

Nepal Airlines Corporation
Syllabus for Senior Technician (Grade - V)
Aircraft Maintenance Service (A & C)
Open Competition

A. Stages and Procedures of Examination System

चरण	विषय	अंकभार	परीक्षा प्रणाली	प्रश्न संख्या x अङ्क	समय
प्रथम ८०%	सेवा सम्बन्धी	पुर्णाङ्क १०० उत्तिर्णाङ्क ४०	Multiple Choice Questions (वस्तुगत)	५० x २ = १००	४५ मिनेट
द्वितीय २०%	अन्तरवार्ता	२०	मौखिक		

Full Marks : 100
Pass Marks: 40

B. Material Contents

Part 1 - Fundamentals 24 marks (12 Questions)

- 1.1. **Arithmetic:** Fractions, decimals, percentages, ratio, proportion, variation, power, roots and logarithms.
- 1.2. **Algebra:** Addition, subtraction, multiplication and division of like unlike terms, simple equations, transpositions of formulae
- 1.3. **Geometry and Mensuration:** Lines, angles, regular plane figures, regular solids. Areas of plane figures and surfaces of regular solids. Volumes of cubes, prisms and cylinders
- 1.4. **Trigonometry:** Sine, cosine and tangent ratios, Solution of right-angled triangles using trigonometrical ratios.
- 1.5. **Graphs:** Construction and interpretation of graphs of linear, simple exponential, sine and cosine functions.
- 1.6. **Vectors:** Vector and scalar quantities, summation and resolution of vector quantities.
- 1.7. **Mechanics:** U.S. British and metric systems of measurement the S.I. System and methods of conversion: measurement tolerances, mass, weight, moments, centre of gravity. Dynamics: force, speed, velocity, angular velocity, acceleration, inertia, momentum, torque, work, energy and power, Newton's Laws of Motion.
- 1.8. **Fluid-mechanics:** Pressure, density, specific gravity, Pascal's principle, Archimedes' principle Properties of fluids, Bernoulli's Theorem, Venture meter, steady and unsteady flow, potential and kinetic energy effects in fluid flow.
- 1.9. **Heat and Thermodynamics:** Thermometers and temperature scales Celsius, Fahrenheit, Rankin and Kelvin. Conversion between scales, Quantity of heat: units of heat (calories, B.T.U., C.H.U.), heat capacity, specific heat. Heat transfer convection, radiation and conduction, expansion of solids and liquids: co-efficient of linear expansion of solids, bi-metallic strips, elementary, thermodynamics, first and second laws, mechanical equivalent of heat, humidity, absolute and relative, vapor pressure, Gases; Charles' and Boyle's Laws, internal energy of a gas, specific heat of gas, relationship between internal energy and heat.

1.10. **Electricity and Magnetism** Fundamentals, atoms and electrons, conductors and insulators electric currents, electromotive forces, difference of potential; electrical units; power; work and energy Ohm's Law, specific resistance series, parallel and combined DC circuits Kirchhoff's Laws, the Wheatstone bridge, Electromagnetic Induction: Faraday's Laws, Lenz's magnitude and direction of induced EMF, generators, inducting coils, Inductance and capacitance: mutual inductance, self inductance, unit of capacitance, specific inductive capacity, condensers, dielectric strength, losses and efficiency, Simple A.C. principles generation, measurement of A.C. current, voltage and frequency simple transformers and rectifiers.

1.11. **Basic Computer knowledge**

Part 2 - Workshop Practice 16 Marks (8 Questions)

- 2.1. **Workshop Standards:** Workshop safety, care of tools, dimensions, workmanship.
- 2.2. **Basic Tools:** Hand tools for driving, cutting and shaping, Spanners and wrenches torque wrenches. Grinding and broaching.
- 2.3. **Measurement:** Rules, dividers, caliper, micrometers, vernier gauges, dial gauges, thread gauges, marking out.
- 2.4. **Technical Drawing:** Orthographic projection first angle and third angle, isometric and oblique projection. Dimensioning standard symbols, Representation of machine unit.
- 2.5. **Wires and Cables:** Standard wire gauges: U.S., U.K. and metric, wire ropes: types, splicing, swaging, and fittings. Turn-buckles and tensioning devices: locking and safety.

