पाटन स्वास्थ्य विज्ञान प्रतिष्ठान सेवाआयोग

प्राज्ञिक सेवा, रेडियोलोजी समूह, **Neuro-Intervention** उपसमूह, सहायक प्राध्यापक पद, नवौं (९ ख) तहको खुला र आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

एवं **परीक्षायोजना**

यस पाठ्यक्रम योजनालाई दुई चरणमा विभाजनगरिएको छ :

प्रथम चरण :– लिखित परीक्षा (Written Examination) पूर्णाङ्क :– २००

द्वितीय चरण :– अन्तर्वार्ता (Interview) पूर्णाङ्क :– ३०

प्रथम चरण (First Phase) : **<u>लिखित परीक्षा योजना (Written Examination Scheme)</u>**

Paper	Subject		Marks	Full Marks	Pass Marks	No. Questions & Weightage		Time Allowed
I	General Subject	Part I: Management, General Health Issues, Academic Research and Teaching-Learning Practices	50	100	40	$10 \times 5 = 50$ (Subjective)	1.30 hrs	2.15 hrs
		Part II: Technical Subject (Relevant Subject)	50			$50 \times 1 = 50$ (Objective Multiple Choice)	45 min	
II	Technical Subject (Relevant Subject)			100	40	$7 \times 10 = 70$ (Long answer) $2 \times 15 = 30$ (Critical Analysis)		3.00 hrs
	द्वितीय चरण (Second Phase)							
	Interview			30		Oral		

द्रष्टव्य :

1. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुन सक्नेछ ।
2. प्रतिष्ठानको प्राज्ञिक सेवा अन्तर्गत समान तहका सबै समूह/सबै उपसमूहहरुको लागि प्रथमपत्रको Part I पाठ्यक्रमको विषयवस्तु एउटै हुनेछ र एकै पटक परीक्षा संचालन हुनेछ ।
3. प्रथम पत्रको Part II र द्वितीयपत्रको पाठ्यक्रम समूह/उपसमूह अनुरुप फरक फरक हुनेछ ।
4. प्रथम पत्रको Part II र द्वितीय पत्रको विषयवस्तु एउटै समूह/उपसमूहहरुको हकमा समान हुनेछ ।
5. प्रथम पत्रको Part II र द्वितीय पत्रको परीक्षा संचालन एकै दिन फरक समयमा हुनेछ ।
6. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरुको 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 ।
7. 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 उक्त उत्तर रद्द हुनेछ ।
8. बहुवैकल्पिक प्रश्नहरु हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन ।
9. विषयगत प्रश्नहरुको हकमा 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 सकिने छ ।
10. विषयगत प्रश्नमा प्रत्येक पत्र/विषयका प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरु हुनेछन् । परिक्षार्थीले प्रत्येक खण्डका प्रश्नहरुको उत्तर सोही खण्डका उत्तरपुस्तिकामा लेख्नुपर्नेछ ।
11. यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भएतापनि पाठ्यक्रममा परेका कानून, ऐन, नियम, विनियम तथा नीतिहरु परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्क्रममा परेको सम्झनु पर्दछ ।
12. प्रथम चरणको परीक्षाबाट उर्त्तिण भई छनौट भएका उम्मेदवारहरुलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।
13. पाठ्यक्रम लागु मिति : २०८२/०९/३०

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Paper I: General Subject
Part I:
(Management, General Health Issues, Academic Research and Teaching - Learning Practices)
Section (A) - 20 Marks

1. **Management**
   - 1.1. Health care management system in Nepal and other parts of the world
   - 1.2. Fundamental principles of healthcare institution and hospital management.
   - 1.3. Effective hospital management principles
   - 1.4. Purpose of medical and non-medical data and records
   - 1.5. Ethics and responsibility of management
   - 1.6. Concept of management and its application in health care including hospital
   - 1.7. Management: Concept, principles, functions, scope and role, level and skills of manager
   - 1.8. Planning: Concept, principles, nature, types, instruments and steps
   - 1.9. Leadership: Concept, function, leadership styles, leadership and management
   - 1.10. Coordination: Concept, types, techniques of effective coordination
   - 1.11. Communication and counselling: Concept, communication processes and barrier to effective communication, techniques for improving communication
   - 1.12. Decision making: Importance, types, rational process of decision making, problem solving techniques, improving decision making
   - 1.13. Participative management: Concept, advantage and disadvantage, techniques of participation
   - 1.14. Time management: Concept, essential factors and strategies for effective time management
   - 1.15. Conflict management: Concept, approaches to conflict, levels of conflict, causes of conflict and strategies for conflict management
   - 1.16. Stress management: Concept, causes and sources of stress, techniques of stress management
   - 1.17. Change management: Concept, sources of organizational change, resistance to change, management of resistance to change
   - 1.18. Appreciative inquiry: Concept, basic principle and management
   - 1.19. Human resource management: Concept, functions and different aspects
   - 1.20. Health manpower recruitment and development
   - 1.21. Financial management: Concept, approaches, budget formulation and implementation, Auditing and topics related to fiscal administration

