

पाटन स्वास्थ्य विज्ञान प्रतिष्ठान सेवा आयोग
 प्राविधिक सेवा, बायोमेड समूह, बायोमेड ईन्जिनियर पद, तह ७ को
 खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम
 एवं परीक्षा योजना

१. प्रथम चरण : – लिखित परीक्षा						पूर्णाङ्क :- २००
पत्र	विषय	पूर्णाङ्क	उतीर्णाङ्क	परीक्षा प्रणाली		समय
प्रथम	Technical Subject, General Knowledge and Related Legislation	१००	४०	वस्तुगत	बहुवैकल्पिक प्रश्न	५० प्रश्न x २ अङ्क
द्वितीय		१००	४०	विषयगत	छोटो उत्तर	४ प्रश्न x ५ अङ्क
					लामो उत्तर	५ प्रश्न x १० अङ्क
					समस्या समाधान	२ प्रश्न x १५ अङ्क
३ घण्टा						
२. द्वितीय चरण : – अन्तर्वार्ता						
विषय	पूर्णाङ्क	उतीर्णाङ्क	परीक्षा प्रणाली			समय
अन्तर्वार्ता	३०	-	मौखिक			

द्रष्टव्य :

- यो परीक्षा योजनालाई प्रथम चरण (लिखित परीक्षा) र द्वितीय चरण (अन्तर्वार्ता) गरी दुई चरणमा विभाजन गरिएको छ ।
- लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुनेछ ।
- प्रथम र द्वितीय पत्रको पत्रको विषयवस्तु एउटै हुनेछ ।
- प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।
- लिखित परीक्षामा यथासम्भव पाठ्यक्रमका सबै एकाईबाट प्रश्नहरू सोधिनेछ ।
- 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 ।
- विषयगत प्रश्नमा प्रत्येक पत्र/विषयका प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन् । परिक्षार्थीले प्रत्येक खण्डका प्रश्नहरूको उत्तर सोही खण्डका उत्तरपुस्तिकामा लेख्नुपर्नेछ ।
- यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम 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 लागू मिति :- २०७९/१२/२१

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प्रथम तथा द्वितीय पत्र :-

प्राविधिक विषय, सामान्य ज्ञान र सम्बन्धित कानूनहरु
(Technical Subject, General Knowledge and Related Legislation)

खण्ड (A): Technical Subject

SECTION 1:PHYSICS:

1. Simple Harmonic Motion
2. Wave in Elastic Media
3. Acoustics
4. Electrostatics
5. Direct Current and Alternating current
6. Magnetism and Magnetic Fields
7. Electromagnetic Oscillations
8. Electromagnetic Waves
9. Optics

SECTION 2: ELECTRO-ENGINEERING MATERIALS

1. Theory of Metal
2. Free Electron Theory of Conduction in Metals
3. Conduction in Liquid and Gases
4. Magnetic Materials and Superconductivity
5. Dielectric Materials
6. Semi-Conducting Materials

SECTION 3: BASIC ELECTRICAL ENGINEERING

1. Basic Concept of DC Circuit
2. Circuit Analysis
3. AC Circuit
4. Three Phase AC Circuit
5. Transformers

SECTION 4: ELECTRONIC DEVICES AND CIRCUITS

1. Integrated Circuit Technology and Device Models
 - 1.1 Overview of dc and ac diode models
 - 1.2 Overview of dc and ac JFET models.
 - 1.3 Overview of dc and ac bipolar transistor models .
 - 1.4 Overview of dc and ac MOS transistor models.
2. Operational Amplifier Circuits
 - 2.1 Bias circuits suitable for IC design.
 - 2.2 The differential amplifier 2.3Active loads .
3. Power Supplies and Voltage Regulators

