

शहीद गंगालाल राष्ट्रिय हृदय केन्द्र, पदपूर्ति समिति
पद : परफ्युजनिष्ट (सेवा - प्राविधिक, समूह - मेडिकल, उप-समूह - कार्डियोभास्कुलर सर्जरी) रा.प.तृतीय (ख) को
खुल्ला / आन्तरिक प्रतियोगितात्मक लिखित 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)

Paper	Subject	Full Marks	Pass Marks	No. Questions & Weightage	Time Allowed
I	Technical Subject	100	40	(Objective Multiple Choice Questions) 50 × 2 = 100	1.00 hrs
II		100	40	(Subjective Descriptive Type) 6 × 10 = 60 (Long answer) 2 × 20 = 40 (Problem Solving)	3.00 hrs

द्वितीय चरण (Second Phase)

Subject	Full Marks	Examination
Interview	30	Oral

द्रष्टव्य :

- लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुनेछ ।
- प्रथम र द्वितीय पत्रको विषयवस्तु एउटै हुनेछ । तर प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै 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 ।
- परीक्षार्थीले वस्तुगत बहुवैकल्पिक प्रश्नको 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 ।
- बहुवैकल्पिकप्रश्नहरू हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन ।
- विषयगत प्रश्नहरूको हकमा 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 प्रश्नमा प्रत्येक पत्र/विषयका प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन् । परीक्षार्थीले प्रत्येक खण्डका प्रश्नहरूको उत्तर सोही खण्डका उत्तरपुस्तिकामा लेख्नुपर्नेछ ।
- परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुनेछ ।
- द्वितीय पत्रमा तोकिएको पाठ्यक्रमबाट सम्बन्धित पदको लागि आवश्यक Competency मा आधारित कम्तीमा दुई वटा Competency Based प्रश्नहरू लिखित परीक्षामा सोधिनेछ ।
- यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भएतापनि पाठ्यक्रममा परेका कानून, ऐन, नियम, विनियम तथा नीतिहरू परीक्षाको मितिभन्दा 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 लागु मिति : आ.व. २०७८/०७९ देखि

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Paper I & II: - Technical Subject

Section (A): 60% Marks

For Paper I (30 MCQs ×2 marks) &

For Paper II (4×10 marks, 1×20 marks)

(I) APPLIED PERFUSION TECHNOLOGY (BASIC)

1. Principles of Perfusion Technology

- 1.1 History of Cardiopulmonary Bypass
- 1.2 Physiology of Extra-corporeal circulations
- 1.3 Heart Lung Machine Basics
- 1.4 Principles of Extra-corporeal Circulation
- 1.5 History of evolution of Blood Pump
- 1.6 Principles of Extra-corporeal Gas exchange
- 1.7 Various types of Oxygenators:
 - 1.7.1 Bubble oxygenator
 - 1.7.2 Membrane/Micro Hollow fiber oxygenator
- 1.8 Theory of Blood Pump:
 - 1.8.1 Pulsatile Flow
 - 1.8.2 Continuous Flow
- 1.9 Occlusive and Non- Occlusive Pumps
- 1.10 Types of Pumps
 - 1.10.1 Rotary pumps
 - 1.10.2 Roller Pumps
 - 1.10.3 Centrifugal pumps
 - 1.10.4 Others
- 1.11 Elements of Extra-corporeal Circulation
- 1.12 Blood filters
- 1.13 Bubble Trap
- 1.14 Flow meter
- 1.15 Temperature probes
- 1.16 Heat Exchanger
- 1.17 Connections of vascular System and Extra-corporeal Circulation:
 - 1.17.1 Venous Drainage
 - 1.17.2 Suction Pump
 - 1.17.3 Hemodynamics of Arterial Re-entry
 - 1.17.4 Arterial Infusion
 - 1.17.5 Cardiomy Blood Return

2. Cardio-Pulmonary Bypass and Perfusion Technology (Advance)

- 2.1 Hemodynamic monitoring
 - 2.1.1 Perfusion flow pressure and resistant
 - 2.1.2 Perfusion flow and oxygen uptake
 - 2.1.3 Electrolyte and water balance in reference to extra-corporeal bypass