2. **General Health Issues**
   - 2.1. Present constitution of federal republic of Nepal (including health and welfare issues)
   - 2.2. Organizational structure of Ministry of Health at national/federal, regional/state, district (if applicable), municipal and village council level
   - 2.3. Professional council and related regulations
   - 2.4. National Health Policy
   - 2.5. Health Service Act and Regulation
   - 2.6. Second Long term health plan
   - 2.7. Health Management Information System, forms, indicators, annual reports
   - 2.8. Human Development Indices, Sustainable Development Goals
   - 2.9. Health volunteers in the national health system, its rationale, use and effectiveness

2.10. Local governance and community participation in health service delivery
2.11. Health Insurance and financing in health care
2.12. Alternative health care system: Ayurveda, homeopathy, Unani, Chinese etc.
2.13. Indigenous and traditional faith health and health practices
2.14. International Health Agencies: Roles and responsibilities of WHO, UNICEF, UNFPA, Inter-agency relationships, Government-agency coordination: Joint Annual Review meeting
2.15. Supervision, types and its usage in health sector
2.16. Monitoring and evaluation system in health sector
2.17. National Health Training Centre
2.18. National and International Disaster Plan, Coordination
2.19. Patan Academy of Health Sciences Act, Mission, Goals, Organogram
2.20. Scope and function of Patan Academy of Health Sciences executive bodies (senate, executive committee, academic council, faculty board, hospital management committee, subject committee), various other committees

Section (B) - 30 Marks

3. **Academic Research**
   3.1 Ethics, Bio-ethics and Professionalism
   3.2 Human dignity and Human Right
   3.3 Benefit and Harm
   3.4 Autonomy and Individual responsibility
   3.5 Consent and capacity to consent
   3.6 Privacy and confidentiality
   3.7 Respect for humans and personal integrity
   3.8 Non-discrimination and non-stigmatization
   3.9 Respect for cultural diversity and pluralism
   3.10 National Health Research Council (NHRC) and its guidelines
   3.11 Research process: ethical research proposal development, research principles, methods and materials, conclusion/recommendation/lesson learnt, commonly used referencing styles
   3.12 IRB/IRC forms, types, use, importance; getting IRB/IRC clearance
   3.13 Ethics on research methodology: sample selection, sample size calculation, ensuring reliability and validity of the instruments as well as methods proposed for health research
   3.14 Quantitative and Qualitative studies
   3.15 Data analysis (data visualization, descriptive statistics, inferential statistics with statistical hypotheses and appropriate tools/methods for quantitative studies; theme and code generation, thematic analysis, content analysis, grounded theory for qualitative and triangulation for mixed method studies)
   3.16 Research ethics on vulnerable and non-vulnerable population
   3.17 Research proposal/protocol/publication:
   3.18 Publication ethics, plagiarism including self-plagiarism

4. **Teaching - Learning, Assessment and Evaluation**
   4.1 Lancet Commission Report on Education of Health Professionals
   4.2 Adult learning: Theories, principles, use, importance and outcomes, Adragogy vs. Pedagogy

