नेपाल सरकार
gृह मन्त्रालय
प्रहरी प्रधान कार्यालय
(मानवश्रोत एवं प्रशासन विभाग, भन्ना तथा छनोट महाशाखा)
नक्साल, काठमाडौं।

प्राधिक निरीक्षक (रेडियोग्राफी) समूहको खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम।

पाठ्यक्रमको रुपरेखा:- यस पाठ्यक्रमको आधारमा निम्नानुसार दुई चरणमा परीक्षा लिखिने छ:

| प्रथम चरण: | लिखित परीक्षा (Written Examination) | पूर्णाङ्क: | २५० |
| द्वितीय चरण: | अन्तरवाता (Interview) | पूर्णाङ्क: | ३५ |

प्रथम चरण: लिखित परीक्षा द्वारा विभाग द्वारा भन्ने साधारण निरीक्षणको प्रणालीको उद्देश्य लिनेछ।

<table>
<thead>
<tr>
<th>पत्र</th>
<th>विषय</th>
<th>पूर्णाङ्क</th>
<th>उत्तीर्णाङ्क</th>
<th>परीक्षा प्रणाली</th>
<th>प्रश्न संख्या X अंक</th>
<th>समय</th>
</tr>
</thead>
<tbody>
<tr>
<td>प्रथम</td>
<td>रेडियोग्राफी</td>
<td>१००</td>
<td>४०</td>
<td>वस्तुगत बहुउत्तर (Multi Choice)</td>
<td>३००×१ = ३००</td>
<td>१ घण्टा १५ मिनेट</td>
</tr>
<tr>
<td>द्वितीय</td>
<td></td>
<td>१००</td>
<td>४०</td>
<td>विषयगत (Subjective)</td>
<td>३००×१ = ३००</td>
<td>३ घण्टा</td>
</tr>
<tr>
<td>तृतीय</td>
<td>नेपाल विभाग सेवा सम्बन्धी</td>
<td>५०</td>
<td>२०</td>
<td>वस्तुगत बहुउत्तर</td>
<td>१०×१ = १०</td>
<td>१ घण्टा</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>विषयगत</td>
<td>लामो उत्तर</td>
<td>१०×१ = १०</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>छोटो उत्तर</td>
<td>६×५ = ३०</td>
<td></td>
</tr>
</tbody>
</table>

द्वितीय चरण

<table>
<thead>
<tr>
<th>परीक्षाको किसिम</th>
<th>पूर्णाङ्क</th>
<th>परीक्षा प्रणाली</th>
</tr>
</thead>
<tbody>
<tr>
<td>व्यापक अन्तरवाताँ</td>
<td>३५</td>
<td>मौखिक</td>
</tr>
</tbody>
</table>

१. लिखित परीक्षाको माध्यम भाषा नेपाली वा अङ्ग्रेजी अथवा नेपाली र अङ्ग्रेजी दुई हुन सक्नेछ।

२. पाठ्यक्रमको प्रथम तथा द्वितीय पत्रको विषयबस्तु एउटै हुनेछ।

३. प्रथम र द्वितीय पत्रको लिखित परीक्षा छुप्राण हुनेछ।
4. प्रथम तथा द्वितीय पत्रहरुका एकाइहरुबाट सङ्कुचित प्रश्नसंख्या निर्माणुसार हुनेछः ।

| एकाइ   | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | XIII | XIV | XV | XVI | XVII |
|---------|---|----|-----|----|---|----|-----|------|----|----|-----|------|------|-----|-----|------|
| प्रथम   | 6 | 6  | 8   | 8  | 8 | 5  | 3   | 8    | 6  | 10 | 4   | 8    | 5    | 2   | 3   | 2    |
| द्वितीय | 1 | 1  | 1   | 1  | 1 | 1  | 1   | 1    | 1  | 1  | 1   | 1    | 1    | 1   | 1   | 1    |

5. बस्तुगत बहुउत्तर (Multiple Choice) प्रश्नहरुको उत्तर सही दिएमा प्रल्येक सही उत्तर बापत पुरा अझ प्रदान गरिएको भने गलत उत्तर दिएमा प्रल्येक गलत उत्तर बापत २० प्रतिशत अझ कप्ता गरिएको । तर उत्तर निविदेमा त्यस बापत अझ दिदिने छैन र अझ कप्ता पनि गरिएको छैन ।

6. द्वितीय पत्रको विषयपत्र प्रश्नका लागि लोकिएका १० अझका प्रश्नहरुको हकका ९० अझको एउटा लामो प्रश्न बा एउटै प्रश्नका दुई बा दुई भन्दा बढी भाग (Two or more parts of a single question) बा एउटा प्रश्न अन्तर्गत दुई बा बढी टिथ्यर्गहरु (Short notes) सोभन सकिने छ ।

