

## नेपाल आयल निगम लिमिटेड

खुला तथा आन्तरिक प्रतियोगितात्मक परीक्षाको लागि पाठ्यक्रम एवं परीक्षा योजना

स्तर : अधिकृत, सेवा : प्राविधिक, समूह : इञ्जिनियरिङ्ग, तह : ६, पद : सहायक प्रबन्धक (इलेक्ट्रिकल)

यस पाठ्यक्रम योजनालाई दुई चरणमा विभाजन गरिएको छ :

प्रथम चरण :- लिखित परीक्षा, पूर्णाङ्क : २००

द्वितीय चरण :- अन्तर्वार्ता, पूर्णाङ्क : ३०

### प्रथम चरण - लिखित परीक्षा

पत्र	विषय	परीक्षा प्रणाली	प्रश्न संख्या	अंक भार	समय	पूर्णाङ्क	उत्तीर्णाङ्क
प्रथम	शासकीय व्यवस्था र विकास	विषयगत	१०	१०	३ घण्टा	१००	४०
द्वितीय	सेवा सम्बन्धी	विषयगत	१०	१०	३ घण्टा	१००	४०

### द्वितीय चरण - अन्तर्वार्ता

विषय	पूर्णाङ्क	परीक्षा प्रणाली
अन्तर्वार्ता	३०	मौखिक

### द्रष्टव्य :

- लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुनेछ ।
- प्रथम पत्र र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।
- परिक्षार्थीले प्रथम पत्रको प्रत्येक खण्डको उत्तर छुट्टाछुट्टै उत्तरपुस्तिकामा र दोस्रो पत्रको लागि सबै प्रश्नको उत्तर एउटै उत्तरपुस्तिकामा लेख्नुपर्नेछ ।
- यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरू परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ ।
- प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र द्वितीय चरणको अन्तर्वार्तामा सम्मिलित गराइनेछ ।
- पाठ्यक्रम लागू मिति : २०७४ असोज २२ गते देखि

## प्रथम पत्र - शासकीय व्यवस्था र विकास

**खण्ड क : शासकीय व्यवस्थाका आधारभूत पक्ष - अंक ३० (३ प्रश्न × १० अंक)**

१. नेपालको वर्तमान संविधान र नेपालको संवैधानिक विकासक्रम ।
२. नेपालमा संघीय शासन प्रणाली ।
३. सरकारको कार्यक्षेत्र, काम, कर्तव्य र अधिकार ।
४. कार्यपालिका, व्यवस्थापिका र न्यायपालिका बिचको अन्तरसम्बन्ध ।
५. सुशासन, पारदर्शिता, उत्तरदायित्व, निष्पक्षता र व्यावसायिकता ।
६. राजनीति र सार्वजनिक प्रशासन बीचको सम्बन्ध र सीमा ।
७. नागरिक वडापत्रको अवधारणा ।
८. कानूनी राज्य, मानव अधिकार ।
९. सामाजिक न्याय र सामाजिक सुरक्षा ।
१०. उपभोक्ताको हक हित संरक्षण सम्बन्धी अवधारणा ।

**खण्ड ख : संस्थान व्यवस्थापन तथा संस्थागत सुशासन - अंक ३० (३ प्रश्न × १० अंक)**

१. सार्वजनिक संस्थानको आवश्यकता, उद्देश्य
२. सार्वजनिक संस्थानको स्वायत्तता र उत्तरदायित्व
३. सार्वजनिक संस्थानका कार्य सम्पादन सुधारका पक्षहरू
४. नेपालमा सार्वजनिक संस्थान निजीकरणको अवस्था
५. नेपालमा सार्वजनिक संस्थान संचालनमा रहेका समस्या र चुनौतीहरू
६. नेपाल सरकारको निजीकरण सम्बन्धी कार्यक्रम
७. उदारीकरणको सन्दर्भमा सार्वजनिक संस्थानको सान्दर्भिकता
८. संस्थागत सुशासनको अवधारणा र सिद्धान्तहरू
९. नेपालमा संस्थागत सुशासनका सम्बन्धमा रहेका कानूनी, नीतिगत र संस्थागत व्यवस्था
१०. नेपाल आयल निगमबाट संस्थागत सुशासनका लागि गरिएका प्रयासहरू