4.3 Conventional teaching - learning: Didactic lectures, Teacher centred approaches, use and importance
4.4 Surface learning, deep learning and metacognition
4.5 Integrated teaching: Genesis, use, importance and outcomes
4.6 Problem-based learning: Genesis, use, importance and outcomes
4.7 SPICES model its use, importance and outcomes
4.8 Socialization, self-directed learning, mentoring, role model
4.9 Community orientation/community posting, re-orientation of medical education camp, community based learning and community engaged teaching-learning methods/models, use, importance and outcomes
4.10 Outcome Based Education (Competency-based Medical/Health Professions Education): Genesis, use, importance and outcomes
4.11 Experiential learning, Reflective practice, Feedback and feed-forward, Situated learning, Co-operative learning, Communities of practice
4.12 Assessment of students
  4.12.1 Blueprinting (Table and specification) : use, importance and outcomes
  4.12.2 Bloom's taxonomy of cognitive, psychomotor and affective domains, use and importance
  4.12.3 Diagnostic, Formative, Summative and Professional exams
4.13 Assessment of knowledge: Selection methods like Multiple Choice Questions, Extended Matching Items and supply methods like Short Answer Question, Problem Based Question, Long Answer Question with or without model answers and marking schemes, unstructured, semi-structured and structured viva-voce examination, advantages and limitations, use and importance, outcomes and its use in quality control
4.14 Assessment of performance (in-vitro): Direct observation of skills in the simulated setting, lab, ward etc. with or without checklist, Objective Structured Practical Examination, Objective Structured Clinical Examination, Standardized patients, use and importance, analysis, quality assurance, outcomes and its use in quality control
4.15 Assessment of performance (in-vivo): Mini-Clinical Evaluation Exercise (Mini-CEX), Direct Observation of Procedural Skills (DOPS), Case-Based Discussion (CbD), OSATS/ PBA, Multi-Source feedback (360 degree evaluation) use and importance for competency based health professions education, analysis, quality assurance, outcomes and its use in quality control
4.16 Assessment of observable behaviours in small groups e.g. Problem Based Learning sessions, Community Based Learning and Education sessions, Clinical clerkship rotations
4.17 Evaluation: Difference between assessment and evaluation, theory of change and its use in health professions education, process and outcome evaluation, qualitative, quantitative and mixed methods used in evaluation of health professions education

Paper I
Part II: Technical Subject
Section (C) Radiology - 25 Marks

1. **Physics in radiology**
   1.1 Production of x-rays
   1.2 Interaction of x-rays with metals
   1.3 X-ray tube

1.4 Radiation protection
1.5 Basic physics and advances in fluoroscopy/ imaging intensifier
1.6 Basic physics and advances in CR/DR system
1.7 Basic physics and advances in CT
1.8 Basic physics and advances in MRI
1.9 Basic physics and advances in USG
1.10 Introduction to nuclear medicine

2. **Sectional and Imaging anatomy**
2.1 Cross-sectional & imaging anatomy of brain
2.2 Cross-sectional and imaging anatomy of chest
2.3 Cross-sectional and imaging anatomy of Abdomen
2.4 Anatomy of orbits and its bones
2.5 Vascular anatomy of brain/head
2.6 Vascular anatomy of abdominal aorta and its branches
2.7 Vascular anatomy of upper and lower limbs
2.8 Relevant Embryology

3. **Nervous system**
3.1 Craniocerebral Trauma
3.2 Imaging of non-traumatic SAH
3.3 Imaging of non-traumatic ICH
3.4 Imaging of stroke
3.5 Cerebral ischemia
3.6 Brain tumors and tumor like processes
3.7 Extra-axial Tumors
3.8 Imaging of sellar tumours
3.9 Non-neoplastic and neoplastic spinal cord pathologies

4. **Head & Neck**
4.1 Radiological imaging of diseases and conditions related to Ear, Nose, Throat
4.2 Radiological imaging of diseases of thyroid, salivary gland and other soft tissue neck

5. **Paediatric imaging**
5.1 Imaging of congenital CNS malformations

6. **Recent advances in radiology and imaging**
6.1 Teleradiology, Radiology Information System & PACS
6.2 Newer advances in CR/ DR system, Fluoroscopy and Mammogram
6.3 Newer advances in CT and MRI

7. **CVS & Interventional**
7.1 Radiological imaging of aortic and peripheral arterial diseases
7.2 Radiologic approach to pulmonary thromboembolism
7.3 Heart and pericardium
7.4 Congenital and acquired heart disease
7.5 Image guided radiological procedures and contrast media

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8. Anatomy

1. Basic neuro- and vascular anatomy

2. Embryology of the nervous system, brain, spinal cord and peripheral nervous system

3. Embryology of the vascular system as relevant to the nervous system

4. Anatomy of the vascular system in general with special emphasis on blood supply to the brain and spinal cord and functional vascular anatomy of CNS.

