

Nepal Airlines Corporation
Syllabus for Senior Technical Officer Grade- VII
Aircraft Maintenance Service, Maintenance (Avionics)
Open Competition

Stages and Procedure of Examination System

First Stage: Written Examination - Full Marks 200

Weightage Allocation and Marks Distribution

S.N.	Paper	Subject	Time	Full Mark	Section	Marks
1	I	Institutional Knowledge and Management	3 Hrs.	100	Section "A" Institutional Knowledge	Long Answer 3x10 =30 Short Answer 4x5 =20
					Section "B" Management	Long Answer 3x10 =30 Short Answer 4x5 =20
2	II	Service Related	45 Min.	100	Multiple Choice Questions	50x2=100

Second Stage - Interview

Individual Interview

Full Marks - 30

द्रष्टव्य :

१. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी वा दुवै हुनेछ ।
२. प्रथम, द्वितीय र तृतीयपत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।
३. लिखित परीक्षामा यथासम्भव पाठ्यक्रमका सबै एकाइबाट प्रश्नहरू सोधिनेछ ।
४. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरूको गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अङ्क कट्टा गरिनेछ तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन ।
५. विषयगत प्रश्नमा प्रत्येक पत्र/विषयका प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तर पुस्तिकाहरू हुनेछन् । परीक्षार्थीले प्रत्येक खण्डका प्रश्नहरूको उत्तर सोही खण्डका उत्तर पुस्तिकामा लेख्नुपर्नेछ ।
६. यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरू परीक्षाको मितिभन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाइएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ ।
७. प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।
८. यस भन्दा अगाडि लागू भएका माथि उल्लिखित सेवा/समूहको पाठ्यक्रम खारेज गरिएको छ ।
९. पाठ्यक्रम लागू मिति :- २०७९।०१।०४

Paper I

Subject: Institutional Knowledge and Management

Full Marks: 100

Time: 3 Hrs.

खण्ड (क) :- संस्थागत ज्ञान (५० अङ्क)

१. संस्थागत ज्ञान : (२X१०) + (२X५) = ३० अङ्क

- १.१ नेपाल वायुसेवा निगमको स्थापनाको उद्देश्य, संगठनात्मक संरचना, कार्यक्षेत्र समस्या र चुनौती
- १.२ नेपाल वायुसेवा निगमको पुनर्संरचनाको आवश्यकता र औचित्य
- १.३ नेपाल वायुसेवा निगमबाट प्रवाह हुने सेवाको गुणस्तर, गुणस्तर नियन्त्रण तथा सेवाग्राहीको सन्तुष्टि तथा सेवाको मूल्य निर्धारण सम्बन्धी व्यवस्था
- १.४ अन्य वायुसेवाहरू सँगको प्रतिस्पर्धा, चुनौती तथा भावी कार्यदिशा
- १.५ अन्तर्राष्ट्रिय नागरिक उड्डयन संगठनको स्थापना, लक्ष्य तथा उद्देश्य
- १.६ नेपाल नागरिक उड्डयन प्राधिकरणको स्थापना, लक्ष्य, उद्देश्य, कार्यहरू र नियमनकारी भूमिका
- १.७ नेपालमा सार्वजनिक संस्थानको आवश्यकता, उद्देश्य, स्वायत्तता, उत्तरदायित्व, समस्या र चुनौती
- १.८ संस्थागत सुशासनको अवधारणा र नेपाल वायुसेवा निगमको संस्थागत सुशासनको अवस्था
- १.९ आवधिक योजनामा हवाई क्षेत्र