Part - 3 Material Science 10 Marks (5 Questions)

- 3.1. **Metals and Alloys:** Pure metals, metallic alloys, carbon additions to iron, cast and wrought forms of steel.
- 3.2. **Mechanical Properties of Metals:** Elasticity, hardness, ductility, behavior under stress and strain, tensile test, hardness, fatigue.
- 3.3. **Steel:** Type of steel, classification of steels, heat treatment, surface hardening.
- 3.4. **Aluminum Alloys:** Properties of aluminum and its alloys, heat treat corrosion protection.
- 3.5. **Non-ferrous Alloys:** Utilization and properties of magnesium alloys, nickel alloys, brasses, bronzes, titanium alloys.
- 3.6. **Joining of Metals:** Welding-gas arc and resistance brazing and silver soldering, adhesive bonding.
- 3.7. **Non-Destructive Testing:** Types of defects, Penetrate dye and electromagnetic methods, elementary principles of ultrasonic, eddy-current methods.
- 3.8. **Corrosion Protection:** Causes and types of corrosion, protection of metals by anodizing, plating, coating and painting.

4.9. **Non-metallic Materials:** Properties and utilization of wood, glue, fabric, dope, paint, rubber, plastics, glass, fiberglass and textiles on aircraft, structural composite materials.

Part 4-General Knowledge of Aircraft - 10 Marks (5 Questions)

4.1. **Flight:** Theory of flight, fixed wings and rotary-wings: advantages and disadvantages.

4.2. **Fixed-wing flight:** Gliders and aeroplanes, biplanes and monoplanes, single-engines and multi engine aircraft. Aircraft shapes for particular purposes

4.3. **Rotary-wing Flight:** Autogiro and helicopters, general principles of rotorcraft

4.4. **Propulsion:** Types of engine: Basic principles of piston and turbo engines elementary principles of pulsejets ramjets and rockets.

4.5. **Air-conditioning Systems:** Heating and ventilating systems, Air-sources: types of compressors and blowers, air bleeds, Silencers and coolers, Flow and pressure controls; flow control valves, pressure controllers, outflow valves, sensing and control devices, Temperature and humidity control: heat sources-compression, combustion heaters. Cooling systems: heat exchangers air-cycle coolers, vapor cycle coolers.

Part 5-Piston Engines Theory -20 Marks (10 Questions)

5.1. **Piston Engine Theory:** Four stroke cycle-bore, stroke, compression ratio, mean effective pressure, engine efficiency, and mechanical volumetric and total, Determination of horsepower, performance.

5.2. **Configuration and Construction:** Inline, horizontally-opposed and radial engines, number of cylinders, cooling methods, construction.

5.3. **Lubrication:** Oil specifications, oil supply system, Engine oil system, pressure regulation, filter and chip detectors.

5.4. **Fuels and Fuel System:** Fuel specifications: octane and performance numbers, additives, tank and fuel system layouts: types of tanks, venting tank pumps, quantity and flow indicating Refueling defuelling: over-wing and under-wing system, filtration, fire explosion precautions. Protection from ice vapor locking and micro-biological contamination.

5.5. **Carburetion and supercharging:** float-types, carburetors: principles, construction control devices. Fuel injection system; principles, types, construction, control devices

5.6. **Ignition:** Magneto systems: polar indicator and rotating armature type, low tension ignition systems, installing and timing magnetos, spark plugs: types, construction, cleaning, testing.

5.7. **Engine Accessories:** Gear-boxes, pumps, generators, etc. Engine starting system, Engine instrumentation: tachometers, pressure and temperature indicators.

Part 6-Gas Turbine Engines - 20 Marks (10 Questions)

- 6.1. **Turbine Engine Theory:** Constant pressure cycle: effect of altitude, temperature and forward speed on performance, engine efficiency-thermal propulsive and overall performance.
- 6.2. **Compressors:** Principles: impulse and reacting blading, blade shrouds, turbine efficiency, construction, materials, balance, surging and stalling, Intakes and castings: pressure recovery, bleeds, anti-icing.
- 6.3. **Turbines:** Principles: impulse and reaction blading, blade shrouds, turbine efficiency, Construction: materials creep, cooling of discs and blades, bearings and balance.
- 6.4. **Fuels and Fuel System:** Fuel specifications: kerosene, wide cut, additives, tank and fuel system layouts: types of tanks, venting tank pumps, quantity and flow indication, fire explosion precautions, Protection from ice. Vapor locking and micro-biological contamination.
- 6.5. **Combustion:** Principles of continuous combustion, pipe, cannular and annular combustion chambers, combustion efficiency, type of fuel nozzles.
- 6.6. **Engine Accessories:** Gear-boxes, pumps, generators, etc. Engine starting system, Engine instrumentation: tachometers, pressure and temperature indicators.