5. Anatomy of the brain and spinal cord, peripheral nervous system

6. Embryology and anatomy of the spine

7. Embryology and anatomy of the skull and face. 8. Anatomy of musculo-skeletal system in relation to CNS and PNS.

9. Physiology

1 Basic and applied neuro- and vascular physiology including cardiac hemodynamics, ECG, EEG.

2 Physiology of nerve conduction, cerebral and spinal blood circulation
3 3 Basics of physiology of peripheral vascular system.
4 4 Physiology of cerebral circulation CSF dynamics and functional inter-relationship of CNS haemodynamics and hydrodynamics.
5 5 Basic and applied neurophysiology including cardiac haemodynamics.

10. Pathology

1 Pathological basis of neurological and vascular disorders

2 Congenital lesions of the central nervous system – brain, spine and spinal cord and organs of special senses

3 Neoplastic disease of the head and neck, skull base including pathologies of temporal bone and orbit

4 Neoplastic diseases of the brain, spine and its coverings.
5 Infective and inflammatory lesion of the CNS
6 Degenerative and demyelinating diseases of the CNS
7 Vascular and ischaemic lesions of brain and spine. Intracranial aneurysms and AVMs
8 Intracranial hemorrhage
9 Hydrocephalus Cerebral edema
10 Neonatal and perinatal CNS disorders
11 Genetic and inherited disorders of CNS
12 Metabolic and Immunologic disorders affecting CNS

11. Neuro-chemistry and Neuro-pharmacology

1 Contrast media in imaging

2 Emergency drugs in Neuroimaging and Interventional Therapeutic Neuroradiology

3 Antiplatelets and anticoagulants. Vasodilators Vasoconstrictors Embolic agents Thrombolytic agents Anaesthetic and analgesic drugs with respect to neuro-imaging and neuro- intervention Antibiotics Anti-inflammatory drugs Cortico-steroids

3 Drugs to counter cerebral edema Drugs to control hypertension Drugs for renal diseases
4 Drugs used in Neurointervention and Therapeutic Neuroradiology

12. Physical principles of imaging

1 Image intensifier and TV and Flat Panel Detectors , Tomography Angiography and Digital subtraction and angiography

2 Computed Tomography and recent advancements in CT, Ultrasound and Doppler and their recent advances

3 Magnetic Resonance Imaging, angiography, spectroscopy, FMRI (Diffusion, Perfusion), molecular imaging and recent advances

5 Film processing techniques – wet and dry
6 Principles of single photon emission and positron emission tomography (SPECT and PET)
7 Fusion Imaging technologies –SPECT, CT PET, MR PET etc.
8 Basics of Nuclear Medicine and safe handling of radioactive material.
9 Radiation protection and Recommendations
10 Computers in Radiology Picture archival and communication systems and Teleradiology
11 New image storage technologies, CLOUD storage systems

Section (D) Neuro-Intervention- 25 Marks

1. Basic Imaging of head, neck, chest, abdomen, spine and extremities
2. CT and Dual energy; CT angiography, CT perfusion ,3D post processing. CT radiation including practice of “imaging gently” based on- As Low As Reasonably Achievable (ALARA)
3. MRI sequences and paameters, MR angiography, MRI safety
4. Advanced imaging techniques (functional MRI, spectroscopy, diffusion/perfusion, diffusion tensor, Fusion imaging)
5. Diagnosis of acute arterial wall dissection, subclavian steal syndrome
6. Imaging of peripheral vascular disease
7. Catheter directed Angiography
8. Angiographic contrast media, contrast utilization including dose and safety.
9. Needles, Guide Wires and Stents
10. Embolization materials
11. Risk management in interventional procedures

12. Universal protocol in interventional radiology
13. Radiation safety in interventional radiology
14. Infection control and sterile technique in interventional radiology
15. Sedation, analgesia and anesthesia
16. Management of contrast media reactions
17. Quality improvement strategies in interventional radiology
18. Outpatient drainage catheter care
19. Commonly use medication and dosages
20. Interventional procedures
    - Image guided FNA in different sites/tumors of head and neck
    - Image guided Trucut biopsy procedures
    - Catheter drainage in collections/abscess in head and neck

21 . Therapeutic and Interventional Neuroradiology

1 Endovascular recanalization / revascularization techniques.

2 Drugs and materials used in endovascular, interventional neuroradiology

3. Embolization Techniques

4. Embolization of CNS lesions.

5. Embolization of craniofacial lesions

6. Interventions in spinal vascular lesions.

7. Thrombolytic therapy in CNS lesions,

8 Spinal interventions –Chemonucleolysis

9. PLDD (Percutaneous Laser disc decompression), Vertebroplasty, Kyphoplasty, Percutaneous Biopsy. Others – Facet Joint Injections etc. Atreriovenous Malformations (AVM) and Fistulae (AVF): Natural History, aetiopathogenesis, clinical features, Imaging and management.