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- 2.1.4 Oxygen toxicity
- 2.2 Effects of perfusion on organs: Brain, Heart, Lungs, kidneys, Liver, and Spleen, Hematologic Effects
- 2.3 Adequacy of perfusion
 - 2.3.1 The ideal perfusion
 - 2.3.2 Monitoring devices: Pressures, Cardiac Output, Brain Protection, Temperature, In line Monitoring
- 2.4 Hematologic Problem:
 - 2.4.1 Blood Prime
 - 2.4.2 Priming Solutions
 - 2.4.3 Control of hematologic problems during CPB
 - 2.4.4 Effects of various priming solutions on RBC trauma
- 2.5 Myocardial Protection
 - 2.5.1 Cardioplegia: Principles, composition, modification of Cardioplegia
 - 2.5.2 Types of Cardioplegia.
- 2.6 Hypothermia
 - 2.6.1 Blood Stream Cooling versus peripheral cooling
 - 2.6.2 Effect of cooling on the circulation and organ metabolism
- 2.7 Assisted Circulation (VAVD)
 - 2.7.1 Circulatory and metabolic support by partial heart lung bypass and its effect on various organs
- 2.8 Centrifugal pump: Principal, effect, advantages and disadvantages
- 2.9 Pulsatile versus Non-pulsatile circulatory support
- 2.10 Circulatory arrest and organ protection
- 2.11 IABP (Counter-pulsation techniques)
- 2.12 Cardiac Arrest Devices: LVAD, RVAD, BiVAD
- 2.13 ECMO in detail and ECMO for non-cardiac cases
- 2.14 Auto-transfusion; Cell Saver; Blood Conservation in Open Heart Surgery
- 2.15 Blood Component Therapy
- 2.16 Complications and management of cardio-pulmonary Bypass
 - 2.16.1 Complications while Initiating during and at termination of CPB
 - 2.16.2 Hemolysis during CPB
 - 2.16.3 Air lock and Air Embolism
 - 2.16.4 Re-warming and Cooling
 - 2.16.4 Loss of Electrical Power and running the pump with hand crack
- 2.17 Recent advances in Perfusion Technology and Cardio Pulmonary Support
 - 2.17.1 Advances in Oxygenators
 - 2.17.2 Advances in CPB Circuits
 - 2.17.3 Advances in Heart Lung Machine Design
 - 2.17.4 Advances in pharmacotherapy during CPB
 - 2.17.5 Advances in myocardial protection
 - 2.17.6 Advances in Brain protection
 - 2.17.7 Other organ protection
 - 2.17.8 Advances in artificial life support

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- 2.18 Paediatric perfusion
- 2.19 Perfusion management in Special cases like pregnant women, sickle cell disease and other complex cases
- 2.20 Systemic Inflammatory Response on CPB

Section (B): 40% Marks
For Paper I (20 MCQs × 2 marks) &
For Paper II (2 × 10 marks, 1 × 20 marks)

(II) GENERAL (20%)

3. ANATOMY

- 3.1 Introduction to Anatomy
- 3.2 Basic Anatomical Terms
- 3.3 Chest:
 - 3.3.1 Chest Wall: Inter-costal space, pleura, bony thoracic cage, ribs sternum and thoracic vertebrae
 - 3.3.2 Lungs : organ of Respiratory system, Trachea, bronchial tree
 - 3.3.3 Heart : Surface anatomy of heart, chambers of the heart, valves of the heart, major blood vessels of heart, pericardium, coronary arteries and Cardiac Veins
- 3.4 Anatomy of digestive system; Component of Digestive system
- 3.5 Excretory system : Kidneys, ureters, bladder
- 3.6 Vascular System
 - 3.6.1 Introduction
 - 3.6.2 Arrangement of the Vascular System

