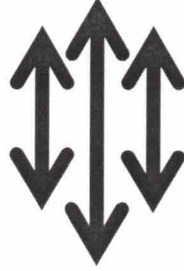
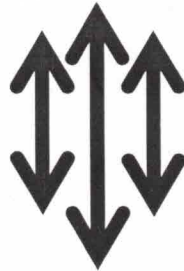


नेपाली सेना  
श्री भर्ना छनौट निर्देशनालय, कार्यरथी विभाग,  
जंगी अड्डा



प्रा.उ.से. ईलेक्ट्रिकल/ईलेक्ट्रोनक्स/एभियोनिक्स ईन्जिनियर  
(खुला तथा आन्तरिक) पदको लिखित परीक्षाको पाठ्यक्रम



Avocines

२०७७

## नेपाली सेना

### प्रा.उ.से. ईलेक्ट्रिकल/ईलेक्ट्रोनिक्स/एभियोनिक्स ईन्जिनियर (खुला तथा आन्तरिक) पदको लिखित परीक्षाको पाठ्यक्रम

समय: ४ घण्टा

पूर्णाङ्क : १५०

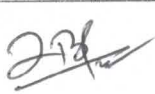
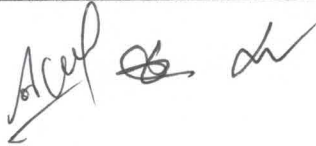
उत्तीर्णाङ्क : ६०

यो पाठ्यक्रम नेपाली सेनाको प्रा.उ.से. ईलेक्ट्रिकल/ईलेक्ट्रोनिक्स/एभियोनिक्स ईन्जिनियर (खुला तथा आन्तरिक) पदको उम्मेदवार छनौट परीक्षाको लागि निर्धारण गरिएको हो । लिखित परीक्षामा सरिक हुने उम्मेदवारहरूको पेशा सम्बन्धी विषयलाई आधारमानी प्रश्नहरू सोधिने छ ।

- (क) लिखित परीक्षाको माध्यम नेपाली/अंग्रेजी वा दुवै भाषा हुनेछ ।  
 (ख) लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र अर्को चरणको परीक्षामा सम्मिलित गराईनेछ ।  
 (ग) प्रश्नपत्र निर्माण गर्दा पाठ्यक्रममा समावेश भएका सबै विषयहरूलाई यथासंभव समिटिनेछ ।  
 (घ) बस्तुगत र विषयगत संयुक्त रूपमा पूर्णाङ्क र उत्तीर्णाङ्क कायम गरिनेछ ।  
 (ङ) बस्तुगत र विषयगत परीक्षाको पाठ्यक्रम एउटै हुनेछ ।  
 (च) बस्तुगत र विषयगत विषयको लिखित परीक्षा एकैपटक वा छुट्टाछुट्टै गरी लिन सकिनेछ ।  
 (छ) यो पाठ्यक्रम मिति २०७७/०६/१३ गतेबाट लागु हुनेछ ।

### लिखित परीक्षाको योजना र पाठ्यक्रम

विषय	पूर्णाङ्क	उत्तिर्णाङ्क	परीक्षा प्रणाली		प्रश्न संख्या अङ्क	समय
पेशा सम्बन्धि	७५	६०	बस्तुगत (Objective)	बहुवैकल्पिक प्रश्न (MCQs) ७५	७५ प्रश्न x १ अङ्क=७५	१ घण्टा
	७५		विषयगत (Subjective)	छोटो उत्तर	१५ प्रश्न x ३ अङ्क =४५	३
				लामो उत्तर	५ प्रश्न x ६ अङ्क =३०	घण्टा


## लिखित परीक्षाको पाठ्यक्रम

### **1. Avionics**

#### **1.1 Aircraft Flight Instruments**

- 1.1.1 Basic Pitot-Static System: Working Principle, Pitot-Static Instruments and their Purpose
- 1.1.2 Basic Six Flight Instruments (Altimeter, Air Speed Indicator (ASI), Vertical Speed Indicator (VSI), Turn and Bank Indicator, Heading Indicator and Attitude Indicator)
- 1.1.3 Aircraft Gyroscopic Instruments: Principles and Types

