Nepal Airlines Corporation
Syllabus for Senior Technical Officer Grade- VII
Aircraft Maintenance Service (Airframe & Engine)
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
द्वितिय २०%	अन्तरवार्ता	२०	मौखिक		

B. Material Contents

Part I - FUNDAMENTALS **- 24 Marks (12 Questions)**

Computer

- *Historical development*: Classes of computer, historical development of computers, generation of electronics computers.
- *Computer systems and organization*: Computer hardware, computer software.
- *Circuit elements*: functional behavior of resistors, capacitors and inductor: Voltage and current sources.
- *Series and parallel circuits***: Kirchhoff's law, Network analysis. Single phase AC circuit** analysis. Power and energy in AC Circuits, Three phase circuits analysis – basics.
- *Introduction to instrumentation:* The oscilloscope and its operation, digital voltmeter, ammeter, ohmmeter.
- *Circuit concepts:* diodes and diode circuit, semi conductor devices.
- *Engineering Static*: Equivalent force systems; equilibrium, friction, cables and center of gravity.
- *Engineering Dynamics***: Velocity, acceleration and momentum; Newton's second law of** motion, The moment law, work and energy.
- *Strength of Materials:* Concepts of stress, strain and stress- **strain diagram; Hook's law.**
- *Thermodynamics:* Properties of substances; first law of thermodynamics; Entropy and second law of thermodynamics; Thermodynamics cycles, gas compression and refrigeration and gas turbine engines – axial and centrifugal flow gas turbines.
- *Fluid Mechanics:* Introductory concepts; Fluid in motion; Continuity equation; Mass **conservation' Viscosity, Bernoulli's equation, Boundary layer; Laminar and turbulent flow.**
- *Heat Transfer:* Steady state and transition; heat conduction; Heat transfer by radiation; convective heat transfer, free and forced convection.
- *Engineering Drawing:* Machine drawings; electrical and electronics diagram, Basic drawing concepts, different types of projections.

Part II – MANAGEMENT- 16 Marks (8 Questions)

- *Organization and management:* Principles of organization and management , organization behavior, management level and function, managerial roles, importance of management. Theory of management. Management information system, Motivation and leading people, Personnel Management.
- *Internal Organization of companies:* Policy and executive groups. Administrative and functional groups. Organization structure.
- *Industrial engineering and management:* Quality Assurance, Quality Control, Production systems and planning forecasting techniques.

Part III – MECHANICAL – 40 Marks

1. Materials / Workshop Technology - 14 Marks (7 Questions)

- *Workshop Technology:* Bench tools and basic hand operations (Eg. Hacksaws, bench vices, hand drills, taps and dies, hand shears, rules, tapes and squares, soldering and brazing equipment, rivets types, scribing layout patterns, shearing and cutting sheet metal, riveting). Measuring and gaging.
- *Material properties:* Tool materials, low/medium and high carbon steels, hot and cold rolled steels, alloy steels carbide and ceramic materials. Heat treatment methods for steels: hardening, tempering, annealing, normalizing, quenching. Aluminum alloys and its properties, heat treatment of Aluminum alloys. Other non ferrous materials such as brass, bronze.
- *Sheet metal work:* Tools, marketing and layout, bending and rolling operations.
- *Engineering Mechanics:* Velocity and acceleration, Newton's law of motion, Newton's law of gravitation, workdone by force, kinetic energy of a particle. Principle of work and energy: appellation, power and efficiency potential energy, conservation, impulsive motion and impact.
- *Strength of Material:* Concept of stress. Axial Loading, normal stress, shearing stress, bearing stress. Application to simple structures.
- *Stress and strain:* Axial loading deformations; concept of strain. Normal strain under axial loading. Stress strain diagram, Hooks law, Modulus of elasticity. Elastic and plastic behavior. Deformation under axial load, Temperature effects. Poisson's Ratio. Shearing strain.
- *Torsion:* Stress and deformations a uniform shaft, shear stresses and angle of twist: Elastic range.
- *Pure bending:* Beam stresses in pure bending. Stresses and deformation in the elastic range.

2. Thermodynamics/ Heat Transfer/ Heat Engine- 12 Marks (6 Questions)

- *Thermodynamics properties:* Closed system, open system, working substance, pure substance: Properties and state. First law of thermodynamics/ Second law of thermodynamics. Properties of an ideal gas, liquids and vapors.
- *Refrigeration:* Air Compressors. Refrigeration and air conditioning.
- *Heat Engines:* gas turbines and its principles, theory.
- *Heat Transfer:* Modes of heat transfer, conduction/ convective/ radiation heat transfer.

3. Instrumentation and measurement 8 marks- (4 Questions)

- *Measurement:* Fundamentals of measurement. Sensors, transducers, resistance gages, thermistors and thermocouples, capacitate transducers, photoelectric transducers, piezoelectric transducers.

- Measurement of force and torque, Pressure measurement, Measurement of fluid flow.
- Temperature measurement, Motion measurement.

4. Machine construction 6 Marks- (3 Questions)

- *Loading tensile:* compressive, shearing, bending, bearing, torsion, common types of failure: failures related to loading types, Impact and plastic deformation effect, cyclic loading.
- *Ball and roller bearings:* Construction and types, friction and lubrication of ball bearing, bearing material.

Part IV – AERONAUTICAL – 20 Marks (10 Questions)

- *Aircraft wing:* Concept: basic structure, types of wing, flaps, slot, slat, aileron, spoiler aspect ratio, span.
- *Airfoil:* Concepts: vortex generator, boundary layer, laminar and turbulent flow. Angle of incidence, lift, drag, lift/drag ratio, different types of airfoils.
- *Flight control surface:* Concept: different types of flight control surfaces, axis of rotation.
- *Basic theory of flights:* General basic concepts, stall buffeting, center of gravity, center of pressure, straight level flight, subsonic, transonic and supersonic flight.
- *Propulsion:* General concepts of gas turbine engine, jet engine, turboprop engine and Bernoulli principal.
- *Gas Turbines:* Compressors, turbines, Diffusers, compression, ration, combustion system compressor stall.
- *Atmosphere:* General idea on different layers of atmosphere. Compressibility and incompressibility. Effects of temp, density and pressure on air viscosity.

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