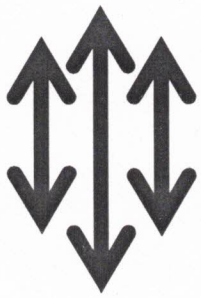
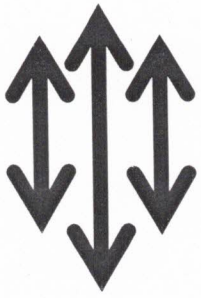
नेपाली सेना
श्री भर्ना छनौट निर्देशनालय, कार्यरथी विभाग,
जंगी अड्डा



प्रा.उ.से. एरोनोटिकल/मेकानिकल ईन्जिनियर(आन्तरिक) पदको लिखित परीक्षाको पाठ्यक्रम



A&C

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नेपाली सेना

प्रा.उ.से. एरोनोटिकल/मेकानिकल ईन्जिनियर(आन्तरिक) पदको लिखित परीक्षाको पाठ्यक्रम

समय: ४ घण्टा

पूर्णाङ्क : १५०
उत्तीर्णाङ्क : ६०

यो पाठ्यक्रम नेपाली सेनाको प्रा.उ.से. एरोनोटिकल/मेकानिकल ईन्जिनियर(आन्तरिक) पदको उम्मेदवार छनौट परीक्षाको लागि निर्धारण गरिएको हो । लिखित परीक्षामा सरिक हुने उम्मेदवारहरुको पेशा सम्बन्धी विषयलाई आधारमानी प्रश्नहरु सोधिने छ ।

(क) लिखित परीक्षाको माध्यम नेपाली/अंग्रेजी वा दुवै भाषा हुनेछ ।
(ख) लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई मात्र अर्को चरणको परीक्षामा सम्मिलित गराईनेछ ।
(ग) प्रश्नपत्र निर्माण गर्दा पाठ्क्रममा समावेश भएका सबै विषयहरुलाई यथासंभव समिटनेछ ।
(घ) बस्तुगत र विषयगत संयुक्त रुपमा 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 २०७७/०६/१२ गतेबाट लागु हुनेछ ।

लिखित परीक्षाको योजना र पाठ्यक्रम

विषय	पूर्णाङ्क	उत्तिर्णाङ्क	परीक्षा प्रणाली		प्रश्न संख्या अङ्क	समय
पेशा सम्वन्धि	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 अंङ्क =४५	३ घण्टा
				लामो उत्तर	६ प्रश्न x ५ अङ्क =३०	

प्रा.उ.से. एरोनोटिकल/मेकानिकल ईन्जिनियर (आन्तरिक) पदको लिखित परीक्षाको पाठ्यक्रम

SECTION A: AERONAUTICAL PART

1. BASIC THEORY OF FLIGHT

1.1 Atmosphere and international standard atmosphere: General ideas on Different layers of atmosphere, effects of temperature, pressure and density with altitude during flight. ISA, IAS, TAS, CAS, QNH, QFE

1.2 Basic Aerodynamics: Airflow around body, boundary layer, laminar flow, turbulent flow, relative air flow, vortices and stagnation, Bernoulli's theorem.

1.3 Airfoil terminology: camber, chord, aspect ratio, aerodynamic resultant, types of airfoils, angle of incidence, angle of attack, pressure distribution, lift, weight, thrust and drag, different types of drag, pitch angle, center of pressure, center of gravity, lift coefficient, drag coefficient, total drag coefficient, lift/drag ratio

1.4 Flight control system : primary and secondary flight control, Principle and functions of ailerons, elevators, rudder, flaps, slats & slots, spoilers, speed brakes, trim tabs, servo tabs, dual purpose flight control surfaces

1.5 Stability and control : Three axis of flight, Static, dynamic, longitudinal, lateral and directional stability,

1.6 Basic concept of high speed flight, sub sonic, transonic, supersonic, hyper sonic Mach number.

1.7 Helicopter Aerodynamics : Blade lift & drag, translational lift, effective translational lift, dissymmetry of lift, advancing & retreating blade, tip-path plane, basic power, induced power, , autorotation, ground resonance, main & tail rotor vibration, IGE & OGE, Coriolis effect, vortex ring state, translating tendency, dynamic rollover, gyroscopic precision, coning, blade twist

1.8 Rotorcraft controls: Types of rotor systems, cyclic & collective pitch controls, anti-torque pedals, flapping hinge, drag hinge & feathering hinge, throttle control, swash plate assembly.

