

शहीद धर्मभक्त राष्ट्रिय प्रत्यारोपण केन्द्र
मानव अङ्ग प्रत्यारोपण विकास समिति, प्रविधिक सेवा, रेडियोग्राफी समूह, पाँचौ तह, रेडियोग्राफर पदको खुला
प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

एवं परीक्षा योजना

यस पाठ्यक्रम योजनालाई दुई चरणमा विभाजन गरिएको छ :

प्रथम चरण :- लिखित परीक्षा (Written Examination)

पूर्णाङ्क :- २००

द्वितीय चरण :- अन्तर्वार्ता (Interview)

पूर्णाङ्क :- ३०

प्रथम चरण (First Phase): लिखित परीक्षा योजना (Written Examination Scheme)

पत्र	विषय	पूर्णाङ्क	उतीर्णाङ्क	परीक्षा प्रणाली		प्रश्नसंख्या X अङ्क	समय
प्रथम	Technical Subject	१००	४०	वस्तुगत	बहुवैकल्पिक प्रश्न (MCQ)	५० प्रश्न x २ अङ्क	४५ मिनेट
द्वितीय		१००	४०	विषयगत	छोटो उत्तर आउने प्रश्न लामो उत्तर आउने प्रश्न	१२ प्रश्न x ५ अङ्क ४ प्रश्न x १० अङ्क	२ घण्टा ३० मिनेट

द्वितीय चरण (Second Phase) : अन्तर्वार्ता (Interview)

विषय	पूर्णाङ्क	परीक्षा प्रणाली
अन्तर्वार्ता	३०	मौखिक

द्रष्टव्य :

- लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुन सक्नेछ ।
- प्रथम र द्वितीय पत्रको पाठ्यक्रम एउटै हुनेछ ।
- प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।
- लिखित परीक्षामा सोधिने **प्रश्नसंख्या र अङ्कभार** यथासम्भव सम्बन्धित पत्र/विषयमा दिईए अनुसार हुनेछ ।
- वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरूको गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अङ्क कट्टा गरिनेछ । तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन ।
- वस्तुगत बहुवैकल्पिक हुने परीक्षामा परीक्षार्थीले उत्तर लेख्दा अंग्रेजी ठूलो अक्षर (Capital letter) A,B,C,D मा लेख्नुपर्नेछ । सानो अक्षर (Small letter) a,b,c,d लेखेको वा अन्य कुनै सङ्केत गरेको भए सबै उत्तरपुस्तिका रद्द हुनेछ ।
- बहुवैकल्पिक प्रश्नहरू हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन ।
- विषयगत प्रश्नहरूको हकमा 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 सकिने छ ।
- विषयगत प्रश्न हुने पत्रमा प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन् । परीक्षार्थीले प्रत्येक खण्डको प्रश्नको उत्तर सोही खण्डको उत्तरपुस्तिकामा लेख्नुपर्नेछ ।
- यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जुनसुकै कुरा लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम, विनियम तथा नीतिहरू परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ ।
- प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।
- पाठ्यक्रम स्वीकृत मिति :- २०८१/०८/०४

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प्रथम र द्वितीय पत्र (Paper I & II)
Technical subject

Section A: 50%

1. Anatomy and Physiology (20%)

- 1.1 General introduction
 - 1.1.1 The cell
 - 1.1.2 Reproduction of the individual
- 1.2 The tissues
 - 1.2.1 Epithelial tissue
 - 1.2.2 Connective tissue
 - 1.2.3 Skeletal tissue
 - 1.2.4 Muscular tissue
 - 1.2.5 Nervous tissue
- 1.3 General pathology
 - 1.3.1 Bacteria
 - 1.3.2 Viruses
 - 1.3.3 Tumours
- 1.4 Surface and regional anatomy
 - 1.4.1 The anatomical position
 - 1.4.2 The head
 - 1.4.3 The neck
 - 1.4.4 The thorax
 - 1.4.5 The abdomen
 - 1.4.6 The pelvic cavity
- 1.5 The skeleton
 - 1.5.1 The structure of bone
 - 1.5.2 Function of bone
 - 1.5.3 The development and growth of bones
 - 1.5.4 The healing of fractures
- 1.6 The skull
 - 1.6.1 The skull viewed from above
 - 1.6.2 The skull viewed from the front
 - 1.6.3 The skull viewed from the side
 - 1.6.4 The skull viewed from the below
 - 1.6.5 The interior of the skull cap
 - 1.6.6 The interior of the base of the skull
 - 1.6.7 The nasal cavity
 - 1.6.8 The accessory nasal sinuses
 - 1.6.9 The individual bones of the skull
- 1.7 The vertebral column, ribs and sternum
 - 1.7.1 The vertebral column
 - 1.7.2 The ribs
 - 1.7.3 The sternum