२. संविधान र सम्बद्ध कानूनहरू (१X१०) + (२X५) = २० अङ्क

- २.१ नेपालको वर्तमान संविधानको मौलिक हक र कर्तव्य, नीति तथा दायित्व, राज्यका निर्देशक सिद्धान्तहरू
- २.२ नेपाल वायुसेवा निगम ऐन, २०१९
- २.३ नेपाल वायुसेवा निगमका कर्मचारीहरूको सेवा, शर्त सम्बन्धी विनियमावली
- २.४ सुशासन (व्यवस्थापन तथा सञ्चालन) ऐन, २०६४ र सुशासन (व्यवस्थापन तथा सञ्चालन) नियमावली, २०६५
- २.५ सार्वजनिक खरिद ऐन, २०६३

खण्ड (ख) :- व्यवस्थापन (५० अङ्क)

3. General Management (1 X 10) + (2 X 5) = 20 Marks

- 3.1 Modern Approaches to Management
- 3.2 Motivation, Leadership, Control, Coordination and Team Work
- 3.3 Role of Manager and Managerial Functions
- 3.4 Managerial Decision Making and Problem Solving
- 3.5 Managing Workforce Diversity
- 3.6 Succession Planning
- 3.7 Quality management and TQM Techniques

4. Organizational Change and Development (1 X 10=10 Marks)

- 4.1 Concept of Organizational Change
- 4.2 Forces of Organizational Change
- 4.3 Resistance to Change and Overcoming the Resistance to Change
- 4.4 Concept and Characteristics of Organizational Development

4.5 General Concept and Dimensions of Development

4.6 Project Management: Use of Network Models like CPM, PERT, Manpower Planning and Resource Scheduling, Project Monitoring and Control, Project Cycle

5. Application of IT in Office Management (2 X 5=10 Marks)

5.1 Basic Knowledge of IT

5.2 Role of IT in Employee and Organizational Performance

5.3 Use of IT in HRM and Accounting System of Nepal Airlines Corporation

6. Management Information System (MIS) (1X 10 =10 Marks)

6.1 Information and Decision Making

6.2 Role and Importance of MIS

6.3 Impact of Information System in the Organization and the Society

6.4 MIS as a Tool for Management Process

Paper II
Subject: Service Related

Full Marks: 100 (Multiple Choice Questions 50x2)
Time: 45 Minutes

Part I: FUNDAMENTALS (10x2=20 Marks)

1. Computer

- Historical development: Classes of computer, historical development of computers, generation of electronics computers.
- Computer systems and organization: Computer hardware, computer software.

2. Electrical

- 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.

3. Basics Electronics

- Introduction to instrumentation: The oscilloscope and its operation, digital voltmeter, ammeter, ohmmeter.
- Circuit concepts: diodes and diode circuit, semi conductor devices.

4. Mechanical

- 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.

5. Engineering Drawing

Machine drawings; electrical and electronics diagram, Basic drawing concepts, Nowerclative; project various projections drawing concept.

Part II – ELECTRICAL/ELECTRONICS/COMMUNICATIONS (10x2=20 Marks)

1. Communication:

A. Analog Communication

- Communication Channels Overview: free space, wire, cable waveguide and fiber, telephone and data channels.

- Liner Modulation: Modulation properties, AM and DSBSC modulation, demodulators and detectors- square law.
 - Angle Modulation: instantaneous frequency and Bessel functions, frequency modulation, and narrowband FM, modulator configurations, demodulators, discriminators.
- B. Digital Transmission:
- Fundamentals of Baseband Pulse Transmission: transmission channels, Basic digital communication transformations. Time division multiplexing and asynchronous transfer mode.
 - Introduction to Switching System: Evolution, basics of switching systems, digital and time division switching SPC
 - Signaling Equipment and systems: Signaling functions, analog and digital subscriber, signaling, signaling within an exchange, voice frequency and outband register, line signaling, common channel signaling, new trends in switching systems- a case study.
- C. Digital Communication:
- Data transmission and digital Modulation Techniques: Signal receivers and error probability, optimum filters the matched filter, coherent and non coherent receivers, binary phase shift keying (BPSK), quadrature phase shift Keying (QPSK) and M-ary PSK, frequency shift keying (FSK), imperfect synchronization and error probability in PSK and FSK systems, quadrature amplitude shift keying (QASK), other methods of digital modulation.
 - Pulse Code Modulation (PCM): Encoders, decoders and companders, multiplexing and synchronizing, differential PCM, noise in PCM systems.