10. Dural Arteriovenous Malformation (DAVFs): Natural History, aetiopathogenesis, clinical features, Imaging and management.

11. Carotico cavernous Fistula (CCF): Aetiopathogenesis, natural history, clinical features and management.

12 Spinal Vascular Malformations: Natural History, aetiopathogenesis, clinical features, Imaging and management. Embolization of vascular lesions of head and neck and spine: meningiomas, juvenile angiofibromas, paragangliomas, tumors of vertebral bodies etc.

13 Intracranial Aneurysms: Natural History, aetiopathogenesis, clinical features,

14 Imaging and Endovascular management. PTA and stenting of the intracranial vessels. Vein of Galen aneurysmal malformations: Natural history, aetiopathogenesis, clinical features,

15 Imaging and Endovascular management -Management of Post SAH vasospasm/ vascular spasm of the CNS vessels due to other causes

16 Management of acute ischemic stroke and related issues

17 Management of dural sinus thrombosis

18 Complications in Interventional and Therapeutic Neuroradiological procedures and their management
19 Tools and devices for Therapeutic and Interventional Neuroradiology

20 Pre-procedure and post-procedure care of patient

21 Techniques in Therapeutic and Interventional Neuroradiology

22 Pharmacology as applied to Therapeutic and Interventional Neuroradiology

23 Managements of AVFs and acute traumatic CNS vascular lesions Stereotactic Radiotherapy in AVMs and DAVFs- concepts and indications

24 Chemotherapy for cranial and orbital malignancies Wada Testing

25 Temporary Balloon Occlusion test (BTO) of cerebral vessels Permanent Balloon Occlusion of cerebral vessels Traumatic lesions of supra-aortic vessels

26 Inferior petrosal sinus sampling

27 Intracranial arterial thrombolysis / embolectomy and venous thrombolysis

28 Percutaneous treatment of herniated disc

29 Nerve blocks Intra-vascular ultrasound

30 percutaneous sclerotherapy,

31 spine pain management

22. Imaging in disorders of brain, spinal cord, orbit, base of skull, head and neck

1 Disorders of brain development CNS

2 Manifestations of phakomatoses and other inherited syndromes

3 Epilepsy

4 White matter disorders and inherited metabolic disorders

5 Intra-axial brain tumors

6 Extra-axial brain tumors

7 Intracranial haemorrhage

8 Intracranial vascular malformations and aneurysms

9 Cerebral ischaemia and infarction

10 Head trauma

11 Intracranial infection / inflammation

12 Metabolic and immunological disorders of CNS

13 Genetic and hereditary disorders of CNS

14 Normal ageing, dementia and neurodegenerative disorders

15 The skull base. Sella turcica and parasellar region

16 Anatomy and diseases of temporal bone

17 Eye, orbit and visual system

18 Paranasal sinuses, temporal bone

19 Congenital anomalies of spine and spinal cord: embryology and malformations

20 Degenerative disease of spine

21Neoplastic diseases of spine and spinal cord

22 Spinal trauma

23 Vascular disorders of spine and spinal cord

24 Spinal infections and inflammatory disorders

23. Angiographic interventional procedures

1. Basics principles

1.1 Periopertive manangement including infrastructure and staffing

1.2 Diagnostic arteriography, venography, pulmonary arteriography

1.3 Stent grafts and basic principles of stent grafting

1.5 Diagnosis and management of endoleaks

1.6 Device migration, dislocation, kinking and occlusion

2. Procedures

2.1 Protocoling and performing patient procedures, including lumbar puncture, myelography, intrathecal chemo, kyphoplasty, and CT guided biopsies

2.2 Vascular intervention (know the indications for angioplasty, thrombolysis, embolic therapy)

2.5 Central venous accessed

2.6 Retrival of intravascular foreign bodies

--- The end ---