#### **1.2 Aircraft Radio and Communication System**

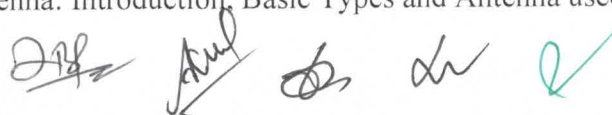
- 1.2.1 Aircraft Communication System: Intercom, VHF and HF Communication System
- 1.2.2 Aircraft Satellite Communication (SATCOM)
- 1.2.3 Emergency Location Transmitter (ELT)

#### **1.3 Aircraft Navigation System**

- 1.3.1 Very High Frequency (VHF) Omnidirectional Range (VOR)
- 1.3.2 Automatic Direction Finder (ADF)
- 1.3.3 Traffic Collision and Avoidance System (TCAS)
- 1.3.4 Global Positioning System (GPS)
- 1.3.5 Instrument Landing System (ILS)
- 1.3.6 Distance Measuring Equipment (DME)
- 1.3.7 Transponder
- 1.3.8 Radio Altimeter
- 1.3.9 Primary and Secondary Radar System: Introduction, Frequencies and Principle of Operation

#### **1.4 Fundamentals of Electromagnetic Wave Propagation**

- 1.4.1 Generation and Propagation of Radio Waves (Ground Waves, Space Waves and Sky Waves)
- 1.4.2 Radio Spectrum: Frequencies, Modulation, Demodulation, Interference and its Usage
- 1.4.3 Antenna: Introduction, Basic Types and Antenna used in Aircraft



## 1.5 Aircraft Recording Systems

1.5.1 Flight Data Recorder (FDR) and Cockpit Voice Recorder (CVR): Introduction, Common Features, Advantages and Purpose

## 1.6 Aircraft Autopilot System

1.6.1 Autopilot: Basic Concept and its Purpose, General Block Diagram of System Operation, Basic Components of Autopilot System

## 2. Electrical

### 2.1 Electrical Fundamentals

2.1.1 Electron Theory, Resistance, Capacitance, Inductance, Theory of Magnetism, Electromagnetism, Voltage, Current, Power

### 2.2 DC Sources of Electricity

2.2.1 Primary and Secondary Cells

2.2.2 Lead Acid Battery, Nickel-Cadmium Battery: Features, Principle of Operation, Charging, Discharging and Advantages/Disadvantages

2.2.3 DC Circuits: Ohm's Law, Kirchhoff's Voltage and Current Laws and its Calculations.

### 2.3 Generators and Motors

2.3.1 AC Generator and DC Generator: Construction, Principle of Operation and Concept of Single Phase and Poly Phase Generation and Distribution

2.3.2 DC Motor and AC Motors: Construction, Principle of Operation and Field Connections

2.3.3 Aircraft Starter-Generator: Purpose, Working Principle, Advantages

### 2.4 Power Conversion

2.4.1 Voltage Regulators: Purpose and Types

2.4.2 Inverter and Transformer Rectifier Unit (TRU): Purpose and Principle of Operation

2.4.3 Transformer: Types, Purpose and Principle of Operation

### 2.5 Controls, Actuators and Transducers

2.5.1 Fuses, Circuit Breakers, Relays and Contactors, Switches and its Types, Thermistors, Solenoids, Thermocouples Variable Resistors, Temperature Transducers, Strain Transducers and Linear Variable Displacement Transformer (LVDT): Purpose and Working Principle

*[Handwritten signatures and marks]*

## 2.6 Electrical Measurements

2.6.1 Permanent Magnet Moving Coil (PMMC), Electrodynamometer, Watthour meter, Potentiometer and Cathode Ray Oscilloscope: Purpose and Working Principle

2.6.2 Instrument Transformer (Current Transformer and Potential Transformer): Purpose and Working Principle

## 3. Electronics

### 3.1 Semiconductor

3.1.1 Formation and Biasing of P-N Junction, Diode Types; Light Emitting Diode (LED), Zener Diode, Varactor Diode, Photodiode: Characteristics and Properties