- 1.8 The bones of the upper limb
 - 1.8.1 The clavicle
 - 1.8.2 The scapula
 - 1.8.3 The humerus
 - 1.8.4 The radius
 - 1.8.5 The ulna
 - 1.8.6 The carpal bones
 - 1.8.7 The metacarpal bones
 - 1.8.8 The phalanges
 - 1.8.9 Arteries and nerves related to the bones of the upper limb
 - 1.8.10 Ossification of the bones of the upper limb
- 1.9 The bones of the lower limb
 - 1.9.1 The hip bone
 - 1.9.2 The pelvis
 - 1.9.3 The femur
 - 1.9.4 The patella
 - 1.9.5 The tibia
 - 1.9.6 The fibula
 - 1.9.7 The tarsal bones
 - 1.9.8 The metatarsal bones
 - 1.9.9 The phalanges
 - 1.9.10 The arches of the foot
 - 1.9.11 Arteries and nerves related to the bone of the lower limb
 - 1.9.12 Ossification of the bones of the lower limb
- 1.10 The joints of the bones of the lower limb
 - 1.10.1 types of joints
 - 1.10.2 The muscles and joints of the head
 - 1.10.3 The joints and muscles of the neck and trunk
 - 1.10.4 The joints and muscles of the upper limb
 - 1.10.5 The joint and muscles of the lower limb
- 1.11 The circulatory system
 - 1.11.1 The blood
 - 1.11.2 The blood vessels
 - 1.11.3 The heart
 - 1.11.4 The pulmonary circulation
 - 1.11.5 The systemic circulation
 - 1.11.6 The veins
- 1.12 The lymphatic system
 - 1.12.1 Lymph
 - 1.12.2 The lymphatic vessels
 - 1.12.3 The lymphnodes
 - 1.12.4 The lymphatic drainage of the body
 - 1.12.5 Lymphatic tissue
 - 1.12.6 The spleen

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- 1.13 The respiratory system
 - 1.13.1 The nose
 - 1.13.2 The pharynx
 - 1.13.3 The larynx
 - 1.13.4 The trachea
 - 1.13.5 The bronchi
 - 1.13.6 The lungs
 - 1.13.7 The physiology of respiration

- 1.14 The digestive system
 - 1.14.1 The mouth
 - 1.14.2 The salivary glands
 - 1.14.3 The pharynx
 - 1.14.4 The oesophagus
 - 1.14.5 The stomach
 - 1.14.6 The small intestine
 - 1.14.7 The large intestine
 - 1.14.8 The pancreas
 - 1.14.9 The liver
 - 1.14.10 The biliary apparatus
 - 1.14.11 The function of the alimentary system

- 1.15 The urinary system
 - 1.15.1 The kidneys
 - 1.15.2 The ureters
 - 1.15.3 The urinary bladder
 - 1.15.4 The urethra
 - 1.15.5 The functions of kidneys
 - 1.15.6 The control of micturition

- 1.16 The nervous system
 - 1.16.1 Nervous tissue
 - 1.16.2 The central nervous system
 - 1.16.3 The brain
 - 1.16.4 The spinal cord
 - 1.16.5 The peripheral nervous system
 - 1.16.6 The autonomic nervous system

- 1.17 The endocrine system
 - 1.17.1 The pituitary gland
 - 1.17.2 The thyroid gland
 - 1.17.3 The parathyroid gland
 - 1.17.4 The adrenal glands

