

Nepal Airlines Corporation
Syllabus for Senior Technician (Grade –V)
Aircraft Maintenance Service, Ground Equipment (Automobile/Mechanical)
Open Competition

A. Stages and Procedures of Examination System

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

B. Material Contents

1. Fabrication Practice

- 1.1. Arc Welding: Principle, Arc Column Theory, Advantages and Application, Arc Welding Equipment and Accessories. Arc Welding Methods and Procedures, Welding Electrodes, Job Preparation in Arc Welding (surface preparation, fixing and tag welding, slag removing and re-striking), Welding Defects (Causes and Remedies), Safety in Arc Welding.
- 1.2. Oxyacetylene Welding (Gas Welding): Principle, Advantages and Applications, Equipment, Tools and Accessories (Uses and Care). Flame types(oxidizing, reducing and neutral) and their uses, Welding Techniques, Welding Defects (Causes and remedies). Flame Cutting Principle and Techniques, Special Tools Used in Flame Cutting, Special Safety Precautions in Gas Welding and Flame Cutting.
- 1.3. Resistance Welding: Principle, Types, Applications and Uses.
- 1.4. Heat Treatment: Concept, Uses, Advantages and Procedure. Types(Annealing, Hardening, Tempering, Surface Hardening, etc.). Concept Residual Stress and Normalizing.
- 1.5. Machine Shop Practice:
- 1.6. Types of Machining Methods and Materials Removal Processes
- 1.7. Accident Prevention and Safety Precautions in Machine Shop.
- 1.8. Limits, Fits and Tolerances: (Definitions, System and Uses)

2. Automobile Technology

2.1 Introduction and Short History of Automobiles.

2.2 Transmission and Mechanism:

- 2.2.1 Clutch
- 2.2.2 Gear Box
- 2.2.3 Propeller Shaft and Universal Joint
- 2.2.4 Rear Axle Assembly
- 2.2.5 Front Axle and Steering
- 2.2.6 Brakes

- 2.2.7 Suspension System
- 2.2.8 Wheels and Tires
- 2.2.9 Chassis and Frames

2.3 Fuel

- 2.3.1 Types
- 2.3.2 Properties of Liquid Fuels

2.4 Combustion Chambers of Diesel Engines

- 2.4.1 Types of Combustion Chambers

2.5 Indicated and Effective (Brake) Characteristics of Engine

- 2.5.1 Mean indicated Pressure
- 2.5.2 Indicated Power and Efficiency
- 2.5.3 Specific Fuel Consumption
- 2.5.4 Brake Power and Mechanical Losses

2.6 Super Charging:

Theoretical Cycle of supercharged engines, Supercharging systems, Turbo charging system, Inertia Supercharging systems.

2.7 Electricity, Magnetism and Automobile Wiring Circuits:

- 2.8 Automobile Battery:
- 2.9 Ignition Systems:
- 2.10. Automobile Starters:
- 2.11. Automobile Generator:
- 2.12. Automobile Cutout and Regulator
- 2.13. Accessories in Automobile:
- 2.14. Non Conventional Energy Vehicles: Battery Operated, Alcohol operated, Solar Operated, LPG and CNG operated.
- 2.15 Air Pollution and Its Controls:
CO and its measurement, HSU and Measurement, NO_x, Sox, HC, PbS Pollutants from Automobiles.

2.16 Traffic Rules and Regulations, Nepalese motor vehicle acts.

2.17 Concept of Maintenance, Repairs and Wear in Vehicles:

- 2.17.1 Types of maintenance repair and its purpose, Overhaul and running repair.
- 2.17.2 Types of Wear: Adhesives wear, Oxidative wear, Thermal Wear, Abrasive Wear, Pitting Wear.
- 2.18. Concept of Services Station Layout for Vehicle Repair and Maintenance: Types, and Characteristics of service stations.
- 2.19. Concept of Motor Vehicles: Forces acting on a motor vehicle, transmission, efficiency, road resistance, rolling resistance, air resistance, fuel economy and consumption trend equation.
- 2.20 Fundamental of Motor Vehicles: General on Braking dynamics, Braking Distance, Smoothness of run of amotor vehicles, cross country ability of motor ehicle with examples of 4×4 and 6×6 types of wheel formula.

