नेपालनागरिक उड्डयन प्राधिकरण
प्राविधिक सेवा, मेकानिकल ईन्जिनियरिङ्ग समूह, सातौं तह, वरिष्ठ अधिकृत पदको खुला/आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

द्वितीयपत्र : सेवा सम्वन्धी

खण्ड (क) - ५० अङ्क

1. Workshop Technology and Metrology

1.1. Basic tools and Basic hand operations
1.2. Machine tools: Lathe, Shaper, Milling, Drilling and Grinding machines
1.3. Metal Joining: Soldering, Brazing, Electric arc welding, Gas welding and Cutting
1.4. Types of fits
1.5. Errors in measurement
1.6. Accuracy and Precision of Measuring Devices
1.7. Linear measurement: Block Gauge, Length Bars, Comparators
1.8. Calibration of measuring instruments

2. Materials Science, Metallurgy and application

2.1. Materials: Types, selection, Properties
2.2. Metals
    2.1.1 Ferrous metal and alloys, grain structure, Grain Growth, Imperfection, Phase diagram, principle of micro constituent of iron-carbon and equilibrium diagram.
    2.1.2 Non-Ferrous metal (Copper, Lead, Zinc, Tin, Nickel, Aluminum, Vanadium and commonly use metal)
2.3. Alloys (Ferrous and non-ferrous alloys)
2.4. Non-metals (Synthetic, Fibers, Rubber, Glass, plastic, wood and other commonly use substance)
2.5. Mechanical properties and testing: Tension, Impact, Fatigue, Hardness Test
2.6. Cold working and Hot working
2.7. Phase Transformation and Heat Treatment: Iron-Carbon Equilibrium Diagram, Hardening, Tempering, Annealing, Normalizing
2.8. Types of steel

3. Thermodynamics

3.1. Basics concepts: Thermodynamic system, Thermodynamic property, Pure substance, Zeroth Law
3.2. First Law of Thermodynamics: Control mass and control volume formulation
3.3. Second Law of Thermodynamics: Heat engine, refrigerator and heat pump, Kelvin Planck and Clausius statements, entropy, entropy generation

4. Machine Component Design and Drawing

4.1. Types of projection
4.2. Production drawing and shop drawing
4.3. Terminologies of mechanisms, mobility and degree of freedom
4.4. Factors affecting choice of materials for design: strength, toughness, durability, hardness
4.5. Loading: tensile, compressive, shearing, bending, bearing and torsion
4.6. Common types of failure: Theories of failure, stress concentration effects, ductile and brittle materials, factor of safety

5. Electro-Mechanical Equipment

5.1. Pumps and Motors

5.1.1 Pumps: Centrifugal pump and reciprocating pump (working principle and characteristics)
5.1.2 DC Motors: Shunt field, series field and compound field motors, Torque-speed characteristics

5.2. Power Generation Devices
5.2.1. Generator Types, Application and Selection
5.2.2. Concept of Transfer Switch, AMF Panel, Application, Requirements and selection
5.2.3. Uninterruptible Power Supplies (UPS),

5.3. Maintenance Management of Mechanical Equipment: Types and planning of Maintenance, Spare parts management
5.4. Working principle of Electric Vehicle, their components and functions

6. Airport Terminal Facilities Equipment

6.1. Elevator: Operation, Maintenance, Selection Criterion and Troubleshooting
6.2. Escalator: Operation, Maintenance, Selection Criterion and Troubleshooting
6.3. Baggage Handling System (BHS): Working principle, Types, Layout, Components and Troubleshooting
6.4. Basic concept of Aerobridge
6.5. Airport Trolley

7. Airport Rescue and Firefighting (ARFF) Vehicles

7.1. Automatic Transmission System
7.2. Firefighting pump
7.3. Concept and application of Pneumatic System
7.4. Concept and application of Hydraulic System
7.5. Power Take-Off

खण्ड (ख) - ५० अङ्क

8. Automotive System

8.1. CI engine, SI engine: Functions and components,
8.2. Braking system, Transmission system, Suspension system, Cooling system, Lubricant system, Steering system, Exhaust system, Troubleshooting of each system
8.3. Electrical system, Fuel injection System, Types and Properties of Batteries and Troubleshooting of each system
8.4. Identification of need of engine overhaul
8.5. Purpose and function of super charger and turbo charger
8.6. Types of wheel, tyres and rating of tyres, Advantages and disadvantages of radial ply and cross ply tyres
8.7. Types of Fuel, Types of Lubricants, application and replacement
8.8. Vehicular Emission Standards and Preventive measures and pollution control

9. Refrigeration and Air condition system

9.1. Air conditioning Equipment, Design and Selection
9.2. Cooling Load and Heating Load calculation
9.3. Refrigerant: Type, Properties, Environmental effect and selection criteria
9.4. Refrigeration: Reversed Carnot cycle, Vapor compression cycle, Vapor absorption cycle, Refrigerants and their properties

9.5. Air conditioning: Psychometric properties and psychometric chart, heating, cooling, humidification, dehumidification process, Air conditioning systems
9.6. Troubleshooting and Maintenance of Air condition system/Equipments

10. Industrial and Project Engineering

10.1. Plant location and Plant layout design
10.2. Workshop layout and design
10.3. Network Methods: PERT and CPM
10.4. Inventory Control: Inventory costs and Inventory models

11. Engineering Economics

11.1. Types of engineering economic decisions
11.2. Time value of money: simple interest, compound interest, continuous compound interest
11.3. Project Evaluation Techniques: Payback period method, NPV method, Future value analysis and IRR method
11.4. Benefit and Cost Analysis: Cost benefit ratio, breakeven analysis
11.5. Depreciation and its types

12. Professional Practice

12.1. Contract Law
  12.1.1. Dispute Resolution in Contract
  12.1.2. Claim and Arbitration
  12.1.3. Standard Bidding Document: International Competitive Bidding (ICB) and National Competitive Bidding (NCB)
12.2. ICAO Annex–14 Part-1, Chapter 8, Manuals and Circulars (related with mechanical equipment, system and facilities)

द्वितीय पत्रबाट निम्नानुसार प्रश्न सोधिनेछ :

द्वितीय पत्र (विषयगत)				
विषय	**खण्ड**	**अङ्कभार**	**छोटो उत्तर**	**लामो उत्तर**
सेवा सम्वन्धी	**(क)**	५०	२ प्रश्न x ५ अङ्क = १०	४ प्रश्न x १० अङ्क = ४०
	(ख)	५०	२ प्रश्न x ५ अङ्क = १०	४ प्रश्न x १० अङ्क = ४०
जम्मा		**१००**	४ प्रश्न x ५ अङ्क = २०	८ प्रश्न x १० अङ्क = ८०