3.1.2 Rectifiers: Half and Full Wave Rectifier, Bridge Rectifier and Silicon-Controlled Rectifier (SCR): Characteristics, Operation and Use

3.1.3 Transistors: Bipolar Junction Transistor (BJT), Unipolar Transistor, FET, MOSFET, TRIACS, DIAC, VARISTORS: Construction, Characteristics, Operation and Use

3.1.4 Integrated Circuits (IC): Digital IC, IC Construction, Operation, Function, Limitation and Application of an Operational Amplifier (Op-Amp)

3.1.5 Oscillators: Introduction and application of Oscillators, Free oscillators, Hartley Oscillator, Colpitts Oscillator, Crystal-Controlled Oscillator, RC oscillators

3.1.6 Printed Circuit Board: Construction of PCB

### 3.2 Numbering System

3.2.1 Binary, Decimal, Octal and Hexadecimal, Conversion between Decimal and Binary, Octal and Hexadecimal and vice versa

### 3.3 Logic Circuits

3.3.1 Types of Logic Gates, Truth Tables and Equivalent Circuits, Interpretation of Logical Diagrams

### 3.4 Integrated Circuits

3.4.1 Bistables: R-S, RST, J-K, Edge Triggered, T bistable, D bistable, MOS bistable

3.4.2 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

*202* *ACF* *20* *20* *2*



### 3.5 Decoder and Encoders

3.5.1 Decoder and Encoder Circuits, Binary Decoder and Encoder, Decoder Application, Priority Encoder and Application, Multiplexing and Demultiplexing

### 3.6 Basic Computer Architecture

3.6.1 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.

### 3.7 Data Conversion

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

3.7.2 Analogue to Digital Converter (ADC): Principle, Feedback Converters, Integrating Converters, Shaft Converters, Tracking Converter, Dual Slope Converters, Quantized Feedback Converter, Shaft Encoder, Optical Shaft Encoder

### 3.8 Fibre Optics

3.8.1 Construction, Principle of Operation and Advantages of Fibre Optics, Fibre Classification, Application of Fibre Optics in Aviation industry.

### 3.9 Data Buses

3.9.1 Data Buses used in Aircraft: Types and Properties

## 4. Aircraft Basics

4.1 Atmosphere: Layers of Atmosphere, International Standard Atmosphere (ISA), Variation of Temperature, Pressure and Density with Altitude.

4.2 Control Surfaces: Flight Control Surfaces and High Lift Devices of an Aircraft and their Purpose

4.3 Basic Aerodynamics: Airfoil and Angle of Attack, Aerodynamic Forces in Flight, Generation of Lift and Drag

4.4 Gas Turbine Engines: Types of Gas Turbine Engines used in Aircraft and their Applications, Construction, Principle of Operation, Purpose of Compressor, Combustion Chamber and Turbine

4.5 Helicopter: Types of Main Rotor System and their Differences, Helicopter Controls, Concept of Momentum Theory and Blade Element Theory

4.6 Aircraft Systems: Fuel System, Hydraulic System, Air Conditioning System and Fire Protection and Detection System: Basic Layout of System Components and their Purpose

*[Handwritten signatures and marks]*

## 5. Aptitude and Case Studies

5.1 Logical Plan and Reasoning: Maintenance Planning, Use of Aircraft Manuals for Maintenance, Aircraft Maintenance Records, Handling of Avionics Components like Electrosensitive Devices (ESD), Troubleshooting and Fault Isolation Plan for Aircraft Systems

यस पेशा सम्बन्धी विषयको पाठ्यक्रमका एकाईहरुबाट सोधिने प्रश्नहरु निम्नानुसार हुनेछ ।