- 1.18 The reproductive system
 - 1.18.1 The male reproductive system
 - 1.18.2 The female reproductive system

- 1.19 The skin and the organs of special sense
 - 1.19.1 The skin

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- 1.19.2 The eye
- 1.19.3 The ear
- 1.19.4 The nose
- 1.19.5 The tongue

2. Radiation Physics (20%)

- 2.1 Atomic structure
 - 2.1.1 The Nucleus
 - 2.1.2 Electron orbits and energy levels
- 2.2 Production of x-ray, properties of x-rays
 - 2.2.1 General radiation (Bremsstrahlung),
 - 2.2.2 Characteristic Radiation
 - 2.2.3 Intensity of x-rays beams
 - 2.2.4 Target material
 - 2.2.5 voltage (kVp) applied
- 2.3 Basic interactions between x-rays and matter
 - 2.3.1 Coherent scattering
 - 2.3.2 Photoelectric effect
 - 2.3.3 Compton scattering
 - 2.3.4 Pair production
 - 2.3.5 Photodisintegration
- 2.4 Radiation measurement and units
 - 2.4.1 Construction & working of the free air ionization chamber
 - 2.4.2 Thimble ionization chamber & condenser ionization chamber
- 2.5 Radiation protection
 - 2.5.1 Historical introduction or why the protection is necessary against the radiation
 - 2.5.2 Maximum permissible dose
 - 2.5.3 Tabulation of the recommended maximum permissible doses for the different parts of the body
 - 2.5.4 Following the code of practice
 - 2.5.5 Identifying the protective materials
- 2.6 Personnel monitoring
 - 2.6.1 The necessity of personnel monitoring & monitoring instruments (film badge, ionization chamber & thermoluminescent dosimeter)
- 2.7 Safety requirements for operating a x-ray unit

3. Radiographic equipment (10%)

- 3.1 Historical background of x-ray and its production
 - 5.5.1 X-ray tube construction
 - 5.5.2 Stationary and rotating x-ray tube
 - 5.5.3 Recent advancement of an x-ray tube
 - 5.5.4 Tube rating cooling and care of x-ray tube and its faults
- 3.2 Control panel, x-ray table and tube column

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- 3.2.1 Type of x-ray table
- 3.2.2 Different metering equipment
- 3.2.3 X-ray tube support
- 3.3 Fluoroscopic equipment
 - 3.3.1 Conventional fluoroscopy and image intensifier tube
- 3.4 Control of scatter radiation & beam restricting devices
 - 3.4.1 Secondary radiation grids and grid cut-off
 - 3.4.2 Cones, Cylinders, Collimators
 - 3.4.3 Air gap technique
- 3.5 Portable and mobile x-ray units
 - 3.5.1 Capacitor discharge and c-arm

Section B: 50%

4. Radiographic Technique (20%)

- 4.1 General radiography
 - 4.1.1 Routine Radiography Technique for upper limb
(Fingers, thumb, hand, wrist forearm, elbow, humerus, shoulder, scapula, clavicle)
 - 4.1.2 Routine Radiography Technique for the lower limb,
(Toes, foot, calcaneum, ankle, tibia, fibula, knee, femur, hip joint, neck of femur, pelvis)
 - 4.1.3 Routine Radiographic technique for thoracic cage and its contents (Chest, heart, ribs and sternum)
 - 4.1.4 Routine technique for the abdomen
Routine technique of plain & erect abdomen x-ray
 - 4.1.5 Routine technique for the spine
(Cervical, thoracic, lumbar, sacrum and coccyx, sacro-illac joint)
 - 4.1.6 Routine technique for the skull
 - 4.1.7 The radiograph anatomical landmarks of the skull
 - 4.1.8 The process of routine examination of the bones of skull (cranium, facial bone and mandible)
 - 4.1.9 To locate the following by x-rays (scaphoid, foreign body in the hand, head of humerus & axial Shoulder, acromio-calvicular joints, sterno- calvicular joints, foreign body in the foot, lateral foot, weight bearing, skyline view of patella, tibial tuberosity)
 - 4.1.10 a) The supplementary views of the chest and abdomen (Apical views, lordotic view & decubitus, oblique views for heart size & lateral with barium swallow, thoracic inlet, diaphragm excursion, inhaled or swallowed foreign body, imperforated anus)
b) The purposes of these views
 - 4.1.11 The supplementary views for the spine and pelvis (soft tissue)
(Neck, odontoid peg (open-mouth), vertebral foramina of cervical spine, upper thoracic spine oblique lumbar spine, lumbosacral