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- 3.1 Half-wave and full-wave rectifiers.
- 3.2 Capacitive filtering.
- 3.3 Zener diodes, bandgap voltage references, constant current diodes.
- 3.4 Zener diode voltage regulators.
- 3.5 voltage regulations
4. Untuned and Tuned Power Amplifiers
 - 4.1 Amplifier classification.
 - 4.2 Direct-coupled push-pull stages.
 - 4.3 Transformer-coupled push-pull stages.
 - 4.4 Tuned power amplifiers.
5. Oscillator Circuits and Filter Circuits:
 - 5.1 CMOS inverter relaxation oscillator.
 - 5.2 Operation amplifier based relaxation oscillators.
 - 5.3 Voltage-to-frequency converters.
 - 5.4 LC Filters
 - 5.5 RC Filters
 - 5.6 Active Filters

SECTION 5: DIGITAL ELECTRONICS AND MICROPROCESSORS

1. Fundamental of Digital Electronics
 - 1.1. Logic Gates: truth tables and Boolean expressions
 - 1.2 Universal gates and gate conversion
 - 1.3 DeMorgan's theorem
2. Combinational Logic Devices
 - 2.1 Encoder and Decoder
 - 2.2 Multiplexer and Demultiplexer
 - 2.3 Half and Full: Adder and Subtractor
3. Sequential Logic Devices
 - 3.1 Counters: types and characteristics
 - 3.2 Registers: SISO, SIPO, PISO, PIPO
 - 3.3 Digital clocks and frequency counter
4. Bus Structure And Memory Devices
 - 4.1. Bus structure, synchronous and asynchronous data bus, address bus, bus timing
 - 4.2. Static and dynamic RAM, ROM
 - 4.3. Programmable read only memory (PROM), ultraviolet
 - 4.4. Electrically programmable memory (EPROM) and electrically erasable programmable memory (EEPROM)
5. Input/Output Interfaces for serial communication
 - 5.1. Asynchronous interface: ASCII code, baud rate, start bit, stop bit, parity bit
 - 5.2. Synchronous interface
 - 5.3. Physical communication standard
6. Interrupt
 - 6.1. Introduction, interrupt vector and descriptor table
 - 6.2. Interrupt service routine requirements

6.3. Interrupt priority: Maskable and Non-maskable interrupts, software interrupts, traps and exceptions

SECTION 6: ELECTRICAL MACHINES

1. Introduction

1.1. Magnetic circuits and Ampere's Law

1.2. Ferromagnetic materials: magnetic saturation, non-linearity, hysteresis

1.3. Types of magnetic circuit

1.4. Effect of DC and AC, hysteresis and eddy currents, energy losses and laminations

1.5. Self and mutual inductances

1.6. Electromagnets

2. Transformers

2.1. Magnetically coupled circuits

2.2. Effects of secondary current in ideal transformer

2.3. Losses in transformer

SECTION 7: CONTROL SYSTEMS

1. System Modeling

1.1 Differential equation and transfer function

1.2 State-space formulation of differential equations, matrix notation

1.3 Mechanical components and Electrical components: mass, spring, damper, inductance, capacitance, resistance, sources, motors, tachometers, transducers, operational amplifier circuits

1.4 Fluid and fluidic components, Thermal system components

1.5 Mixed systems

1.6 Linearized approximations

2. Frequency Response Methods:

2.1 Frequency domain characterization of systems

2.2 Bode amplitude and phase plots, Effects of gain and time constants on Bode diagrams, Stability from the Bode diagram

2.3 Nyquist plots, Correlation between Nyquist diagrams and real time response of systems: stability, relative stability, gain and phase margin, damping ratio

SECTION 8: COMMUNICATION SYSTEMS

1. Analog and Digital Communication Systems

1.1. Analog and digital communication sources, transmitters, transmission channels and receivers.

1.2. Fundamental limitations due to noise, distortion, and interference and the relationships between noise, bandwidth and information.

