

नेपाल नागरिक उड्डयन प्राधिकरण
प्राविधिक सेवा, इलेक्ट्रिकल इन्जिनियरिङ्ग समूह, नवौं तह, प्रबन्धक पदको खुला/आन्तरिक प्रतियोगितात्मक
लिखित परीक्षाको पाठ्यक्रम

द्वितीय पत्र : सेवा सम्बन्धी

खण्ड (क) - ५० अङ्क

1. **Electrical Machine:**

- 1.1 **Transformers:** type, construction, load and no load condition, open circuit and short circuit test, equivalent circuit, losses, efficiency and voltage regulation, auto transformer, parallel operation, load sharing, instrument transformer
- 1.2 **DC Machines:** type, construction. voltage /speed/ load characteristics of dc generators, separate and self-excited machines, voltage regulation of generator, torque/speed characteristics of shunt field, series field and compound field motors, armature reaction and commutation, DC motor starters, speed regulation and control of DC motor
- 1.3 **Synchronous Generators:** classification and construction, voltage regulation of an alternator by synchronous impedance method and mmf method, losses and efficiency, power angle characteristics
- 1.4 **Synchronous Motors:** equivalent circuit, power and torque, effect of excitation, stability v-curve, hunting, starting and application
- 1.5 **Induction Motors:** type, construction, equivalent circuits. torque-slip characteristics starters, speed control and motor selection
- 1.6 **Induction Generators:** principle of operation, application, controllers and harmonics

2. **Power System Analysis**

- 2.1 **Load Flow Study:** Load characteristics, effects on voltage and frequency, real power frequency balance, reactive power frequency balance, basic complex power flow equations for a network, voltage profile and VAR compensation, causes and effects of low power factor, advantages and methods of power factor improvement.
- 2.2 **Control and Protection:** Faults in power system and their calculation, Components of power system protection, Isolators/Disconnecting switches, contactors, Types and characteristics of circuit breakers and protective relays, Automatic reclosure, Protection of generators, transformers and transmission/distribution lines, Lightning protection, Governor's principle and characteristics
- 2.3 **Distribution System:** Types of Distribution systems, Distribution substations, Bus bar schemes, Power factor correction, Protection coordination in distribution systems, Distribution system reliability indices, rural distribution system and Loss reduction

3. **Power Distribution and Consumer Services**

- 3.1 Sub-station & switchyards: General layout of Sub-station and their key elements. Types of underground Cable, Cable Resistances and Capacitances, Insulation Resistance, Handling of cable and protection, Cable joints, Single wire power Distribution, lightning phenomenon, lightning arrestors types and function, overhead earth wire, voltage drops, Ferranti effects, SIL of Transmission Line
- 3.2 Earthing of electrical system and electrical equipment. its importance and methods of earthing
- 3.3 Energy Tariffs structure

4. **Economics of Power Utilization**

- 4.1 Basic concept about Energy Audit, Load management TOD meter, Demand side management

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- 4.2 Power Factor Improvement: Causes and effects of low power factor, advantages and methods of power factor improvement
- 4.3 Economics of power generation, Load forecast, demand factor, load factor, plant use factor, diversity factor, energy rates (tariff), depreciation, Rate of Return
5. **Electrical Maintenances**
 - 5.1 Maintenance schedules – Periodic, Preventive and emergency maintenance
 - 5.2 Fault finding and fault reporting: fault reporting procedures, fault category and action plan, maintaining log, fault clearing and logging and fault recording system
 - 5.3 Check list of equipment – Daily, Weekly, Monthly and Yearly
 - 5.4 Duty and Responsibilities of Shift- In charge and section Chief, Roaster Duty, Manpower Management and Leadership, Motivation
6. **Electrical Safety**
 - 6.1 Physical effect of electric shock, safety rules and regulation, safety tools and devices, explosion of electrical equipment in premises and precaution to be taken
 - 6.2 Concept of touch voltage, effects of non-ionizing electromagnetic fields on human, earthing and shielding techniques for electrical equipment
 - 6.3 Fire hazards, firefighting techniques and equipment, First aid requirements for after the event treatment
 - 6.4 Fire Alarm System - Principle and operation, electrical induction into communication and transmission lines, effects of non-ionizing magnetic fields on human body, Noise hazard
7. **Engineering Economics**
 - 7.1 Cash flow analysis, project evaluation indicator, payback period, risk analysis, taxation system in Nepal, Energy Tariff
8. **Project management and Administration**
 - 8.1 Inventory Control & Management
 - 8.2 Budget Planning and Allocation
 - 8.3 National Standard Bidding Document, PPMO guidelines
 - 8.4 International Standard Bidding Document
 - 8.5 Terms of Reference (ToR), EOI, Contract Documents
 - 8.6 Construction Managements: Work Schedule, Preparation of progress reports, Monitoring and evaluation, Quality control and Assurance
 - 8.7 Contract Dispute Resolution
- खण्ड (ख) - ५० अङ्क**
9. **Visual Aids and Aeronautical ground lighting system**
 - 9.1 Lighting fixture and structures, Elevated lights, Surface (Inset) lights, Airport Lighting Control and Monitoring System (ALCMS) based on TCP/IP (Touch screen control)
 - 9.2 Application, Location and Characteristics of lights: Aerodrome beacon, circling guidance system, runway threshold identification lights, runway edge lights, runway threshold lights, wing bar lights, runways end light, runway center line lights, runway touchdown zone lights, rapid exit taxiway light, stop way light, taxiway center line lights, taxiway edge lights, runway turn pad lights, stop bar lights, runway guard lights.