3. Hydraulics and Pneumatics

- 3.1 Hydraulic system: General and types.
- 3.2 Hydraulic fluids: types and properties.
- 3.3 Pumps: Gear/Vane/Piston/Pumps and their uses and principle.
- 3.4 Hydraulic Cylinders: types (Single/double acting, Vane and Miscellaneous type cylinders).
- 3.5 Purpose, Function and Types of Hydraulic Valves: Pressure/Flow/Direction Control Valves.
- 3.6 Hydraulic Motors: Types (Gear/Vane/Piston)
- 3.7 Accumulators: Purpose and Function, Spring/Weight Loaded Accumulator, Pneumatic accumulator.
- 3.8. Hydraulic filters, Oil Cooler and Reservoir
- 3.9. Components of pneumatic Systems
- 3.10 Compressors: Types and uses
- 3.11 Air Cylinders, Air Motors.
- 3.12 Valves: (Pressure/Flow/Direction Control Valves).
- 3.13 After Cooler and Driers:
- 3.14 Receiver and Filters: selection of Filters.

4. Material science

- 4.1. General Properties of Materials: Physical Properties, Mechanical properties, Electrical properties, Magnetic properties, Thermal Properties.
- 4.2. Carbon Steels: Iron Systems, Reading of Iron Carbon Diagram, Properties and Uses of Carbon Steel.
- 4.3. Alloy Steels: Classification, Effect of Alloying Elements, Properties and uses of Alloy Steel.
- 4.4. Heat Treatment Processes: Hardening, Surface Hardening, Tempering, Annealing, Normalizing.
- 4.5. Corrosion and its Preventions.
- 4.6. Cast Iron: Types, Uses and Properties.
- 4.7. Non Ferrous Metals: Composition, Properties and Uses.
 - 4.7.1 Aluminum and its Alloy.
 - 4.7.2 Copper and its Alloy.
 - 4.7.3 Bronze and Brasses.
 - 4.7.4 Mechanical (Destructive) Testing of Metals.
 - 4.7.5 Non Destructive Testing of Metals.
- 4.8. Non Metals: Properties, Classification and Uses.
 - 4.8.1 Lubricants.
 - 4.8.2 Fuels.
 - 4.8.3 Bonding Materials, Gaskets, Packing.
 - 4.8.4 Polymers.
 - 4.8.5 Rubbers and Materials used in tires and tube.
 - 4.8.6 Ceramics and minerals.
 - 4.8.7 Paints and Polishes.
 - 4.8.8 Materials used in Upholstery.
 - 4.8.9 Timbers.
 - 4.8.10 Composite Materials.
 - 4.8.11 Glass.

5. Industrial Management.

- 5.1. Production Management: Production System, Production Process and plant layout, productivity, time and motion study.
- 5.2. Materials Handling.
- 5.3. Quality Control: Objective and Importance, TQM.
- 5.4. Inventory Management: Meaning and Necessity.
 - 5.4.1. Procurement: System and Process.
 - 5.4.2. Store: Objective and Function, Duties and Responsibility of Store Keeper.
 - 5.4.3. Inventory Level and Economic Order Quantity.
- 5.5. Estimating and Costing: Estimating and Costing of Jobs in machine shop, sheet metal shop, welding/fabrication shop, plumbing shop, automobile service shop.

6. Industrial Hygiene and Safety.

- 6.1 Industrial Environment: Health Hazards and their preventions.
- 6.2 Pollutions in Industrial Environment: Air Pollution, Industrial Vibration, Noise Pollution, Electromagnetic Radiations.
- 6.3 Electrical Accident Prevention.
- 6.4 Industrial Lighting and Ventilation.
- 6.5 Fire Protection:
 - 6.5.1 Fire Hazards and Principles of accident prevention.
 - 6.5.2 Storage of Explosives and flammable inventories.
 - 6.5.3 Fire Alarm System.
 - 6.5.4 Suppression of fire and fire fighting equipments.
- 6.6 Chemical Handling: Effects of Toxic Materials, Permissible Limits, Store of Toxic Materials.
- 6.7 Safety Requirements of Industrial Equipment and Processes: Machine Guarding, Operating Controls, Safeguards, Interlocks, Signals and Colors, Hoisting, Loading and Handling Mechanisms.

7. Applied Electronics.

- 7.1 Fundamentals and Basic Electronic Circuits: Diode, LED, Transistor, Thyristor, SCR, Amplifier and Op-amp, Half wave and full wave bridge rectifiers and filters.
- 7.2 Sensing Devices: Sensors (Mechanical, Electrical, Electronic, Magnetic, Optical, Thermal).
- 7.3 Motor Control Circuits: Servo Mechanism, Motor Control using PLC, DC motor control by SCR.

