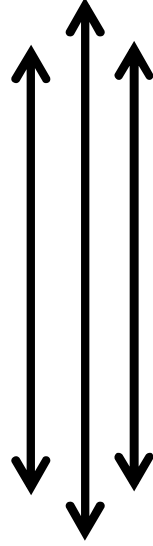
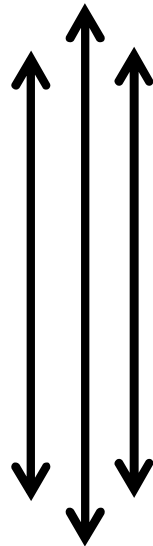


नेपाली सेना
श्री भर्ना छनौट निर्देशनालय, कार्यरथी विभाग
जंगी अड्डा



प्रा.उ.से. इलेक्ट्रिकल/इलेक्ट्रोनक्स/एभियोनिक्स इन्जिनियर (खुला) पदको पेशा
सम्बन्धी लिखित परीक्षा र प्रयोगात्मक परीक्षाको पाठ्यक्रम योजना



२०७५

नेपाली सेना

प्रा.उ.से. इलेक्ट्रिकल/इलेक्ट्रोनिकस/एभियोनिक्स इन्जिनियर (खुला) पदको पेशा सम्बन्धी लिखित परीक्षा र प्रयोगात्मक परीक्षाको पाठ्यक्रम योजना

यो पाठ्यक्रम नेपाली सेनाको विभिन्न ईकाईहरूमा रिक्त रहेको प्रा.उ.से. इलेक्ट्रिकल/इलेक्ट्रोनिकस/एभियोनिक्स इन्जिनियर (खुला) पदका उम्मेदवार छनौट परीक्षाको लागि निर्धारण गरिएको हो । लिखित परीक्षामा सहभागी हुने उम्मेदवारहरूको विविध विषय (अंग्रेजी, गणित, नेपाली र सामान्यज्ञान), पेशा सम्बन्धी विषय र पेशागत विषयको प्रयोगात्मक परीक्षाको लागि निम्न विषयहरूलाई आधार मानी प्रश्नहरू सोधिने छ ।

- (क) लिखित परीक्षाको माध्यम नेपाली/अंग्रेजी वा दुवै भाषा हुनेछ ।
- (ख) लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र अर्को चरणको परीक्षामा सम्मिलित गराईने छ ।
- (ग) प्रश्न पत्र निर्माण गर्दा पाठ्यक्रममा समावेश भएका सबै विषयहरूलाई समेटिनेछ ।
- (घ) नेपाली सेनाको आवश्यकता तथा विविध परिस्थितिमा नेपाली सेना अनुकूल हुने गरी उल्लेखित विवरणहरूमा हेरफेर हुन सक्नेछ ।
- (ङ) 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 ।
- (च) वस्तुगत बहुवैकल्पिक प्रश्नहरू हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन ।
- (छ) विषयगत प्रश्न हुने पत्र/विषयका प्रत्येक भाग खण्ड/एकाइ/प्रश्नका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन् । परीक्षार्थी प्रत्येक भाग/खण्ड/एकाइ/प्रश्न प्रश्नको उत्तर सोही भाग/खण्ड/एकाइ/प्रश्नको उत्तर पुस्तिकामा मात्र लेख्नुपर्नेछ ।
- (ज) पाठ्यक्रमको रूपरेखा देहायमा उल्लेख गरे अनुसार हुनेछ ।
- (झ) पाठ्यक्रम लागू मिति २०७५/१०/२७ गतेदेखि ।

प्रा.उ.से. इलेक्ट्रिकल/इलेक्ट्रॉनिक्स/एभियोनिक्स इन्जिनियर (खुला) पदको पेशा सम्बन्धी
विषयको लिखित परीक्षा योजना र पाठ्यक्रम

विषय	पुर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली		प्रश्न संख्या x अङ्क	समय
पेशा सम्बन्धी	१००	४०	वस्तुगत (Objective)	बहुवैकल्पिक प्रश्न (MCQs)	४० प्रश्न x १ अङ्क = ४०	२ घण्टा ३० मिनेट
			विषयगत (Subject)	छोटो उत्तर	१० प्रश्न x ३ अङ्क = ३०	
				लामो उत्तर	५ प्रश्न x ६ अङ्क = ३०	

लिखित परीक्षाको पाठ्यक्रम

1. Aerodynamics and Flight Control

1.1. Atmosphere:

Different layers of Atmosphere, ISA, Variation of Temperature, Pressure and Density with Altitude.