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- 9.3 Approach Lighting System: Simple Approach Lighting System, Precision Approach Lighting System, types and characteristics of approach lighting system, intensity control of approach lights.
- 9.4 Visual Approach Slope Indicator System: PAPI and APAPI
10. **Aerodrome Safety Management System (DOC 9859)**
 - 10.1 Safety management system, Safety management applicability, Implementing safety management, Integrated risk management, Safety objectives, Safety performance indicators and safety performance targets, Monitoring safety performance
 - 10.2 Safety data collection, Safety analysis, Safety data processing, Safety data and safety information management, Reporting of analysis results, Safety information sharing and exchange, Data-driven decision-making
 - 10.3 State safety management, State safety program (SSP), State safety policy, objectives and resource, State safety risk management, State safety assurance, State safety promotion, SSP implementation
 - 10.4 SMS framework: Safety policy and objectives, Safety risk management, Safety assurance, Safety promotion, Implementation planning
11. **Electrical Circuits**
 - 11.1 Electrical characteristics, Series circuits, Parallel (multiple) circuits, Comparison of series and parallel lighting circuits, Series circuitry for aerodrome lighting, Grounding, Step-down transformers, Series cut-out
 - 11.2 Aerodrome Lighting Circuit: Interleaving of aerodrome lighting circuits, Arrangement in the electrical vault, Provision of interleaving, Possible provision of interleaving Selective switching of taxiway circuits
 - 11.3 Constant current regulators: Types of constant current regulators, Operating characteristics of constant current regulators, Rating characteristics of constant current regulators, Open circuit and over-current protection
 - 11.4 Load calculations/regulator sizing: Types of loading, Calculation of lighting facility load
12. **Aerodrome ground lighting series transformers**
 - 12.1 Functions, Transformer design, Enclosure, Transformer ratings, Several lamps from a single transformer, Effects of open circuited secondary of transformer, Lamp by-pass devices, Transformer stand
 - 12.2 Control and monitoring of aerodrome lighting systems: Apron control panel, Control circuitry, Types of remote control systems, Transfer relay panel, Use of relays, Interconnection of controls, Automatic controls, Monitoring of aerodrome lighting circuits, Classes of monitors
13. **Aerodrome Certification, Regulatory System (DOC 9774)**
 - 13.1 Aerodrome Certification: Basic principles for aerodrome certification regulations, Implementation of the regulation, Aerodrome certification model regulations
 - 13.2 Aerodrome certification procedures: Certification process, Dealing with the expression of interest, Assessment of a formal application for an aerodrome certificate, The grant or refusal of a certificate, Promulgation in the AIP of the certified status and details of the aerodrome, Transfer of an aerodrome certificate, Surrender of an aerodrome certificate

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- 13.3 Regulatory authority: Organization, Functions and responsibilities of the DASS, Technical library and records, Staffing Qualifications, duties and responsibilities of aerodrome inspectors
- 13.4 Certification of aerodromes (DOC 9981):
- 13.4.1 Aerodrome manual (Components and subjects covered in an aerodrome manual), Initial certification Process (Technical inspections and on-site verifications), Continued aerodrome safety oversight
- 13.4.2 Safety assessments for aerodrome: Safety assessment process, Approval or acceptance of a safety assessment, Promulgation of safety information, Safety assessment flow chart, Safety assessment methodologies for aerodromes
- 13.4.3 Reporting format using standard runway condition report (RCR): Runway surface condition assessment and reporting, Aerodrome movement area maintenance, Methods of assessing runway surface condition, NOTAM/SNOWTAM, AIP & its revision process
14. **Universal Safety Oversight Audit Programme (USOAP) Continuous Monitoring Approach (CMA)**
- 14.1 Critical Elements of a State Safety Oversight System:
- 14.1.1 Primary aviation legislation (CE-1)
- 14.1.2 Specific operating regulations (CE-2)
- 14.1.3 State system and functions (CE-3)
- 14.1.4 Qualified technical personnel (CE-4)
- 14.1.5 Technical guidance, tools and the provision of safety-critical information (CE-5)
- 14.1.6 Licensing, certification, authorization and approval obligations (CE-6)
- 14.1.7 Surveillance obligations (CE-7)
- 14.1.8 Resolution of safety issues (CE-8)

द्वितीय पत्रबाट निम्नानुसार प्रश्न सोधिनेछ :

द्वितीय पत्र (विषयगत)				
विषय	खण्ड	अङ्कभार	तर्कयुक्त विश्लेषणात्मक प्रश्न	समस्या समाधानमूलक प्रश्न
सेवा सम्वन्धी	(क)	५०	३ प्रश्न X १० अङ्क = ३०	१ प्रश्न X २० अङ्क = २०
	(ख)	५०	३ प्रश्न X १० अङ्क = ३०	१ प्रश्न X २० अङ्क = २०
जम्मा		१००	६ प्रश्न X १० अङ्क = ६०	२ प्रश्न X २० अङ्क = ४०