8. Thermodynamics and Heat Engines.

- 8.1 First law of Thermodynamics.
- 8.2 Thermodynamic properties of Fluids: Internal Energy, Specific Heat Capacities.
- 8.3 Heat Engine Cycles: Petrol and Diesel Engines.

9. Engineering Drawing.

9.1 Drawing of Fastening and Connecting Means (Permanent and Temporary):

9.1.1 Riveted Joints and Symbols.

9.1.2 Welded Joints and Symbols.

9.1.3 Temporary Fastening: Knot Bolts, Key Joints, Spline Joints, Threaded Joints.

9.2 Drawing of Power Transmission Trains:

9.2.1 Gear Drive System: Spur Gear, Worm Gear, Bevel Gear.

9.2.2 Sprocket and Chain Drive.

9.2.3 Pulleys and Belt Drive.

9.3 Drawing of Pipes and Pipe Connections: Symbols of Pipe fittings and Joints.

9.4 Assembly and Disassembly Drawings of Machine Parts.

9.5 Shop Drawing: Details Parts Drawing, Manufacturing Drawings.

9.6 Drawing Sheet layout and Presentation.

10. Metrology

10.1 Standard units of Measurement used in Engineering Practices.

10.2 Measuring Instruments (Their Constructions, Types, Applications and Care):

10.2.1 For Linear Measurements: Precision and Non-Precision.

10.2.2 For Surface level and Surface Straightness measurements: Spirit Level, Straight Edge, Surface Gauge, Optical Flat, Interferometer and Surface Plate.

10.3 Graduation (Calibration) and Reading of Measuring Instruments.

10.4 Error, its Types and Measurement of Errors: Flatness, Straightness, roundness, parallelism, Cylindricity, perpendicularity, angularity, intersection of axes, concentricity.

11. Electrical Engineering

11.1. DC Circuits: Series, Parallel and Mixed Circuits. Kirchoff's Law. Electrical Works, Energy and Power. Units and Measurements. Current Density and fuses. Efficiency.

11.2. Electric Field: Laws of Electric fields. Capacitors (construction, charging and discharging, series-parallel connections).

11.3. Magnetic Fields: Electro Magnetism (Electromagnetic Induction, Eddy Currents, force on a current carrying conductor).

11.4. Inductance: Symbol, Units, Series and Parallel connections.

11.5. Electromagnetic Devices: Protective Switches, Relays, Circuit Breakers, etc.

11.6. AC Circuits:

11.6.1. Alternating Currents: Generation, Frequency, Period and Cycle.

11.6.2. Ohmic Resistance and Impedance: Vector Representation and Phasor Diagram. Phase Angle.

11.6.3. AC Power: Active, Reactive and Apparent Power, Power Factor.

11.6.4. Three Phase AC Circuit: Concept of Generation and the Rotary Field, Star and Delta Connection, Measurement of Power.

11.6.5. Electrical Engineering Applications:

11.6.5.1. Primary and Secondary Cells (Lead Acid Accumulators): Construction, Properties, Function and Application.

11.6.5.2. Electric Traction: Trolley buses, Rail ways, Rope Ways, Cable cars.

11.6.5.3. Heating, Lighting and Industrial Ventilation: Electric furnaces, lamps and fans.

11.7. Electrical machines:

11.7.1. Transformer: Working principle, construction, operation and types.

11.7.2. AC motors:

11.7.2.1. Induction motors: Working principle, construction and operation.

11.7.3. DC motors:

11.7.3.1. Working principle, construction, operation and types.

11.8. Generators: Working Principle and Types.

11.9. Power and efficiency of electrical machines.

11.10. Construction, operation, working principle and uses of fuses, circuit breakers, switches, starters, contactors, relays and other control and protective devices.

11.11. Earthing: uses, concepts and methods.

11.12. Electrical measurements: measurement of current, voltage, power, energy, insulation resistance, resistance. Use of Multimeter and Meggar.

11.13. Maintenance and Safety: Fault finding, concept of preventive maintenance and routine checkup.

12. Computer Application

12.1. Computer system: Hardware, software and memory devices.

12.2. Computer operating systems: General idea of MS Windows, Application Programs: MS Office Package.