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- junction, oblique sacro-illac joints, illum, acetabulum, pelvimetry, skeleton survey)
- 4.1.12 The supplementary views for the skull (towne's view, submento vertical, sella turcica, temporo-mandibular joint, nasal bones, paranasal sinuses, mastoids, orbits, optic foramina, foreign body in the eye, dental radiography)
- 4.1.13 Tomography
- a) Basic principle of tomogram
 - b) Practical application of Tomography for the chest, kidney, gall bladder and skeletal system
- 4.1.14 Registration process
- a) The steps of registration of patients
 - b) The importance of a monthly and annual record, filling system and preparing the Performa invoices
 - c) Filling of radiographs and reports (x-ray No, hospital number, patient's name, cross reference bill, with patient's name)
- 4.2 Radiographic examination with contrast media
- 4.2.1 Contrast media
- 4.2.1.1 Definition of the contrast media
 - 4.2.1.2 Types of contrast media
 - 4.2.1.3 Methods of introducing the contrast media
 - 4.2.1.4 Reactions of contrast media
 - 4.2.1.5 Name of the emergency equipment's and drugs needed to cope with reactions
- 4.2.2 Radiographic investigation of Gastro-intestinal tract using contrast media
- 4.2.2.1 Barium swallow
 - 4.2.2.2 Barium meal
 - 4.2.2.3 Barium follow-through
 - 4.2.2.4 Examination of GI tract
 - 4.2.2.5 Ba-enema
 - 4.2.2.6 Small bowel enema
 - 4.2.2.7 Loopogram
 - 4.2.2.8 State the role of a radiographer during fluoroscopy
- 4.2.3 Investigation of urinary tract and hysterosalpinogram
- 4.2.3.1 Intravenous Urogram (IVU)
 - 4.2.3.2 Cystogram
 - 4.2.3.3 Micturating cystogram
 - 4.2.3.4 Urethrogram
 - 4.2.3.5 Retrograde pyelogram
 - 4.2.3.6 Hystero salpinogram (HSG)
- 4.2.4 Radiographic procedure of the Biliary tract
- 4.2.4.1 Oral cholecystography (OCG)
 - 4.2.4.2 Intravenous cholangiography (IVC)
 - 4.2.4.3 Percutaneous transhepatic cholangiography and drainage (PTC)

and PTCD)

- 4.2.4.4 Endoscopic retrograde cholangio pancreatography (ERCP)
- 4.2.4.5 Operatic cholangiography
- 4.2.4.6 T. Tube cholangiography
- 4.2.5 Use of portable/mobile x-ray in ward and operation theatre
 - 4.2.5.1 The uses of portable machine
 - 4.2.5.2 The technique of using ward radiography
 - 4.2.5.3 The technique of using operating theatre radiography
 - 4.2.5.4 Technique to help in Hip pinning
 - 4.2.5.5 The technique of operative-cholangiography
- 4.2.6 Vascular and Neurological examinations
 - 4.2.6.1 Carotid and vertebral angiogram
 - 4.2.6.2 Femoral angiogram
 - 4.2.6.3 Aortogram
 - 4.2.6.4 Phlebogram
 - 4.2.6.5 Encephalogram
 - 4.2.6.6 Ventriculogram
 - 4.2.6.7 Myelogram

