

नेपाल विद्युत प्राधिकरण

प्राविधिक सेवा, इलेक्ट्रिकल समूह/उपसमूह तह-१० प्रबन्धक पदको
खुला तथा आन्तरिक प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

द्वितीय पत्र: सेवा सम्बन्धी बिस्तृत ज्ञान

खण्ड क: (२X१५=३०, १X२०=२०) - ५० अंक

1. Generation and Grid Interconnection

- Hydroelectric Power Plants: selection of water turbines; essential features of hydroelectric alternators; choice of size and number of generating units; auxiliaries in hydroelectric plant, Governing mechanism
- Renewable energy technology: Micro hydro, solar photovoltaic, wind and geothermal method of power generation and their importance, grid interconnection of renewable energy
- Synchronous Generators: Construction, Operating Characteristics, Steady state and transient equivalent circuits, Excitation system and requirements, PQ capability curve Parallel operation and synchronization to grid
- Induction generator Operating principles, controllers and harmonics, Field of applications
- Transformers: Operating characteristics, Losses and efficiency, Voltage regulation, Grounding, Current harmonics, Parallel operation, Overloading capacity, Temperature rise, Auto-transformers, Instrument transformers

2. Power System Analysis

- Performance analysis of transmission lines and Fault calculations in integrated power systems
- Corona phenomenon: Factors affecting corona and its disadvantages; corona loss, audible noise and radio interference;
- Inductive interference between power and communication lines
- Transient stability: Equal area criterion, Swing equation for a multi-machine system, stability enhancement techniques
- Protection of generators, transformers and transmission/distribution lines
- Insulation coordination, Over voltages and Lightning protection

3. Distribution System and Smart Grid

- Distribution system Layouts, UG/ overhead, Rural/ Urban Distribution.
- Load Forecasting, Small area load forecasting methods, Techniques, Distribution Transformer selections,
- Distribution Automation; Distribution network reconfiguration and other intelligent distribution, Control methods, optimal capacitor placements in primary distribution systems
- Distribution system protection coordination, Fault analysis
- Smart Grid & the retail customer smart meter, Home area networks, Commercial & Industrial energy management
- Demand response programs & technology
- Distributed renewable, Integration of renewable energy to smart grid, Problems of renewable energy to smart grid
- Energy Efficiency programs & technology
- Distribution system reliability indices

4. Power Electronics in Power System

- Switched mode DC-AC and AC-DC converters Sinusoidal PWM, dynamic model and control of PWM inverters
- AC-AC Converters: Single-phase AC regulator; Three-phase AC regulators, Single-phase and three-phase Cyclo-converters
- Basics of Flexible AC transmission systems (FACTS).
- Principles of series and shunt compensation..Thyristor controlled compensators Static var compensators (SVC), series compensators (TCSC), series compensator (SSSC)
- Phase shifters (SPS), and Unified power flow controller (UPFC), STATCOM
- Active Front End Rectifiers: Power factor correction, single phase and three-phase, control schemes
- Active filters

5. Electric Energy System Management

- Load dispatching: Principle of economic load dispatch, requirements, tools and role of dispatcher, Rationale and tools of demand side management.
- Economic analysis and control of power utility, Electrical load forecasting, Generation scheduling, Technical and Economic issues of generation and energy dispatch, Grid Code.
- Optimal load flow, fixed variable state variables, control variables, equality and inequality constraints, solution techniques, PQ decoupling
- Voltage stability, PQ capacity of transmission line, voltage collapse
- Concept of frequency stability

6. Power Supply Quality

- Power quality indicators: definition of power quality, voltage and frequency fluctuations, short duration and long duration voltage variations, waveform distortion
- Power Quality symptoms: Sensitive Electronic Equipment, Nuisance tripping of circuit breakers, Malfunction of UPS systems and generator systems, Metering problems, Overvoltage problem
- Power quality issues: power acceptability curves, options to address power quality problem, Power quality standards.
- Voltage sag/swell; definition, standards, effects of sags on equipment, testing equipment, tolerance to voltage sags, Areas of occurrence,
- Causes for Voltage sag/swell: motor starting, ground faults, transformers energizing, Sudden load changes
- Remedy Voltage sag/swell: general solutions, improving equipment immunity
- Power Quality Testing: Lab testing, on site testing
- Power Quality Certification

खण्ड ख: (२x१५=३०, १x२०=२०) - ५० अंक

7. Engineering Economics

- Disbursement scheduling, Cash flow analysis, Time value of money
- Project evaluation indicators, IRR, Payback period and others Criterion, Choosing the best alternative
- Incremental Analysis, Sensitivity & breakeven analysis
- Risk analysis, Inflation & price change
- Rationing limited financial resources between projects
- Taxation system in Nepal
- Energy tariff schemes and regulatory issues

8. Safety Engineering

- Effects of non-ionizing magnetic fields on human body, Physical effect of electric shock, Safety considerations, Live line maintenance, Earthing and shielding technique, Fire fighting techniques and equipment, Noise hazard, First aid requirements after Electrical accidents.

9. Contract management

- Preparation of contract documents, specifications, condition of contract and other contractual procedures
- Familiarization with Procurement guidelines and standards of World Bank & Asian Development Bank (WB & ADB)
- International Standard Bidding Document, National Standard Bidding Document
- Arbitration

10. Trends and Status of Power Sector Development

- Role of Government institutions involved in power sector development, Role and importance of IPPs, Major projects under implementation and planning, Importance of power exchange agreement with India, Scope of power exchange with other countries, Cross border/regional power trade, Coordination between stakeholders in power sector, Scope for export oriented development of power sector

11. International Treaty and Conventions

- Koshi Agreement, 1954/1966, Gandak Agreement, 1959, Electricity Exchange 1961, Treaty between the then His Majesty's Government of Nepal and Government of India concerning the integrated development of Mahakali river including Sarada Barrage, Tanakpur Barrage and Pancheswar Project

12. Service Related Manuals

- Manual for public Involvement in Environmental Impact Assessment (EIA) process of Hydropower Projects
- Manual for preparing Terms of Reference (TOR) for environmental Impact Assessment (EIA) of Hydropower Projects
- Manual for preparing Scoping Document for Environmental Impact Assessment (EIA) of Hydro power Projects
- Manual for preparing Environmental Management Plan (EPM) for Hydropower Projects
- National Environmental Impact assessment Guidelines, 1993
- Safety Guidelines and standards for Generation, Transmission and Distribution of Hydro Electricity
- IEC Standards for electrical equipment tests