1.2. Aerodynamics and Flight Control

Fundamental: Equation of State, Continuity Equation, Bernoulli's Equation, Types of Fluid Flow, Speed of Sound, Measurement of Speed of Sound, Mach Number, Critical Mach Number, Shock Waves, Flutter- Buffeting, Airflow around a body; Reynold's Number, Boundary layer, Flow Separation, Stall, vortices, stagnation

Aerodynamic Forces: Aerodynamic Forces; Aerodynamic centre, Centre of Pressure, Generation of Lift and Drag.

Aerofoil Classification, Aerofoil Nomenclature, Aerofoil Terms, Lift coefficient, Drag coefficient, Moment coefficients, vortex generator, lift/drag ratio, Types of wing, Aspect ratio, fineness ratio, Angle of attack, Angle of Incidence, Pitch Angle.

Aircraft Performance: Equation of Aircraft's Motion in Flight, Thrust and Power for Level Flight, Effect of Altitude on Power Required and Available, Rate of Climb, Rate of Descend, Gliding Flight and related Hodograph, Absolute and service ceiling, Range and Endurance, load factor

Stability: Static and Dynamic Stability, Three Axes of Rotations, longitudinal, lateral and directional Stability, Dutch Roll

Weight and Balance: Consideration of Different Aircraft Weight, Center of Gravity.

Introduction to Flight control: Primary and secondary Flight controls, High Lift device, Lift Dumpers & speed brakes.

Manual Flight Control: Cable operated flying control, Trimming system, Push pull tube operation.

Fly-by-wire control system: Introduction to fly-by-wire control, Active load control.

High Lift Device: Trailing Edge Flap, Electrically operated flap system, Leading edge high lift devices, Leading edge slat.

Helicopter Engineering: Types of main rotor systems, Helicopter controls, Blade lift & drag, Basic power, Lift dissymmetry, blade tip stall, ground effect, Coriolis effect, Autorotation.

2. Electronics

2.1. Semiconductor

2.1.1. Diodes

Diode symbols, Diode in series and parallel, P and N type material, majority and minority carriers and its effects on conduction, principle of operation of P-N junction diode, Diode characteristic and properties, Diode in series and parallel, Forward and reverse bias circuit of PN junction diode, LED (Light Emitting Diode), Photodiode, Operation and function of diode in half and full wave rectifier, bridge rectifier and clipper circuit, Diode clamps. Characteristics, operation and use of silicon-controlled rectifier (thyristors), LED, Varactor diode, Zener diode, Tunnel diode, High frequency diode.

2.1.2. Transistor

Bipolar Junction Transistor (BJT): Transistor symbol, basic understanding of Transistor, Construction and operation of PNP and NPN transistor, application of transistor, Transistor circuit arrangements (CB,CE,CC), characteristics of BJT, Class A, B and C transistor.

Unipolar Transistor: Junction gate field effect transistor (JUGFET) symbol, construction and principle of operation, output characteristics.

MOSFET: types of MOSFET and its symbol, principle of operation, construction, characteristics. Application of MOSFET.

TRIACS: Construction and operation of the TRIAC, advantages of TRIAC over thyristor, application.

DIAC: Construction and operation of the DIAC.

VARISTORS: Introduction and principle of operation.

2.1.3. Integrated Circuits

Digital IC, IC construction, Operation, function and limitation of an operational amplifier (Op-Amp). Application of Op-Amp.

2.2. Amplifier: Principle of operation of different amplifiers.

2.3. Oscillators: Introduction and application of oscillators, Free oscillators, Tuned collector oscillator, Hartley oscillator, Colpitts oscillator, Variable frequency oscillator, Tunnel diode oscillator, crystal-controlled oscillator, RC oscillators,

2.4. Printed Circuit Board: Construction of PCB.

3. Electrical

3.1. Electron Theory

3.1.1. Structure and distribution of electrical charges within; atoms, molecules, ions, compound

3.1.2. Molecular structure of conductors, semiconductors and insulators.

3.2. Static Electricity and Conduction

Static electricity and distribution of electrostatic charges, units of charge, coulomb's law.

3.3. DC sources of Electricity

Primary cell, secondary cell, Zinc carbon cell, Lead Acid battery, Nickel-Cadmium cells, cells connected in series and parallel, Thermocouples and its operation.

3.4. DC Circuits

Ohm's Law, Kirchoff's Voltage and Current Laws and its calculations.

3.5. Resistance/Resistor

Resistor symbol, Resistors in series and parallel, Calculation of total resistance using series and parallel combinations, identification of resistor with colour code, values and tolerances, Operation of Wheatstone Bridge. Fixed resistors, variable resistor, Thermistor,

3.6. Power

Power, work and energy (Kinetic and Potential), calculation of power, work and energy.