5. Patient Care and Management (10%)

- 5.1 The hospital, the patient and the radiographer
 - 5.1.1 Clinical responsibility
 - 5.1.2 Legal responsibility
 - 5.1.3 The radiographer and the hospital
- 5.2 Features of general patientcare
 - 5.2.1 General preliminaries to the examination
 - 5.2.2 Moving chair and stretcher patients
 - 5.2.3 The anaesthetized patient
 - 5.2.4 Hygiene in the x-ray department
 - 5.2.5 General comfort and reassurance for the patient
- 5.3 Drugs in the x-ray department
 - 5.3.1 Poisons and dangerous drugs
 - 5.3.2 Units of measurement
 - 5.3.3 Drugs used in preparation of the patient
 - 5.3.4 Contrast agents used in x-ray examinations
 - 5.3.5 Drugs used in resuscitation
 - 5.3.6 Labeling and issuing
- 5.4 Sterilization and sterile techniques
 - 5.4.1 Methods of sterilization
 - 5.4.2 Central sterile supply
 - 5.4.3 Preparation of the hands for aseptic procedures
- 5.5 Preparation of the patient
 - 5.5.1 General abdominal preparation
 - 5.5.2 Clothing of the patient
- 5.6 First aid in the x-ray department
 - 5.6.1 Radiological emergencies

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- 5.6.2 Shock
- 5.6.3 Hemorrhage
- 5.6.4 Burns and scalds
- 5.6.5 Loss of consciousness
- 5.6.6 Asphyxia
- 5.6.7 Fractures
- 5.6.8 Electric shock
- 5.7 Medico-legal aspects of the radiographer's work
 - 5.7.1 Breach of professional confidence
 - 5.7.2 Negligence
 - 5.7.3 Procedure in the event of an accident
 - 5.7.4 The importance of records
- 5.8 Human Organ donation and transplantation
 - 5.8.1 Basic concept of solid organ donation and transplantation
 - 5.8.2 Role of X- ray in kidney/ liver transplantation
 - 5.8.3 Role of special procedures in kidney (Angiogram) and liver transplantation

6. Radiographic Photography (10%)

- 6.1 Film
 - 6.1.1 Construction and composition of x-ray film
 - 6.1.2 Characteristic curve, special sensitivity & role of dyeing
 - 6.1.3 Film speed, density, contrast, sensitometry
 - 6.1.4 Artifacts and its causes
- 6.2 Image
 - 6.2.1 Production of radiographic image
 - 6.2.2 Component of radiographic image
 - 6.2.2.1 Contrast, sharpness, resolution
 - 6.2.2.2 Exposure factors
 - 6.2.2.3 Absorption coefficient
- 6.3 Identification
 - 6.3.1 Methods
 - 6.3.2 Importance

7. Human Organ Transplant Act and Regulations (10%)

- 7.1 Human Organ Transplantation (Regulation and Prohibition) Act, 2055 with amendment.
- 7.2 Human Organ Transplantation Regulations, 2073
- 7.3 Guidelines on medical treatment of deprived citizens program, 2080
- 7.4 Human Organ Transplant Development Committee Personnel Administration Rules, 2069 (मानव अंग प्रत्यारोपण विकास समिति कर्मचारी प्रशासन नियमवाली, २०६९)
- 7.5 Human Organ Transplant Development Committee Formation Order, 2068 (मानव अंग प्रत्यारोपण विकास समिति गठन आदेश, २०६८)
- 7.6 General knowledge about Shahid Dharmabhakta National Transplant Center
- 7.7 Brain death donation: Brain death Declaration Criteria

शहीद धर्मभक्त राष्ट्रिय प्रत्यारोपण केन्द्र
मानव अङ्ग प्रत्यारोपण विकास समिति, प्रविधिक सेवा, रेडियोग्राफी समूह, पाँचौ तह, रेडियोग्राफर पदको खुला
प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

प्रथम र द्वितीय पत्रको लागि यथासम्भव निम्नानुसार प्रश्नहरू सोधिनेछ ।

प्रथम पत्र (वस्तुगत)							
खण्ड	A			B			
इकाई	1	2	3	4	5	6	7
प्रश्न संख्या	10	10	5	10	5	5	5

द्वितीय पत्र (विषयगत)					
पत्र	विषय	खण्ड	अङ्कभार	छोटो उत्तर	लामो उत्तर
द्वितीय	Technical subject	A	५०	६ प्रश्न × ५ अङ्क = ३०	२ प्रश्न × १० अङ्क = २०
		B	५०	६ प्रश्न × ५ अङ्क = ३०	२ प्रश्न × १० अङ्क = २०