1.3. Types and reasons for modulation.

2. Representation of Communication Signals and Systems

3. Frequency Modulation (FM) and Phase Modulation (PM):

4. Digital Communication Systems

4.1. Digital communication sources, transmitters, transmission channels and receivers.

4.2. Distortion, noise, and interference.

4.3. Nyquist sampling theory, sampling of analog signals, spectrum of a sampled signal.

4.4. Sampling theorem for band-limited signals, effects of aliasing, reconstruction of sampled signals.

SECTION 9: DIGITAL SIGNAL PROCESSING

1. Introduction to Discrete Signal and Systems:

1.1 Discrete signals – unit impulse, unit step, exponential sequences.

1.2 Linearity, shift invariance, causality.

1.3 Convolution summation and discrete systems, response to discrete inputs.

1.4 Stability, sum and convergence of power series.

1.5 Sampling continuous signals – spectral properties of sampled signals.

2. General Introduction of various filters

SECTION 10: BIOMECHANICS

1. Force in Joint

2. Skeletal Biology

3. Mechanical Properties of Tissues

4. Mechanics of Soft Tissues

5. Synovial Joint Mechanics

6. Muscle Mechanics

7. Modalities of Elastic and Viscoelastic Solids, Constitutive Equations,

SECTION : 11 BIO FLUID MECHANICS

1. Basic concepts in fluid mechanics: Viscosity, surface tension, compressibility; hydrostatics, pressure on plate; kinetics & kinematics of fluid flow; continuity equation; conservation of momentum; Bernoulli's equation; Poiseuille equation; viscous, unsteady flows; dimensional analysis

2. Physiological Fluid Mechanics: Introduction to blood flow in the circulatory system, respiration, peristaltic motion, ciliary and flagellar transport, Rheology of blood and blood vessels, static and steady flow model, native heart valve, Fluid dynamics measurement techniques

SECTION: 12 APPLIED MECHANICS

1. Concept of a particle, Rigid body, Principles of forces, Free body diagram, Equilibrium in two dimensions.

2. Distributed forces, Centre of gravity, Centroid of lines, areas and volumes.

3. Friction and Laws of Friction

4. Rectilinear and curvilinear motion of particles, Position, Velocity and acceleration.

5. Dynamics, Kinetics & Kinematics.

6. Mechanics and Properties of Solids:

6.1 Stress, Strain, Stress-Strain diagram, Hooke's Law

6.2 Thermal stress of elasticity.

6.3 Temperature Effects

6.4 Torsion

6.5 Bending of beams, Pure bending, Shearing force, Bending moment, Shearing force and bending moment diagram.

SECTION: 13 MEASUREMENT AND INSTRUMENTATION

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1. Measurement and Error
2. Measurements and Control by Analog and Digital System
3. Transducers and Sensors
4. Analog Signal Conditioning
5. Digital Signal Conditioning
6. Output Devices, Display and Recording Systems

SECTION 14: BIO-ENGINEERING MATERIALS AND COMPONENTS

1. Introduction to Bio-materials
 - 1.1. Biomaterial science: An interdisciplinary course.
 - 1.2. Classes of materials used in medicine.
2. Polymers
 - 2.1. Types of polymers used in medicine
 - 2.2. Hydrogel
3. Ceramics, Glasses and Composites:
 - 3.1. Structure, chemistry and properties of ceramics and glasses used in medical devices.
 - 3.2. Types of bio-ceramics.
4. Natural Materials
 - 4.1. Different types of natural materials.
 - 4.2. Structure of native collagen.
 - 4.3. Physical modification of the native structure of collagen.
 - 4.4. Chemical modification of collagen.
 - 4.5. Proteoglycans and glycosaminoglycans.