3.7. Capacitance/ Capacitor

Operation and function of a capacitor, Capacitor types, Calculation of capacitance in series and parallel connection, factors affecting capacitance, relationship between voltage and charge, Capacitor time constant.

3.8. Magnetism

Theory of magnetism, Laws of magnetism, properties of magnet, Action of magnet suspended in Earth's magnetic field, Electromagnet construction and principles of operation, Magnetomotive force (MMF), Reluctance, field strength, permeability, eddy currents, solenoid, Right hand grasp rule, Types of magnetic materials, Magnetic shielding, Dia, Para and Fero magnetic material.

3.9. Inductance

Hysteresis Loop, Faraday's Law, Lenz's Law, self-inductance, mutual inductance, Induced EMF, Back EMF, Inductances in series and parallel, coil, Power loss in an inductor, uses of inductors,

3.10. DC Motor/Generator Theory

Motor and generator theory, construction and principle of operation. series wound, shunt wound and compound motor. Construction and purpose of components in DC generator, Operation and factors affecting output in DC generator, starter generator construction.

3.11. AC Theory

Phase, period, frequency, cycle, Instantaneous, average, root mean square, peak to peak current and Voltage, power in AC circuit, Triangular or square waves, Three phase AC circuits, Reactive circuits, Phasor representation,

3.12. Resistive(R), Capacitive(C) and Inductive (L) Circuits

Series and parallel connection, Impedance, Phase angle, power factor, active power, reactive power and apparent power, Resonance, Harmonics, Filters.

3.13. Transformer

Transformer principles and operations, losses, Primary and secondary current, voltage and turns ratio, Types of transformer, Three phase transformer.

3.14. AC Motor

Construction and principle of operation of AC synchronous and induction motors both single and polyphase. Methods of producing a rotating field; capacitor, inductor, split pole.

3.15. AC Generator

Operation and construction of revolving armature and refiled type AC generator. Single phase and three phase alternators, Three phase star and delta connection advantages and uses, Permanent Magnet generator.

4. Digital Fundamentals and Computer

4.1. Numbering System

Binary, Decimal, Octal and hexadecimal, conversion between decimal and binary, octal and hexadecimal and vice versa, BCD, Signed binary numbers.

4.2. Logic Circuits

Logical gates symbols, truth tables and equivalent circuits, Interpretation of logical diagrams.

4.3. Integrated Circuits

Bistables: R-S, RST, JK, Edge Triggered, T bistable, D bistable, MOS bistable.

Registers: Serial in/out, Recirculating Shift Registers, Parallel Registers, Serial/Parallel, Parallel/Serial Register, Left-Right Shift Register, Synchronous and Asynchronous Register, Static and Dynamic MOS Registers.

Decoder and Encoders: Decoder and Encoder circuits, Binary Decoder and Encoder, Decoder application, Priority Encoder and application.

Multiplexing and Demultiplexing.

4.4. Basic Computer Architecture

Simple computer system, types of buses, Memory (Primary and secondary), Memory maps, CPU, ALU, Control unit.

Microprocessor: Introduction to microprocessor, Register Control, instruction-word format, Computer Operations, Microprocessor Architecture.

4.5. Data Conversion

Digital to Analogue Converter (DAC): Principle, Terminologies applied to DAC, Serial Input DAC, Multiplying DAC, Unipolar/Bipolar DAC.

Analogue to Digital Converter (ADC):Principle, Feedback Converters, Integrating Converters, Shaft converters, Tracking converter, Dual slope converters, quantised feedback converter, shaft encoder, optical shaft encoder.

4.6. Fibre Optics

Construction and principle of operation of Fibre optics, fibre classification, Different sources and detectors, Advantages of fibre optics, Application of fibre optics in aviation industry.

5. Aviation Management and Safety

- 5.1.** Concept of routine, planned, preventive, corrective and predictive maintenance
- 5.2.** Engineering activities in maintenance management: inspection, overhaul, testing, calibration, improvements/modifications
- 5.3.** Aircraft documentation: Log card, maintenance manuals, IPC and service bulletins, TBO & TSN of aircraft components.
- 5.4.** Safety Management system

6. Aircraft systems

- 6.1.** Principle and functions of hydraulic system
- 6.2.** Principle and function of pneumatic system
- 6.3.** Air conditioning system and pressurization system
- 6.4.** De-icing and anti-icing system
- 6.5.** Fuel system
- 6.6.** Ice protection system
- 6.7.** Fire detection and protection system
- 6.8.** EWIS

7. Aircraft Instruments

Flight Instruments, Air speed indicators, Altimeters, Rate of climb/descend meter, Gyro based instruments, Engine performance measuring instrument, Flight data recording system, glass cockpit.