2. Wave and Propagation (10x2=20 Marks)

A. Electromagnetic field and Wave:

Introduction: Review of electromagnetism, Laplace's and Poisson's equations, boundary value problems, sinusoidally varying field, Maxwell's equations in Phasor form.

Uniform Plane Waves: Uniform plane waves in free space, wave polarization, the wave equation and solutions for material media, wave impedances and intrinsic impedance, waves in dielectrics and conductors, Poynting vector, power dissipation, energy storage, refraction and refraction, standing waves, skin depth.

Transmission lines: Transmission line configurations, transmission line equations, primary and secondary parameters, time domain analysis, discontinuities and reflection, shorted and open line, reflection coefficient, VSWR, arbitrary terminations, impedance matching, Smith chart, matching methods, the dissipative transmission line.

Waveguides: Introduction to waveguides, TE and TM modes in a parallel plate wave guide dispersion, phase and group velocities, rectangular waveguides, cylindrical waveguides, cavity resonators, dielectric waveguides, optical waveguides and systems.

B. Antenna and Wave Propagation:

Antenna fundamentals: Review of Maxwell's equations and the wave equations. Solution of the wave equations in free space, wave velocity, wave impedance, Poynting's vector and Polarization.

Antenna Terminology and Parameters: Radiation pattern, radiation lobes, half power beamwidth, front to back ratio, beam angle, beam efficiency, directivity, directive gain, power

gain antenna efficiency, frequency bandwidth, antenna input impedance, self impedance, mutual impedance.

Various Types of Antennas: Short and long dipoles: radiation pattern, radiation resistance and directivity; folded dipoles, monopoles, ground plane considerations, travelling wave antennas: beverage antennas, Vee antennas, rhombic antennas; broadband antennas: biconical antennas, disc antennas, helical antennas; Frequency independent antennas: spiral antennas, log periodic antennas; Array antennas: Yagi Uda arrays, log periodic arrays; Reflector antennas, feed configuration for parabolic antennas, lens antennas.

Wave Propagation: Free space propagation, Friis transmission formula, ground wave propagation, pseudo Brewster angle, skywave propagation, refraction, virtual height, critical frequency, maximum usable frequency, skip distance, VHF and UHF propagation, diffraction Fresnel zones, path loss due to smooth earth and knife edge obstacles, microwave propagation.

C. Signal and systems:

Introduction: Signal classification, use of signals, examples of signals, continuous and discrete time signals and systems.

Fourier series and transform: Fourier series: representation of periodic signals and properties; Fourier integral: representation of periodic and periodic signals; Forward and reverse/inverse Fourier transform properties.

Signal Transmission: Filtering: frequency selective and frequency shaping: Modulation Noise, Energy and power: white and colored noise, stochastic signals finite energy and finite power signals, Parseval's theorems, signal to noise ratio.

3. POWER (10x2=20 Marks)

A. Power Electronics:

Introduction : Recent advancement in power electronics and its application: power semiconductor switching devices; power diodes, power transistors, power MOSFET, IGBT, MCT and their characteristics; Freewheeling; diodes with RC and RL, LC and RLC loads.

Thyristor: Principle of operation, construction, two transistor analogy, gate characteristics, rating turn on/off mechanism, protection and cooling, firing circuits, optoisolators and pulse transformer, trigger devices (UJT, PUT, DIAC, UJT/PUT relaxation oscillator), series and parallel operation of Thyristor, Triacs and GTO.

Static Switches: Single phase and three phase AC switches, three phase reversing switches, AC switches for bus transfer, DC switches, solid state relay and design of static switches.