2. AIRCRAFT STRUCTURES:

2.1 Primary structure and secondary structure, Different types of aircraft fuselages, empennage, bulkheads, formers, longerons, stringers, ribs, spar, different types of wing design and construction, aspect ratio, vortex generators, winglets.

2.2 Landing gear and Brake System: Airplane and helicopter landing gears types and their working principle, construction and their advantages & disadvantages, types of brakes, brake mechanism, anti-skid system.

3. GAS TURBINE ENGINE :

3.1 Types & working principle of Gas Turbine Engines – Turbo prop, turbo jet, turbo fan and turbo shaft engines. Fixed turbine and free turbine engines.

3.2 Air Inlet : Compressor inlet ducts, effects of various inlet configurations, ice protection of air inlet

3.3 Compressors: Compressor types and operating principles, causes and effects of compressor stall and surge, methods of air flow control - bleed valves, variable inlet guide vanes, variable stator vanes, rotating stator blades, compression ratio

3.4 Combustion chambers: Classification of combustion chambers, combustion process; flame tube cooling.

3.5 Turbines: Stator and rotor blades, impulse, reaction, impulse-reaction turbines, blade to disk attachment, nozzle guide vanes, causes and effects of turbine blade stress and creep

3.6 Exhaust: Constructional features and principles of operation, convergent, divergent and variable area nozzles, engine noise reduction, afterburners, thrust reversers

3.7 Basics of engine starting (APU, air starter, electric motors), ignition system, engine fire protection system, engine lubrication system, engine fuel system, engine instrument system

4. AIRCRAFT SYSTEMS:

4.1 Principle and functions of hydraulic system and pneumatic system

4.2 Principle and function de-icing and anti- icing system

4.3 Fuel system: Basic principle of aircraft fuel system, fuel specification, types of fuel tanks, vents, booster pumps, vapor locking and microbiological contamination, protection from ice, fire and explosion precautions

4.4 Fire protection system: classification of fires, Fire risk in aircraft, fire extinguishing systems and agents

5. AVIONICS

5.1 Basic flight instruments, purpose and basic working principle of pitot static system, gyroscopic principles, mach meter, gyroscopic instruments, turn and slip indicator,

directional indicators, pressure, temperature and position indicator, quantity and flow indicators

5.2 Radio communication, general principle of HF, VHF, VOR, DME, ELT, ILS, FDR, CVR, Weather RADAR, Radio altimeter

5.3 Basic components of autopilot system

5.4 Installation and maintenance of avionics components, cleaning of avionics components, wire routing techniques, bonding and shielding, static discharger installation and precautions.

5.5 Ohm's law, A/C internal batteries, basics of DC generators & alternators, circuit protection mechanism, electric motors & actuators, essential and non-essential electrical power system, relays, solenoids, fuses, circuit breakers, diodes, aircraft lighting system

6. AVIATION MANAGEMENT

6.1 Aircraft documentation: Log card, flight manuals, maintenance manuals, Repair manuals, IPC and service bulletins, aircraft directives, TBO & TSN of aircraft components,

6.2 Concept of routine, planned, preventive, corrective, predictive maintenance, MEL, MMEL, inspection, overhaul, testing, calibration, improvements/modifications.

6.3 Aviation safety , human factors

SECTION B : MECHANICAL PART

7. MATERIALS AND STRENGTH OF MATERIALS

7.1 Type of forces – tension, compression, shear, bending, torsion

7.2 Concept of stress and strain, Hooke's law and modulus of materials, Mechanical properties of materials, fundamentals of metals and its alloys, structure of metals, formation of grains, deformation of metals, recovery, re-crystallization and grain growth, concept of creep and fatigue

7.3 Purpose and methods of heat treatment of metals and its alloys- annealing, normalizing, hardening and case hardening.

7.4 Different types of corrosion and preventive measures.

7.5 Mechanical working: hot working, cold working, rolling, forging, drawing.

7.6 Ferrous metals and alloys: iron carbon equilibrium diagram, pig iron, cast iron, wrought iron, carbon steel, alloy steel, stainless steel, high speed steel and cutting alloy steel.

7.7 Non-ferrous metals and alloys: Aluminum and its alloys, Magnesium and its alloys, Titanium and its alloys, Nickel and its alloys, Copper and its alloys.

7.8 Destructive and Non-Destructive Testing of Materials.

8. MACHINE DESIGN

8.1 Axial load, torsion load, bending load, shear load

8.2 Bearings: Construction and types of bearing, friction and lubrication of bearings, bearing materials

8.3 Gear Drives: Spur gear, helical gear, bevel gear, rack and pinion gear, types of gear trains

8.4 Lathe machines: main parts of lathe machine, operations – turning, chamfering, facing, thread cutting, knurling, filing and boring.