SECTION 15: HUMAN ANATOMY AND PHYSIOLOGY

1. Introduction to Human Body
 - 1.1. Understanding of body design at structure-function level.
 - 1.2. Interpretation of the molecular cell biology to the development of body organs & system.
 - 1.3. Appreciation of the Control & regulation of body function.
 - 1.4. Understanding of disease mechanism
2. The Cells, Tissues & Organization of the Body, Disorder of the Cells & Tissues
 - 2.1. Understanding of structure & function of different types of cells & tissues
 - 2.2. Cell to cell transport mechanisms
 - 2.3. Cell division
 - 2.4. Development of organ-system
 - 2.5. Abnormal development of cells & tissues
 - 2.6. Tissue repair & regeneration
3. The Nervous System.
 - 3.1. Understanding the microanatomy of Nerve cell (neurons)
 - 3.2. Arrangement of neurons. Types of neurons & their connections
 - 3.3. Functions of nerve cell. Impulse generation. Neuromuscular transmission
 - 3.4. Structure of Central Nervous system (CNS)
 - 3.5. Identification of underlying areas of Brain
4. Brief Introduction Of Blood Component. Haemostasis & Thrombosis, Coagulation
 - 4.1. Brief revision of blood components.

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- 4.2. Blood function
- 4.3. Learning of haemostatic mechanisms
- 4.4. Review of Blood coagulation & disorders
5. The Cardiovascular System
 - 5.1. Understanding of Anatomy of heart & blood vessels.
 - 5.2. Study of blood supply of heart or coronary circulation
 - 5.3. Blood circulation from different organs to the heart & from the heart to different organs. 5.4. Outline the heart functions
 - 5.5. Understanding of cardiac cycle, cardiac output & blood pressure
 - 5.6. Learning of conduction system of heart
6. The Respiratory System
 - 6.1. Understanding of Anatomy-physiological relationship of upper respiratory tract
 - 6.2. Lungs & its topography. Pleura & pleural cavity
 - 6.3. Learning of lung functions
 - 6.4. Mechanism of breathing, types of breathing & control of respiration
 - 6.5. Composition of air
 - 6.6. Understanding of Ventilation & Lung volumes
 - 6.7. Gas transfer & diffusion

SECTION 16: IMPLANTABLE DEVICES

1. Cardiovascular Implants (General Introduction)
 - 1.1 Cardiopulmonary bypass
 - 1.2 Heart valves
 - 1.3 Vascular grafts
 - 1.4 Drug administration systems and vascular access
 - 1.5 Stents, catheters and cannulas
 - 1.6 Pacemakers
 - 1.7 Inferior venacava filters
 - 1.8 Intraaortic balloon pump
 - 1.9 Ventricular assist device and total artificial hearts
 - 1.10 Blood substitutes
2. Orthopaedic Implants
 - 2.1 Biomaterials used in orthopaedic implants
 - 2.2 Total hip arthroplasty.
3. Catheters
 - 3.1 Catheter materials and biocompatibility.
 - 3.2 Biomaterials and catheter complications.
4. Different Kinds of Artificial Organs (General Introduction)
 - 4.1 Artificial Pancreas.
 - 4.2 Artificial liver.
 - 4.3 Artificial Heart and lung.
 - 4.4 Artificial skin
 - 4.5 Artificial reproductive organs.
 - 4.6 Artificial vision
 - 4.7 Artificial hearing implant.

5. General Introduction to Tissue Engineering

SECTION 17: BIOMEDICAL INSTRUMENTATION

1. Fundamental of Medical Instrumentation

- 1.1 Anatomy and Physiology
- 1.2 Physiological System of the Body
- 1.3 Sources of Biomedical Signals
- 1.4 Basic Medical Instrumentation System
- 1.5 Performance Requirements of Medical Instrumentation Systems
- 1.6 Intelligent Medical Instrumentation Systems
- 1.7 General Constraints in Design of Medical Instrumentation Systems

1.8 Regulation of Medical Devices

2. Bioelectric Signals and Electrodes

- 2.1 Origin of Bioelectric Signals
- 2.2 Recording Electrodes
- 2.3 Silver-silver Chloride Electrodes
- 2.4 Electrodes for ECG
- 2.5 Electrodes for EEG
- 2.6 Electrodes for EMG
- 2.7 Electrical Conductivity of Electrode Jellies and Creams