7. यस पाठ्यक्रममा जेमसुके लेखिएको भएता पनि पाठ्यक्रममा परेका ऐन, नियमहरु परिशालको मिति भन्दा ३ (तीन) महिनाअघाडि (संशोधन भएका बा संशोधन भई हटाईएका बा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा रहेको सम्बन्ध पद्धत ।

8. प्रथम चरणको लिखित परिशालाबाट छत्तीट भएका उमेदवारहरुलाई मात्र द्वितीय चरणको अन्तर्भावांमा सम्मलित गराइनेछ ।

9. अन्तर्भावांको अंक्राब सम्बन्धमा प्राप्ति नियुक्ति र बढौ गर्दा अपनाउनु पनि सामान्य सिद्धान्त, २०६९ को अनुसूची-१६ मा व्यवस्था भए बमोजिम हुनेछ ।

10. पाठ्यक्रम लागू मिति :-
Subject Details

Section I  6%

Human Anatomy
- Unit I: Introduction of Anatomy of Human Body as whole
- Unit II: Musculo-skeletal system
- Unit III: Nervous System
- Unit IV: Cardiovascular System
- Unit V: The Lymphatic System
- Unit VI: The Respiratory system
- Unit VII: The Digestive System
- Unit VIII: The Urinary System
- Unit IX: The Reproductive System
- Unit X: Special Senses
- Unit XI: The Endocrine system
- Unit XII: Practical identification of major bones, muscles, central and peripheral nervous system, organs of respiratory system, heart and vessels, organs of GIT, organs of reproductive and endocrine system, organs of urinary system

Section II  6%

Human Physiology
- Unit I: General Physiology
- Unit II: Cardiovascular system and Blood, Applied-Shock, CPR, Hypertension, Anemia
- Unit III: Respiratory system, applied-cyanosis, hypoxia, dyspnoea, hyperventilation, respiratory failure, COPD
- Unit IV: Digestive System, applied-ulcer, diarrhea, constipation, vomiting, malabsorption syndrome, pancreatitis and jundice
- Unit V: The Musculoskeletal system, applied-exercise, atrohy, hypertrophy of muscle, fasciculation and fibrillation
- Unit VI: The Nervous System/Special senses, applied-paralysis, convulsion, refractive errors, pupillary reaction in life and death, upper and lower motor neuron lesion, Babinski sign and ataxia and tuning fork hearing tests
- Unit VII: The Urinary system, applied-renal stones, ureteric stones and bladder stones, renal fuction, acidosis, alkalosis and renal failure
- Unit VIII: The endocrine and reproductive System,
Section III 8%
Basic Radiation Physics

- Unit I: Electricity - Current, Voltage, Faraday's laws, Linz's laws, mutual induction phenomena
- Unit II: Transformer - Different types of transformer (step down and step up transformer, central tapped transformer, Auto transformer and variacter transformer)
- Unit III: Thermionic Emission, semiconductor and Rectifiers - phenomena of thermionic emission and Richardson, formation of P and N type semiconductor
- Unit IV: Atomic Structure and Electromagnetic Radiation - Different electron shell Bohr's theory of hydrogen atom, phenomenon of excitation and ionization and their corresponding potential
- Unit V: Measure of Electromagnetic Radiation and other Particles - measurement of radiation and particles
- Unit VI: X-Rays - X-ray production (gas filled tube and Coolidge tube) and the properties and uses of it.
- Unit VII: Radioactivity - Discovery of Nucleus and its constituents (Proton, Neutron), mass number, atomic mass, atomic mass unit and isotopes.
- Unit VIII: Interaction of Radiation with Matter - Radiation passes through the body, difference between homogeneous and heterogeneous beam.
- Unit IX: Ultrasound - longitudinal wave and high frequency sound wave, generation and reception of ultrasound, intensity, power and field of ultrasound.

Section IV 8%
Radiographic Equipment

- Unit I: X-ray Tubes - X-ray tube tubes and its development, basic design of stationary and rotating anode x-ray tube.
- Unit II: Radiographic Couches, Stands and Tube Supports - Classify X-ray tube supports, various types of Radiographic couches.
- Unit III: Exposure Timers - Different type of timers (photoelectric timer and ionization chamber timer)
- Unit IV: Beam Centering and beam Limiting Devices - Functioning of Coins and cylinders, Aperture diaphragms, Lighting beam diaphragms, positive beam limitation
- Unit V: Portable and Mobile Radiographic Equipments -
- Unit VI: Control of Scattered Radiation - Significance of scattered radiation, methods of controlling scattered radiation, and techniques of reducing the amount of scattered radiation produced.
- Unit VII: Fluoroscopic Equipment - Conventional fluoroscopy, fluoroscopy screen and fluoroscopic image, features of fluoroscopic X-ray table.
- Unit VIII: Radiation protection - Radiation sensitivity, factors influencing radio-sensitivity.
- Unit IX: Tomography - Principle of Tomography, features of tomography equipment.
- Unit X: Equipment for dental Radiography
• Unit XII: Mammographic Equipment - Differentiate Mammography x-ray tube and ordinary x-ray tube.
• Unit XIII: Photofluorography - design photofluorography system (cut film and roll film type)