8.5 Drill machines: types of drill machines, drill machine operations- drilling, reaming, countersinking, boring, counter boring, tapping, drill bits and its type

9. WORKSHOP TECHNOLOGY

9.1 Basic Tools: Hand tools and its purposes, Taps and dies.

9.2 Measuring tools: precision and non-precision measuring tools, linear measuring tools, angular measuring tools, go no go gauges, feeler gauges

9.3 Limit, fit and tolerance, types of fit

9.4 Welding Technology: Weldability and various types of welding- electric arc welding, gas welding, TIG welding, MIG welding, Brazing, Spot welding, Resistance welding.

यस पेशा सम्बन्धि विषयको पाठ्यक्रमका एकाईहरुबाट सोधिने प्रश्नहरुको संख्या निम्नानुसार हूनेछ ।

THEORITICAL/WRITTEN EXAM MARKS GRID							
Units	Objectives		Subjectives (Short Questions)		Subjectives (Long Questions)		Total Marks
	No. of Questions	Marks	No. of Questions	Marks	No. of Questions	Marks	
SECTION A : AERONAUTICAL PART							
1. BASIC THEORY OF FLIGHT							
1.1	1	1	-	-	-	-	**25**
1.2	1	1	-	-	-	-	
1.3	1	1	1	3	-	-	
1.4	1	1	1	3	-	-	
1.5	1	1	-	-	1	5	
1.6	1	1	-	-	-	-	
1.7	1	1	1	3	-	-	
1.8	1	1	1	3	-	-	
2.AIRCRAFT STRUCTURES							
2.1	2	2	-	-	-	-	**7**
2.2	2	2	1	3	-	-	
3.GAS TURBINE ENGINES							
3.1	2	2	1	3	-	-	**13**
3.2	1	1	-	-	-	-	
3.3	2	2	-	-	-	-	
3.4	1	1	-	-	-	-	
3.5	2	2	-	-	-	-	
3.6	1	1	-	-	-	-	
3.7	1	1	-	-	-	-	
4.AIRCRAFT SYSTEMS							
4.1	1	1	1	3	-	-	**12**
4.2	1	1	-	-	-	-	
4.3.	2	2	-	-	-	-	
4.4	2	2	1	3	-	-	
5.AVIONICS							
5.1	2	2	-	-	-	-	**10**
5.2	1	1	-	-	-	-	
5.3	1	1	-	-	-	-	
5.4	1	1	-	-	-	-	
5.5	2	2	1	3	-	-	
6. AVIATION MANAGEMENT							
6.1	1	1	-	-	-	-	**8**
6.2	1	1	-	-	-	-	
6.3	1	1	-	-	1	5	
SECTION B. MECHANICAL PART							
7.MATERIALS AND STRENGHT OF MATERIALS							
7.1	1	1	-	-	-	-	
7.2	1	1	1	3	-	-	
7.3	3	3	-	-	1	5	

7.4	3	3	-	-	1	5	**37**
7.5	1	1	1	3	-	-	
7.6	3	3	-	-	-	-	
7.7	1	1	-	-	-	-	
7.8	3	3	-	-	1	5	
8.MACHINE DESIGN							
8.1	1	1	-	-	-	-	**16**
8.2	2	2	1	3	-	-	
8.3	2	2	-	-	-	-	
8.4	2	2	1	3	-	-	
8.5	3	3	-	-	-	-	
9.WORKSHOP TECHNOLOGY							
9.1	5	5	1	3	-	-	**22**
9.2	3	3	-	-	-	-	
9.3	1	1	-	-	-	-	
9.4	3	3	1	3	1	5	
TOTAL	**75**	**75**	**15**	**45**	**6**	**30**	**150**

प्रयोगात्मक परीक्षाको पाठ्यक्रम

TIME: 01:00 HR

FULL MARKS: 50
PASS MARKS: 25

PRACTICAL MARKS GRID		
S.NO	TOPIC	MARKS
1	Identification of tools and their practical uses (viva and practical job) Hand tools, bench tools, special tools, measuring tools	20
2	Identification of avionics tools and their practical uses (viva and practical job), Voltmeter, multi meter, circuit, megger, insulation tester	10
3	Aviation safety and ground support equipment (viva and practical job), Fire extinguisher and its type, ground equipment, aircraft safety, workshop safety, personnel safety	10
4	Aircraft documentation (viva and practical job), IPC, log book, log card, Aircraft maintenance manual, service bulletin.	10
	TOTAL	**50**

समाप्त