2.8 Microelectrodes

3. Physiological Transducers

- 3.1 Introduction
- 3.2 Classification of Transducers
- 3.3 Performance Characteristics of Transducers
- 3.4 Displacement, Position and Motion Transducers
- 3.5 Pressure Transducers
- 3.6 Transducers for Body Temperature Measurement
- 3.7 Photoelectric Transducers
- 3.8 Optical Fibre Transducers
- 3.9 Optical Fibre Sensors
- 3.10 Biosensors
- 3.11 Smart Sensors

4. Recording System

- 4.1 Basic Recording System
- 4.2 General Consideration for Signal Conditioners
- 4.3 Preamplifiers
- 4.4 Sources of Noise in Low Level Measurement
- 4.5 Biomedical Signal Analysis Techniques
- 4.6 Signal Processing Techniques
- 4.7 The Main Amplifier and Driver Stage

6. Patient Monitoring Systems:

- 6.1 System Concept
- 6.2 Cardiac Monitor
- 6.3 Beside Patient Monitoring Systems

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- 6.4 Central Monitors
- 6.5 Measurement of Heart Rate
- 6.6 Measurement of Pulse Rate
- 6.7 Blood Pressure Measurement
- 6.8 Measurement of Temperature
- 6.9 Measurement of Respiration Rate
- 6.10 Catheterisation Laboratory Instrumentation
- 7. Arrhythmia and Ambulatory Monitoring Instruments
 - 7.1 Cardiac Arrhythmias
 - 7.2 Arrhythmia Monitor
 - 7.3 QRS Detection Techniques
 - 7.4 Exercise Stress Testing
 - 7.5 Ambulatory Monitoring Instruments
- 8. Foetal Monitoring Instruments
 - 8.1 Cardiotocograph
 - 8.2 Methods of Monitoring Foetal Heart Rate
 - 8.3 Monitoring Labour Activity
 - 8.4 Recording System
- 9. Biomedical Telemetry and Telemedicine
 - 9.1 Wireless Telemetry
 - 9.2 Single Channel Telemetry Systems
 - 9.3 Multi-patient Telemetry
 - 9.4 Multi-channel Wireless Telemetry Systems
 - 9.5 Implantable Telemetry System
 - 9.6 Transmission of Analog Physiological Signals
 - 9.7 Telemedicine
- 10. Oximeters
 - 10.1 Oximetry
 - 10.2 Ear Oximeter
 - 10.3 Pulse Oximeter
 - 10.4 Skin Reflectance Oximeters
 - 10.5 Intravascular Oximeter
- 11. Blood Flowmeters
 - 11.1 Electromagnetic Blood Flowmeter
 - 11.2 Types of Electromagnetic Blood Flowmeter
 - 11.3 Ultrasonic Blood Flowmeters
 - 11.4 NMR Blood Flowmeters
 - 11.5 Laser Doppler Blood Flowmeter
- 12. Cardiac Output Measurement
 - 12.1 Indicator Dilution Method
 - 12.2 Dye Dilution Method
 - 12.3 Thermal Dilution Techniques
 - 12.4 Measurement of Continuous Cardiac Output Derived from Aortic Pressure Waveform
 - 12.5 Impedance Technique
 - 12.6 Ultrasound Method

