Demand Analysis and Sales Forecasting

14. Medical Robotics and Neural Network

14.1 Introduction of Robotics
14.2 Medical Robotics in Surgery
14.3 Robotic Rehabilitation Therapy
14.4 Telesurgery
14.5 Introduction to Neural Networks
14.6 Neural Networks Architecture,
14.7 Artificial Neural Networks (ANN) and Applications of ANN
14.8 Neural networks in medicine
14.9 Introduction to Genetic Algorithms and Fuzzy Logic

15. Engineering Mathematics, Statistics and Research Methodology

15.1 Limits and Continuity of a Function, Derivatives and Applications of Derivatives, Integration and Applications of Integral Calculus, Differential Equations, Linear Programming

15.2 Plane Analytic Geometry, Vector Algebra, Analytic Geometry of 3-D, Plane Curves and Polar Coordinates, Vector Calculus, Matrices and Determinant, Infinite Series, Laplace Transformation, Line Integration, Surface Integrals and Volume Integrals, Integral Theorems, Complex variables, Transforms, The Fourier series, Integral and Transform

15.3 Introduction to Descriptive Statistics, Probability, Discrete Random Variables, Estimation, Hypothesis Testing, Simple Linear Regression and Correlation

15.4 Introduction to Research methodology, Research design, Sampling, data collection and data analysis, Research proposal and report writing

16. Engineering Drawing and Basic Mechanical Engineering

16.1 Instrumental Drawing, Practices and Techniques

16.2 Freehand Technical Lettering, Dimensioning, Pictorial Drawing, AutoCAD Drawing

16.3 Workshop technology, Basic Tools, Hand operating operations and Measuring, Machine Tools

16.4 Metal Joining: Soldering, Brazing, Gas welding, Arc welding, Safety

16.5 Measuring and Gagging: Rulers, Scales, Depth gages, Micrometer, Venire calipers, Dial indicators

खण्ड "ग" (Section-C)

17. सामान्य ज्ञान तथा नेपाल प्रहरी सेवा सम्वन्धी

क. **नेपालको भूगोल सम्बन्धी सामान्य जानकारी** (भौगोलिक अवस्था, स्वरुप, किसिम र विशेषताहरु, हावापानी किसिम र विशेषता, जल सम्पदा: स्थिति र महत्व, वन सम्पदा: अवस्था र महत्व, संरक्षण क्षेत्रहरु तथा वन विनाशका कारण र संरक्षणका उपायहरु , नेपालका प्रमुख हिमशिखरहरु, तालतलैया, झरना, भञ्ज्याङ ।

ख. **इतिहास र संस्कृति सम्बन्धी सामान्य जानकारी** (आधुनिक नेपालको इतिहास (पृथ्वीनारायण शाह देखी हालसम्म), नेपालको सांस्कृतिक, धार्मिक एवं मौलिक परम्परा, जातजाति, भाषाभाषी, कला र साहित्य सम्बन्धी सामान्य जानकारी ।

ग. **नेपालको वर्तमान संविधान २०७२** (भाग १, ३, ४, ५, २८ र अनुसूचीहरु)

घ. **जनसंख्या र वातावरण सम्बन्धी सामान्य जानकारी** (जनसंख्या, शहरीकरण, बसोवास (बँसाईसराई), जैविक विविधता, जलवायु परिवर्तन, वातावरण तथा प्रदुषण)

ङ. **समसामायिक घटना तथा नविनतम् विषयवस्तुहरु:** (राष्ट्रिय तथा अन्तर्राष्ट्रिय महत्वका राजनैतिक, सामाजिक, आर्थिक, वैज्ञानिक, सांस्कृतिक, खेलकूद, पुरस्कार, कला साहित्य, संगीत सम्बन्धी)

च. **नेपाल प्रहरीको पृष्ठभूमि (वि.स. २००७ साल देखि हालसम्म) र वर्तमान अवस्था ।**

छ. **प्रहरी ऐन, २०१२ र प्रहरी नियमावली, २०७१ (संशोधन सहित) का मुख्य-मुख्य व्यवस्थाहरु** (संगठनात्मक स्वरुप, सेवाको प्रकार, दर्ज्यानी चिन्ह, पद तथा श्रेणी सेवा, शर्त र सुविधा, प्रहरी आचरण, नियुक्ति र अवकाश, प्रहरी कर्मचारीको काम-कर्तव्य अधिकार, नेपाल प्रहरीमा प्राविधिक प्रहरी कर्मचारीको महत्व र आवश्यकता, नेपाल प्रहरी कार्यालयको स्थापना र कार्यालय प्रमुख सम्बन्धी व्यवस्था)

ज. **विविध:-** सुरक्षा समिति (केन्द्र, प्रदेश र जिल्ला), नेपाल प्रहरी र अन्य सुरक्षा निकायहरु (नेपाली सेना, सशस्त्र प्रहरी बलनेपाल र राष्ट्रिय अनुसन्धान विभाग) संगको सम्बन्ध, अपराध परिचय, महत्व र प्रविधिको प्रयोग, विपद व्यवस्थापनमा नेपाल प्रहरी, सार्क, संयुक्त राष्ट्रसंघ, इन्टरपोल सम्बन्धी जानकारी ।

लिखित परीक्षाको नमूना प्रश्नपत्र

वस्तुगत बहुवैकल्पिक प्रश्न (Multiple Choice Question)

1. An object of mass 5 kg moves at 15 m/s. A constant force that acts for 5 secs on the object gives it a speed of 5 m/s in opposite direction. The force acting on the object is
   a) -4N
   b) -20N
   c) 4N
   d) 20N
2. Which of the following substances will not stimulate an immune response unless they are bound to a larger molecule?
   a) Antigen
   b) Antibody
   c) Virus
   d) Hapten
3. Dielectric strength of a material implies its
   a) Energy storage capacity
   b) Magnetic strengt
   c) Capacity to withstand high voltage
   d) None of the above
4. The type of joint between the skull bones is
   a) Fibrous
   b) Cartilaginous
   c) Synovial
   d) Hinge
5. Which of the following are not found in the glomerular filtrate?
   a) Glucose
   b) Protein
   c) Creatinine
   d) Uric acid

छोटो प्रश्न (Short Question)

1. What is LASER? Draw a block diagram of fiber-optic gastric photo-coagulation and discuss its operation.

लामो प्रश्न (Long Question)

1. Describe working principle of X-ray machine & CT-scan machine with necessary diagram. What are the differences between X-ray machine & CT-scan machine? Also compare CT-scan with MRI. What are the biological effects of X-rays?

-समाप्त-