Thyristor Converters: Single and three phase rectification, half and full controlled rectifiers, introduction to twelve pulse converters, rectifiers with inductive load., AC voltage controllers and cycle converters, Harmonic analysis and their remedial methods.

Inverters: Principles and types, adjustment of AC frequency and voltage, PWM- inverter; Commutation; Inverter operation with inverse power flow.

B. Instrumentation and Measurement:

Introduction to process control: Definitions of terms used in measurement and instrumentation; measurement, instrument, measured, meter, metrology, Example of process control, automatic process control. Advantages of electronics in measuring systems; Measurement and process

control systems; analog measuring system model: temperature control process with analog method; Digital processing systems; digital supervisory and analog process control systems, computer based direct digital control.

Fundamental and Derived Units in the SI Units: Standards, accuracy, precision, resolution, sensitivity, significant figures, errors, limiting error, statistical analysis: average/mean value, deviation from mean value, average deviation, standard deviation, variance, probability of error, histogram, probable error.

Introduction to Electromechanical indicating Instruments: Operating principle of permanent magnet moving coil (PMMC) galvanometer, dynamic behavior of PMMC movement, taut band suspension galvanometer; DC meters: ammeters, voltmeter, ohmmeter, voltmeter loading effects, meter protection techniques, electronic voltmeter.

AC Measurement: Sinusoidal signal parameters (average, RMS, peak and peak to peak relations): parameter relations in half wave rectified sinusoidal signals, triangular wave forms and signals with sinusoidal waves superimposed and square waves. Measurement with PMMC movement using single diode and bridge diode rectification; The form factor, Operating principle of AC voltmeter, peak reading meter, current transformer, power meters, power factor meter, watt hour meter and electro-dynamometer, Cathode Ray Oscilloscope based principles and application.

Introduction to signal Conditioning: Analog signal conditioning: Linearization techniques, signal conversion, filtering, impedance and power matching; operational amplifier in various configurations: ideal Op-amp analysis, Op amp specifications, non inverting amplifier, inverting amplifier, summing amplifier, differential amplifier, instrumentation amplifier, integrator, differentiator, logarithmic amplifier, comparator.

Digital Signal conditioning Circuits: Interfacing with the analog world (principle); Digital to analog conversion principle and circuits: standard DAC with binary inputs, DAC resolution, step size, input weight etc. DAC formulae, DAC with BCD input codes, bipolar DACs, DAC circuits, integrated circuit DACs; Analog to digital conversion: Counter type ADC, successive approximation type ADC, flash type ADC and design principle, resolution, reference voltage and formulae, integrated ADC circuits, sample and hold techniques and circuit principle. Time multiplexing techniques.

Actuators: Relays, solenoids and electronic switches; silicon-controlled rectifiers, triacs, diacs. Transducer and Sensors: Measuring principles using bridges: resistance measurement with wheat stone bridge, inductance measurement with Maxwell and Hay bridges, capacitance measurement with Schering bridge, bridge unbalanced conditions and their use in measurement, problems in bridges; Voltage measurement using potentiometer, semiconductor sensors (thermistors) thermocouple; Optical sensor, light to resistance.

Part III – AVIONICS (10x2=20 Marks)

- Operation of Aircraft Communication System: VHF Communication, HF Communication
- Operation of short range navigation system
- Automatic Direction Findings (ADF): Introduction, basic principles
- VHF Omni directional Range (VOR): Introduction, basic principles
- Instrumental Landing system (ILS): Introduction, basic principles
- Distance measuring Equipment (DME): Introduction, basic principles

- Operation of flight instrument
- Air Speed Instrument (ASI): Introduction, basic principles
- Vertical Speed Indicator (VSI): Introduction, basic principles
- Altimeter: Introduction, basic principles
- Gyro: Introduction, basic principles
- Turn and Slip Indicator (TSI) : Introduction, basic principles