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13. Pulmonary Function Analyzers
 - 13.1 Pulmonary Function Measurements
 - 13.2 Spirometry
 - 13.3 Pneumotachometers
 - 13.4 Measurement of Volumes
 - 13.5 Pulmonary Function Analyzers
14. Clinical Laboratory Equipments:
 - 14.1 Medical Diagnosis with Chemical Tests
 - 14.2 Spectrophotometry
 - 14.3 Spectrophotometer type Instruments
 - 14.4 Colorimeters
 - 14.5 Biochemistry Analyzers
 - 14.6 Electrolyte Analyzers
 - 14.7 Microscope
 - 14.8 Centrifuge
 - 14.9 ELISA reader and washer
 - 14.10 Biosafety Cabinet
 - 14.11 Autoclave
15. Blood Gas Analysers
 - 15.1 Acid Base Balance
 - 15.2 Blood pH Measurements
 - 15.3 Measurement of Blood PCO₂
 - 15.4 Blood pO₂ Measurement
 - 15.5 Intra-Arterial Blood Gas Monitoring
16. Blood Cell Counters
 - 16.1 Types of Blood Cells
 - 16.2 Methods of Cell Counting
 - 16.3 Coulter Counters
 - 16.4 Automatic Recognition and Differential Counting of Cells
17. Audiometers and Hearing Aids:
 - 17.1 Mechanism of Hearing
 - 17.2 Measurement of Sound
 - 17.3 Basic Audiometer
 - 17.4 Pure Tone Audiometer
 - 17.5 Speech Audiometer
 - 17.6 Audiometer System Bekesy
 - 17.7 Evoked Response Audiometry System
 - 17.8 Calibration of Audiometers
 - 17.9 Hearing Aids
18. Patient Safety
 - 18.1 Electric Shock Hazards
 - 18.2 Leakage Currents
 - 18.3 Safety Codes for Electromedical Equipment
 - 18.4 Electrical Safety Analyser
 - 18.5 Testing Biomedical Equipment
19. Cardiac Pacemakers

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- 19.1 Need for Cardiac Pacemaker
- 19.2 External Pacemaker
- 19.3 Implantable Pacemakers
- 19.4 Recent Development in Implantable Pacemakers
- 19.5 Pacing System Analyser
- 20. Cardiac Defibrillators
- 20.1 Need for a Defibrillator
- 20.2 DC Defibrillator
- 20.3 Pacer – cardioverter-defibrillator
- 20.4 Defibrillator Analysers
- 21. Instruments for Surgery
- 21.1 Principal of Surgical Diathermy
- 21.2 Surgical Diathermy Machine
- 21.3 Safety Aspects in Electro-surgical Units
- 21.4 Surgical Diathermy Analysers
- 22. Laser Applications in Biomedical Field
- 22.1 The Laser
- 22.2 Pulsed Ruby Laser
- 22.3 Nd-YAG Laser
- 22.4 Helium-Neon Laser
- 22.5 Argon Laser
- 22.6 CO₂ Laser
- 22.7 Excimer Lasers
- 22.8 Semiconductor Lasers
- 22.9 Laser Safety
- 23. Physiotherapy and Electrotherapy Equipment:
- 23.1 High Frequency Heat Therapy
- 23.2 Short-wave Diathermy
- 23.3 Microwave Diathermy
- 23.4 Ultrasonic Therapy Unit
- 23.5 Electrodiagnostic/ Therapeutic Apparatus
- 23.6 Pain Relief Through Electrical Stimulation
- 24. Haemodialysis Machines
- 24.1 Function of the Kidneys
- 24.2 Artificial Kidney
- 24.3 Dialysers
- 24.4 Membranes for Haemodialysis
- 24.5 Haemodialysis machine
- 25. Lithotripters
- 25.1 The Stone Disease Problem
- 25.2 First Lithotripter Machine
- 25.3 Modern Lithotripter Systems
- 25.4 Extra-corporeal Shock-wave Therapy
- 26. Anaesthesia Machine
- 26.1 Need for Anaesthesia

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- 26.2 Anaesthesia Machine
- 26.3 Electronics in Anaesthesia Machine
- 26.4 Vaporizers
- 26.5 Clinical Application
- 27. Ventilators
 - 27.1 Mechanisms of Respiration
 - 27.2 Artificial Ventilation
 - 27.3 Clinical Application
 - 27.4 Types of Ventilators
 - 27.5 Ventilator Terms
 - 27.6 Classification of Ventilators
 - 27.7 Pressure-volume-flow Diagrams
 - 27.8 Modern Ventilators
 - 27.9 High Frequency Ventilators
 - 27.10 Humidifiers, Nebulizers and Aspirators
- 28. Automated Drug Delivery Systems
 - 28.1 Infusion Pumps
 - 28.2 Components of Drug Infusion Systems
 - 28.3 Implantable Infusion Systems
 - 28.4 Closed-loop Control in Infusion Systems
 - 28.5 Examples of Typical Infusion Pumps
 - 28.6 Syringe Pump