8. Communication and Navigation

8.1. Communication

Information, transmitter, channel, noise, receiver

Modulation, need for modulation, AM, FM, Receivers, super heterodyne receivers, wave propagation, groundwave, skywave, space waves, tropospheric scatter propagation, antennas, antenna gain, effective radiated power, radiation measurement, field intensity, antenna resistance, bandwidth and polarisation, HF antenna, UHF and microwave antennas, wideband and special purpose antennas

8.2. Navigation

Basic principles of Air navigation, Techniques used for navigation (VFR and IFR), Classification of Air Navigation: Pilotage, Dead reckoning, Radio navigation- ADF, VOR, DME; Hyperbolic navigation: Loran and Decca; Doppler and Inertial navigation system; GPS, Traffic alert and Collision Avoidance System (TCAS), ELT, Transponder

9. Radar

9.1. Radar Fundamentals: Principle of Radar, Components of Radar, Pulse modulated transmitters and radar technology, MTI, Range and bearing measurement, factors affecting radar, CW doppler radar, FM CW radar

9.2. Air Traffic Control: Air Traffic Control (ATC), Traffic Collision Avoidance system (TCAS), DME, ADS-B.

10. Aircraft Propulsion

10.1. Types of Gas Turbine Engine: Turbo prop, Turbo jet, Turbo fan and Turbo shaft Engines

10.2. Working of gas turbine engine.

10.3. Engine Performances: Thrust equation; Factors affecting thrust; Engine performance parameters – Efficiency, Specific fuel consumption, Methods of thrust augmentation; By Pass Ratio; HP, BHP, SHP, THP and ESHP

10.4. Air Inlet: Compressor inlet ducts, Effects of various inlet configurations; Ice protection of Air inlet.

10.5. Compressors: Compressor types and operating principles, Fan balancing; compressor stall and surge; Compression ratio, Bleed valves, guide vanes, diffuser

10.6. Combustion chambers: Classification of combustion chambers; Combustion process; Flame Tube Cooling

10.7. Turbines: Principle and types of Turbines, Blade to disk attachment, Nozzle guide vanes, Turbine blade stress and creep.

10.8. Exhaust: Constructional features and principles of operation; Convergent, divergent and variable area nozzles; Engine noise reduction; Afterburners; Thrust reversers.

10.9. Basic engine oil system, lubrication system and engine fuel system.

10.10. Basics of Engine starting, Ignition and Fire protection System.

यस पेशा सम्बन्धी विषयको पाठ्यक्रमका एकाईहरूबाट सोधिने प्रश्नहरू निम्नानुसार हुनेछ ।

Section	Weightage	MCQ	Short Questions	Long Questions
1	10	4	-	1X6
2	25	10	1X3	2X6
3	25	10	1X3	2X6
4	10	4	2X3	-
5	5	2	1X3	-
6	5	2	1X3	-
7	5	2	1X3	-
8	5	2	1X3	-
9	5	2	1X3	-
10	5	2	1X3	-
Total	100	40 questions X 1 marks	10 questions X 3 marks	5 questions X 6 marks

प्रा.उ.से. इलेक्ट्रिकल/इलेक्ट्रॉनिक्स/एभियोनिक्स इन्जिनियर (खुल्ला) पदको
पेशागत विषयको प्रयोगात्मक परीक्षा पाठ्यक्रम

समय : १ घण्टा

पूर्णाङ्क : ५०

उत्तीर्णाङ्क : २५

1. Identification of tools, components and their practical uses (20)

- 1.1. Files
- 1.2. Hammer
- 1.3. Different types of nuts, bolts and rivet
- 1.4. Measuring tools
- 1.5. Plier & screw driver
- 1.6. Voltmeter
- 1.7. Multimeter
- 1.8. Soldering rod and flux
- 1.9. Insulation tester
- 1.10. Diode
- 1.11. Transistor
- 1.12. Resistor
- 1.13. Bonding tester

2. Testing, identification and troubleshooting (15)

- 2.1. Testing of Voltage, Current, Capacitance and Resistance using Multimeter
- 2.2. Identification of Resistor using colour code
- 2.3. Understanding of ATA 100 chapters
- 2.4. General understanding of Aircraft wiring diagrams
- 2.5. Aptitude on fault troubleshooting

3. Engine and Battery General (5)

- 3.1. Types of batteries and its identification
- 3.2. Components of engine and their terminologies

4. Maintenance safety and support equipment's (5)

- 4.1. Fire extinguisher & types
- 4.2. Breakdown, preventive & predictive maintenance
- 4.3. Maintenance safety & health hazards

5. Aircraft General (5)

- 5.1. Aircraft Type
- 5.2. Identification of aircraft major components.
- 5.3. Aircraft Terminology
- 5.4. Aircraft general circuits