4. PHYSIOLOGY

- 4.1 The Cell: Structure and functions
- 4.2 The Blood:
 - 4.2.1 Composition of Blood, functions of the blood and plasma proteins, classification and protein
 - 4.2.2 Pathological and Physiological variation of the RBC
 - 4.2.3 Function of haemoglobin
 - 4.2.4 Platelets- formation and normal level and functions
 - 4.2.5 Blood groups and Rh Factor
 - 4.2.6 Coagulation and Anticoagulation
 - 4.2.7 Clotting cascade- Physiology of haemostasis
- 4.3 Cardio- Vascular System:
 - 4.3.1 Physiology of the heart
 - 4.3.2 Cardiac cycle, Cardiac output
 - 4.3.3 Arterial pressures, blood pressure
 - 4.3.4 Hypertension
 - 4.3.5 Electrocardiogram

- 4.4 Respiratory System:
 - 4.4.1 Respiratory movement
 - 4.4.2 Definitions and normal values of Lung Volumes and Capacities
- 4.5 Excretory System
 - 4.5.1 Formation of urine
 - 4.5.2 Normal Urinary Output
 - 4.5.3 Mechanism of urine formation
 - 4.5.4 Micturation
 - 4.5.5 Diuretics
- 4.6 Central Nervous System
 - 4.6.1 Introduction to CNS
 - 4.6.2 Arrangement of the Nervous System
- 5. **BIOCHEMISTRY**
 - 5.1 Classification of Carbohydrate and Function
 - 5.2 Classification of proteins and functions
 - 5.3 Classification of lipids and functions
 - 5.4 Enzymes:
 - 5.4.1 Definition
 - 5.4.2 Classification
 - 5.4.3 Factors affecting enzyme activity
 - 5.5 Liver function test
 - 5.6 Cardiac profile
- 6. **PATHOLOGY**
 - 6.1 Blood collection
 - 6.2 Anticoagulations used in Haematology
 - 6.3 Normal Values in Haematology
 - 6.4 Blood Grouping
 - 6.5 Heart:
 - 6.5.1 Atherosclerosis
 - 6.5.2 Hypertention
 - 6.5.3 Heart Failure
 - 6.5.4 Ischemic Heart Disease
 - 6.5.5 Valvular Heart Disease
 - 6.5.6 Congenital heart disease
 - 6.6 Respiratory system
 - 6.6.1 Chronic obstetric airway disease
 - 6.6.2 Pulmonary edema
 - 6.6.3 Pleural effusion
 - 6.7 Renal system
 - 6.7.1 Acute Renal Failure
 - 6.7.2 Chronic Renal Failure

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7. PHARMACOLOGY

- 7.1 Drugs used in cardiovascular system
- 7.2 Inotropes, vasoactive agents including Calcium
- 7.3 Diuretics
- 7.4 Anti-coagulants; Antiplatelet medications
- 7.5 Anti-fibrinolytic drugs
- 7.6 Coagulants
- 7.7 Alpha-blockers
- 7.8 Beta-blockers
- 7.9 Anti-arrhythmic Drugs
- 7.10 Antihypertensive Drugs
- 7.11 Anaesthetic Drugs
- 7.12 Cardioplegia solutions and Potassium homeostasis

8. CLINICAL MICROBIOLOGY

- 8.1 Introduction
- 8.2 Morphology of bacteria
- 8.3 Stains used in identifying bacteria
- 8.4 Sterilization Techniques
 - 8.4.1 Chemical Method
 - 8.4.2 Gas sterilization
 - 8.4.3 Filtration
- 8.5 Blood stream infection
 - 8.5.1 Nosocomial Infection and prevention

(III) (20%)

9. CARDIAC SURGERY

- 9.1 Introduction to Cardiac Surgery
- 9.2 Congenital Heart Disease
- 9.3 Acyanotic Congenital Heart Disease
- 9.4 Cyanotic Congenital Heart Disease
- 9.5 Palliative Surgery for Congenital Heart Diseases
- 9.6 Shunts
- 9.7 Physiological Corrections
- 9.8 Anatomical correction for Congenital Heart Disease
- 9.9 Acquired Heart Diseases
- 9.10 Valvular Heart Disease
- 9.11 Coronary Artery Disease
- 9.12 Diseases of the Aorta
- 9.13 Pericardial Diseases
- 9.14 Off Pump CABG

10. General knowledge about the Shahid Gangalal National Heart Center