Specification Grid							
Units	Objective		Subjective (Short Questions)		Subjective (Long Questions)		Total Marks
	No. of Questions	Marks	No. of Questions	Marks	No. of Questions	Marks	
1.	AVIONICS						
1.1 Aircraft Flight Instruments							15
1.1.1	2	2	1	3	-	-	
1.1.2	2	2	-	-	1	6	
1.1.3	2	2	-	-	-	-	
1.2 Aircraft Radio and Communication System							8
1.2.1	1	1	1	3	-	-	
1.2.2	2	2	-	-	-	-	
1.2.3	2	2	-	-	-	-	
1.3 Aircraft Navigation System							27
1.3.1	1	1	1	3	-	-	
1.3.2	2	2	-	-	-	-	
1.3.3	1	1	-	-	-	-	
1.3.4	2	2	-	-	-	-	
1.3.5	1	1	1	3	-	-	
1.3.6	1	1	1	3	-	-	
1.3.7	2	2	-	-	-	-	
1.3.8	1	1	-	-	-	-	
1.3.9	1	1	-	-	1	6	
1.4 Fundamentals of Electromagnetic Wave Propagation							8
1.4.1	2	2	1	3	-	-	
1.4.2	2	2	-	-	-	-	
1.4.3	1	1	-	-	-	-	
1.5 Aircraft Recording Systems							1
1.5.1	1	1	-	-	-	-	
1.6 Aircraft Autopilot System							4
1.6.1	1	1	1	3	-	-	
2.	ELECTRICALS						

20/2/2020

45 86 2

2.1 Electrical Fundamentals							2
2.1.1	2	2	-	-	-	-	
2.2 DC Sources of Electricity							6
2.2.1	1	1	-	-	-	-	
2.2.2	-	-	1	3	-	-	
2.2.3	2	2	-	-	-	-	
2.3 Generators and Motors							11
2.3.1	-	-	-	-	1	6	
2.3.2	2	2	-	-	-	-	
2.3.3	-	-	1	3	-	-	
2.4 Power Conversion							6
2.4.1	1	1	-	-	-	-	
2.4.2	2	2	-	-	-	-	
2.4.3	-	-	1	3	-	-	
2.5 Controls, Actuators and Transducers							4
2.5.1	4	4	-	-	-	-	
2.6 Electrical Measurements							6
2.6.1	1	1	1	3	-	-	
2.6.2	2	2	-	-	-	-	
3.	ELECTRONICS						
3.1 Semiconductor							10
3.1.1	2	2	-	-	-	-	
3.1.2	-	-	1	3	-	-	
3.1.3	2	2	-	-	-	-	
3.1.4	1	1	-	-	-	-	
3.1.5	1	1	-	-	-	-	
3.1.6	1	1	-	-	-	-	
3.2 Numbering System							2
3.2.1	2	2	-	-	-	-	
3.3 Logic Circuits							3
3.3.1	-	-	1	3	-	-	
3.4 Integrated Circuits							2
3.4.1	1	1	-	-	-	-	
3.4.2	1	1	-	-	-	-	
3.5 Decoders and Encoders							2
3.5.1	2	2	-	-	-	-	
3.6 Basic Computer Architecture							2
3.6.1	2	2	-	-	-	-	
3.7 Data Conversion							4
3.7.1	1	1	-	-	-	-	
3.7.2	-	-	1	3	-	-	
3.8 Fibre Optics							1
3.8.1	1	1	-	-	-	-	
3.9 Data Buses							1
3.9.1	1	1	-	-	-	-	

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4.	AIRCRAFT BASICS						19
4.1	2	2	-	-	-	-	
4.2	-	-	-	-	1	6	
4.3	2	2	-	-	-	-	
4.4	4	4	-	-	-	-	
4.5	2	2	-	-	-	-	
4.6	-	-	1	3	-	-	
5.	APTITUDE AND CASE STUDIES						
5.1	-	-	-	-	1	6	6
<b>Total</b>	<b>75</b>	<b>75</b>	<b>15</b>	<b>45</b>	<b>5</b>	<b>30</b>	<b>150</b>

प्रयोगात्मक परीक्षा पाठ्यक्रम

समय: १ घण्टा

पूर्णाङ्क: ५०

उत्तीर्णाङ्क : २५

S. N.	Topic	Marks
1	Identification of Tools, Components and their Practical Uses	20
2	Testing, Identification and Troubleshooting	15
3	Engine and Battery General	5
4	Maintenance Safety and Support Equipment	5
5	Aircraft General	5
	<b>Total</b>	<b>50</b>

*28/11/20*

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