SECTION 18: MEDICAL IMAGING

- 1. X-ray Equipment
 - 1.1 X-ray tubes
 - 1.2 X-ray production and methods
 - 1.3 X-ray control and indicating equipment
 - 1.4 Filters and grids
 - 1.5 Different types of X-ray equipment (portable, fluoroscopy, mammography etc.)
 - 1.6 Biological Effects of Ultrasound
- 2. Digital Imaging
 - 2.1 Introduction
 - 2.2 Digital Radiography
 - 2.3 PACS (Picture Archiving and Communicating System)
- 3. Computed Tomography (CT)
 - 3.1 Basic Principles of CT
 - 3.2 Generation of CT
 - 3.3 System Components
- 4. Magnetic Resonance Imaging (MRI)
 - 4.1 Fundamental Concepts
 - 4.2 Principles of Parameters of MRI
 - 4.3 Basic Principles of MR Imaging and Related Parameters
 - 4.4 Contrast Enhanced MRI 4.5 Clinical Application
- 5. Ultrasonography (USG)

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- 5.1 Physics of Ultrasound
- 5.2 Construction and Properties of Ultrasound Transducer
- 5.3 Ultrasonic Beam
- 5.4 Modes of Ultrasound Imaging
- 5.5 Doppler Ultrasound
- 5.6 Clinical Application
- 5.7 Biological Effects of Ultrasound
6. Digital Substraction Angiography system(CATHLAB)
 - 6.1 Basic working principle
 - 6.2 Clinical Application
 - 6.3 Biological effect
7. NUCLEAR MEDICINE (Gamma Camera, PET CT scan, Radiotherapy machines)
 - 7.1 Basic Working principle
 - 7.2 Clinical Application
 - 7.3 Biological effect
8. Mammography machine
 - 8.1 Basic working principle
 - 8.2 Clinical application
 - 8.3 Biological effects

SECTION 19: MINIMALLY INVASIVE MEDICAL TECHNOLOGY

1. General techniques and applications
2. Endoscopic surgery systems
3. Image-guided surgery
4. Ablation

SECTION 20: THEORY OF MEDICAL ROBOTICS

1. Introduction of Robotics:
2. Review of Technology
3. Fuzzy Logic
4. Medical Robotics in Surgery
5. Robotic Rehabilitation Therapy
6. Telesurgery

SECTION 21: ENGINEERING ECONOMICS

1. Introduction
2. Cost Classification and Analysis
3. Interest and the Time Value of Money
4. Basic Methodologies of Engineering Economic Studies
5. Cash/Benefit Analysis
6. Investment Decisions
7. Risk Analysis
8. Taxation System in Nepal
9. Demand Analysis and Sales Forecasting

SECTION 22: ORGANISATION AND PROJECT MANAGEMENT

- 1 Introduction
- 2 Organisation
- 3 Leadership and Motivation
- 4 Personnel Management
- 5 Project Planning
- 6 Project Monitoring and Evaluation (M&E) and Control
- 7 Capital Planning and Budgeting

SECTION 23: MEDICAL INDUSTRY MANAGEMENT

1. Introduction:
2. Types of Medical Devices:
3. Structure of Multinationals
4. Roles of the Medical Device Industry:
5. International Standards:
6. Risk Assessment and Management:
7. Product Liability:
8. Clinical Requirements and Their Implication in Device Design:
9. Protection of Intellectual Property:
10. Introduction of Clinical Evaluation of Medical Devices:
11. Case Studies: Implantable Devices:
12. Case Studies: Tissue Engineering Products:
13. Case Studies: Other Devices