Section V  8%
Radiographic photography
• Unit I: Radiographic Photography Principles - Photographic effect, photosensitive materials, photographic emulsion, gelatin and function of the gelatin binder.
• Unit II: X-ray Films - background of X-ray film and its construction, duplitized x-ray film.
• Unit III: Image Characteristics - real and mental image, reflected, transmitted and emitted light image.
• Unit IV: X-ray Film Processing - development of hand processing to automatic processing, processing cycles, constituent of developing solutions and developer replenisher solution.
• Unit V: Storage & Archiving of Film - Storage areas, storage condition.
• Unit VI: Intensifying screens - luminescence, fluorescence and phosphorescence, quantum detection efficiency.
• Unit VII: Design and Construction of Darkroom - Layout of a well-equipped ideal darkroom, darkroom location, size, radiation protection, floor.
• Unit VIII: Presentation and viewing of Radiographs - Types of information: essential, technical and miscellaneous, methods of recording information: opaque letters and legends, actinic marking and perforating device.
• Unit IX: Estimation of Exposure Factors - Kilo voltage (kV) and its effect in radiographic image, Milliampere second (mAs) and its effect in radiographic image.

Section VI  8%
Radiographic Technique
• Unit I: Introduction to Radiographic Technique- Identity some abbreviation and common medical terms, radiographic positioning terminology.
• Unit II: Skeletal System
• Unit III: Upper Limb - Process of all routine radiographic examination of upper limb including fingers thumb, hand, wrist joint, radio-ulnar joint, lower two third of radius and Ulna.
• Unit IV: Shoulder Girdle and Thorax - View of head humerus, shoulder joints; shoulder outlet view, acromio-calvicular joint, view of scapula.
• Unit V: Lower Limb - radiographic examination of the lower limb including foot, toes, great toe, tarsus calcaneum, talo-calaneum.
• Unit VI: Vertebral Column - Radiographic examination of the spines cranio- vertebral joint, atlanto-occipital joint.
• Unit VII: Pelvic Girdle and HIP Regions - Radiographic examination for whole pelvis, ileum, ischium, and pubic bones.
• Unit VIII: Skull - Process of routine examination of the bones of skull face, cranium, mandible, zygomatic arches, nasal bone.
• Unit IX: Thoracic Cage and Abdomen - Radiographic examination of the thoracic cage including lungs, trachea, bronchi, mediastinal structure, heart and sternum, ribs.
• Unit X: Pelvimetry - Radiation hazard.
• Unit XI: Ward and Domiciliary Radiography -
• Unit XII: Use of Portable/mobile x-ray in ward and operation theatre - Main function and supply of apparatus, procedure in collaboration with theatre staffs.
• Unit XIII: Mammography - Principle and routine of radiography views of mammography.
• Unit XIV: Macro-Radiography - Principles and its application.
• Unit XV: Tomography - Practical application of tomography of the chest, kidney, gall bladder, skeletal system.
• Unit XVI: Registration Process - Steps of registration of patient
• Unit XVII: Dental Radiography

Section VII 5%
Hospital Practice & Patient Care
• Unit I: Communication Skills - Initiate the interaction, identify the reason for examination, and deal with people from different social background.
• Unit II: The Hospital, the patient & the radiographer
• Unit III: Features of General Patient Care - General preliminaries to the examination, moving chair and stretcher with patient.
• Unit IV: Sterilization and sterile Techniques - Methods of sterilization.
• Unit V: The Infectious Patient
• Unit VI: Nursing Procedures - Laying up a sterile trolley, injection technique, process of oxygen therapy and resuscitation
• Unit VII: First aid in X-ray department, shock, hemorrhage, burns, loss of consciousness
• Unit VIII: General First Aid
• Unit IX: Maternal and Child health
• Unit X: Medico-legal aspects of the Radiographers’ work