SECTION 24: MEDICAL INFORMATICS

1. Database system
2. Review of telecommunication and computer networks
3. System analysis and design/System design and engineering
4. Information security and privacy
5. Medical informatics application to health services
6. Expert system and Clinical decision support system

SECTION 25: TELEMEDICINE AND TELEHEALTH

1. Introduction and history of remote management of diseases
2. Telehealth: A patient perspective
3. Telecommunication technologies in healthcare
4. Clinical Applications
5. Special settings
6. Telehealth and relationship with physicians
7. Telehealth care transactions
8. Regulatory considerations, security and privacy
9. Market for telehealth services
10. Contracting for telehealth care
11. Starting Telemedicine
12. Choosing the right technology for telemedicine

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13. Telemedicine and Telehealth in Nepalese Context
14. Future of Telehealth and Telemedicine

SECTION 26: ENGINEERING PROFESSIONAL PRACTICE

1. Background Perspective:
2. Ethics and Professionalism:
3. Roles of Professional Association:
4. Legal Aspect of Professional Engineering in Nepal:
5. The Roles and Practice of Professional Engineering in Other Countries:
6. Case Studies Involving Professional Ethical Issues Chosen From a Wide Range of Topics:

SECTION 27: OTHERS

1. Public Procurement Monitoring Office (PPMO) Procurement Rules and Regulation

खण्ड (B): General Knowledge and Related Legislation

1. सामान्य ज्ञान तथा ऐन, नियमहरू
 - 1.1 नेपालको भौगोलिक, ऐतिहासिक, आर्थिक, सामाजिक, सांस्कृतिक र राजनैतिक अवस्था सम्बन्धी सामान्य जानकारी ।
 - 1.2 राष्ट्रिय र अन्तर्राष्ट्रिय महत्वका समसामयिक घटनाहरू : राजनैतिक, आर्थिक, वैज्ञानिक, खेलकूद, सूचना प्रविधि, पुरस्कार, स्वास्थ्य
 - 1.3 पाटन स्वास्थ्य विज्ञान प्रतिष्ठान ऐन, २०६४
 - 1.4 पाटन स्वास्थ्य विज्ञान प्रतिष्ठानको कर्मचारी सेवाका शर्त र सुविधा सम्बन्धी नियमावली, २०६७
 - 1.5 पाटन स्वास्थ्य विज्ञान प्रतिष्ठान आर्थिक प्रशासन नियमावली, २०६७
 - 1.6 पाटन अस्पताल संचालन विनियमावली, २०६७
 - 1.7 नेपाल स्वास्थ्य सेवा ऐन, २०५३ र स्वास्थ्य सेवा नियमावली, २०५५
 - 1.8 नेपाल मेडिकल काउन्सिल ऐन, २०२० र नियमावली
 - 1.9 नेपाल नर्सिङ परिषद् ऐन, २०५२
 - 1.10 नेपाल स्वास्थ्य व्यवसायी परिषद् ऐन, २०५३

प्रथम तथा द्वितीय पत्रमा यथासम्भव निम्नानुसार प्रश्नहरू सोधिनेछ ।

प्रथम पत्र			
खण्ड	अङ्कभार	प्रश्न संख्या	
		वस्तुगत	विषयगत
A	८०	४० प्रश्न X २ अङ्क = ८०	-
B	२०	१० प्रश्न X २ अङ्क = २०	-
जम्मा		५० प्रश्न X २ अङ्क = १००	-
द्वितीय पत्र			
खण्ड	अङ्कभार	प्रश्न संख्या	
		विषयगत	समस्या समाधान
A	१००	४ प्रश्न X ५ अङ्क = २० ५ प्रश्न X १० अङ्क = ५०	२ प्रश्न x १५ अङ्क = ३०
B	-	-	-

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जम्मा	४ प्रश्न x ५ अङ्क = २० ५ प्रश्न x १० अङ्क = ५०	२ प्रश्न x १५ अङ्क = ३०
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--- The end ---

पाटन स्वास्थ्य विज्ञान प्रतिष्ठान, सेवा आयोग