Section VIII 3%
Basic Health Sciences-III
• Unit I: Pharmacology-pharmacokinetics, pharmacodynamics, Iodine, Barrium, Muscle relaxant and sedative hypnotics
• Unit II: Microbiology-Eukyarotypes, prokyrotypes, viruses, bacteria, fungus, parasites
• Unit III: General Pathology-Musculoskeletal system, respiratory system, cardiovascular system, endocrine system, hemopoetic system
• Unit IV: Biochemistry-carbohydrate, protein, fat, enzymes, pH, buffer system
Section IX  8%
Radiological Procedures:
- Unit I: First Aid and Emergency Care
- Unit II: Contrast medias - Types, methods of introduction, reactions, emergency equipments and drugs to cope the reaction
- Unit III: Radiographic investigations of gastro-intestinal tract using contrast medias- indications, contraindications and preparation
- Unit IV: Investigations of urinary tract and hysteron-salphingography- indications, contraindications and preparation of contrast media and radiographic techniques
- Unit V: Radiographic procedure of biliary tract- OCG, IVC, PTC and PTCD
- Unit VI: Vascular and neurological examinations- carotid and vertebral, femoral aortogram, phlebogram, encecephlaogram, ventriculogram, myelogram
- Unit VII: Special Examinations-Arthrogram, Dacrocystogram, sinogram, Fistulogram, Siologram, Bronchogram, Mammogram, Lymphangiogram, Thermogram, Micro radiography, Soft tissue radiography
- Unit VIII: Paediatric Radiography-Paediatric radiology

Section X  6%
Radiological and Cross-Sectional Anatomy
- Unit I: Head and Neck
- Unit II: Thorax
- Unit III: Abdomen and Pelvis
- Unit IV: Shoulder, Elbow and Wrist Joints
- Unit V: Hip, Knee and Ankle Joints

Section XI  10%
Physics of Modern Medical Imaging Technology
- Unit I: Dental Imaging
- Unit II: Computed Tomography (CT)
- Unit III: Magnetic Resonance Imaging (MRI)
- Unit IV: Ultrasoundography
- Unit V: Nuclear Medicine

Section XII  4%
Bio-statistics and Research Methodology
- Unit I: Biostatistics - Scope functions, limitations and usefulness, frequency distribution, central tendency, probability, Correlation and correlation coefficient, regression analysis etc
- Unit II: Basic Epidemiology- Definition, aims, descriptive epidemiology, analytical epidemiology, etc
- Unit III: Research Methodology
- Unit IV: Development of project proposal
Section XIII  8%
Special Imaging Techniques
- Unit I: Computed Tomography (CT)-overview, application and perform of various kinds of CT in the Human body, helical spiral multislice CT scanning and 3D reconstruction
- Unit II: MRI-overview, application, perform MRI on various parts of the human body

Section XIV  5%
Quality Assurance in Radio diagnosis
Quality, light beam, developer, fixer activity, processing chemicals, screen film, grid movement test, collimator test, safe light test, radiation output reproducibility, consistency of radiation output, accuracy of timer test and KVP test, alignment of X-ray beam to X-ray table test, reject film analysis, focal spot size measurement test

Section XV  2%
Information Technology
- Unit I: Basic concept of computer application
- Unit II: Information technology basic
- Unit III: Making digital image
- Unit IV: Image capture techniques and dicom (digital imaging and communication in medicine)
- Unit V: Data compression
- Unit VI: Local area networks
- Unit VII: PACS Picture achieving and communication system
- Unit VIII: Legal and Financial issues in Tele radiology

Section XVI  3%
Health Care Management
- Unit I: Introduction
- Unit II: Personal and Interpersonal Skills
- Unit III: Health and Management Planning
- Unit IV: Organizing Function of Management
- Unit V: Human Resource Management
- Unit VI: Logistic Management
- Unit VII: Health Information Management
- Unit VIII: Financial Management
- Unit IX: Management Research
Section XVII 2%
Basic X-ray Engineering
- Unit I: Basic items for Electric and Electronic Circuit
- Unit II: The Components and the electronic circuits for X-ray unit
- Unit III: Dark Room electrical and Mechanical Component

Model Questions:

Group A:
1. How do you perform I.V.U. in patient with B/L Hydronephrosis?
2. How do you perform an M.C.V. patient with folley's catheter?
3. What do you mean by mortise view waters view?
4. What is Thoracic cage and what are its bony parts?
5. What preparation do you need to give to a patient going under barium series?
6. Do you need to give a preparation to the patient for K.U.B.
7. Write shortly on Renal function.
8. What do you know about mastoid view?
9. How do you perform an examination to a patient with bullet in abdominal cavity?
10. Write down the views of fore arm?
11. What view do you perform for Sellaturcicia?
12. What do you mean by "T" Tube Cholangiogram?

Group B:
1. Write the indications for C.T. Routine Thorax
2. Describe about generation and principle of CT Scan
3. What is pitch?
4. What do you mean by H.R.C.T.?
5. Write down the indications for CT Enteroclysis.
6. Write down indication for CT Angiography of the abdomen.
7. Write down indication for CT Colonoscopy.
8. Write down indication for contrast enhanced cerebrum sequences.
9. Write down indication for CT Angiography for the circle of willis.