**खण्ड ग : नेपाल आयल निगम र उपभोक्ताको अधिकार - अंक ४० (४ प्रश्न × १० अंक)**

१. नेपाल आयल निगमको उद्देश्य, काम, कर्तव्य र अधिकार
२. निगम संचालक समितिको भूमिका तथा उत्तरदायित्व
३. नेपाल आयल निगमको कर्मचारी प्रशासन र कर्मचारीका आचारण
४. नेपाल आयल निगमको खरिद कार्यविधि सम्बन्धी व्यवस्था
५. नेपालमा पेट्रोलियम पदार्थ आयात, ढुवानी तथा बिक्री वितरण सम्बन्धी व्यवस्था
६. पेट्रोलियम पदार्थ गुणस्तर नियन्त्रण सम्बन्धी व्यवस्था
७. पेट्रोलियम पदार्थको स्वचालित मूल्य निर्धारण सम्बन्धी व्यवस्था
८. पेट्रोलियम पदार्थ र यसबाट वातावरणमा पर्ने असर, प्रभाव, समस्या र समाधानका उपायहरू
९. अन्तर्राष्ट्रिय तेल बजार : उत्पादन, बिक्री वितरण तथा मूल्य निर्धारण प्रणाली
१०. कम्पनीको स्थापना तथा खारेजी प्रक्रिया सम्बन्धी कानूनी व्यवस्था
११. करार तथा सम्झौताका आधारभूत पक्षहरू

## द्वितीय पत्र - सेवा सम्बन्धी

### 1. NETWORK ANALYSIS

- 1.1 Ohm's Law, Kirchhoff's Law, Nodal and mesh analysis
- 1.2 Series and parallel circuit, delta-star and star-delta transformation
- 1.3 Concept of complex Impedance and Admittance RLC series and parallel circuit
- 1.4 Network theorem: Thevenin's theorem, Norton's theorem, Superposition theorem, Reciprocity theorem and Maximum power transfer theorem.
- 1.5 Resonance in series and parallel RLC circuit.
- 1.6 Active, Reactive and Apparent power
- 1.7 Transient response of RLC circuit excited by DC and AC sources
- 1.8 Fourier Analysis
- 1.9 Two-port network: Z, Y, T and h parameters, T to IT and IT to T transformation, two-port network connection.
- 1.10 Three-phase circuit analysis, phase and line quantities.

### 2. ELECTRICAL ANALYSIS

- 2.1 Transformer: Constructional detail, Operating principle, Equivalent Circuit, Losses and efficiency, Voltage regulation, Exciting current harmonics, Transformer inrush current, Transformer tests, Auto transformer connections, Three phase transformer connections, Parallel operation.
- 2.2 D.C Machine: Constructional detail, Operating principle of dc generator, Voltage build-up process, Types of dc generator, their characteristics and applications, Losses and efficiency, Armature reaction and commutation, Operating principle of dc motor, Back emf, Types of dc motor, their characteristics and applications, DC motor starter, Speed control of dc motor
- 2.3 Induction machine: Constructional detail, Operating principle of three phase induction motor, Equivalent circuit, Torque-speed characteristics, Losses and efficiency, Starting methods, Speed control of three phase induction motor types, characteristics and applications.
- 2.4 Constructional detail, Operating principle of synchronous generator, Armature reaction, Equivalent circuit, phasor diagram and power angle characteristics of cylindrical rotor machine and salient pole machine, Parallel operation of synchronous generators, Operating principle of synchronous motor, V and Inverted V curves.

### 3. MEASUREMENTS AND INSTRUMENTATION

- 3.1 Accuracy, Precision, Absolute and Relative Errors, Parallax
- 3.2 Deflection type measuring instruments: Galvanometer, Ammeter, Voltmeter, Wattmeter, Watt-hour meter, Maximum Demand meter, Frequency meter and Power Factor meter
- 3.3 Instrument Transformers: Operating Principles of Measuring and Protection type CTs, Potential transformers
- 3.4 Transducers: Tachometer, Potentiometer, Measurement of electrical, mechanical, thermal and hydraulic variables
- 3.5 Measurement of low medium and high resistances by Ohmmeter method, Mergers and DC bridges
- 3.6 Measurement of inductance, capacitance and frequency by AC bridge circuits
- 3.7 Operational Amplifier: Signal Amplification, attenuation, differentiation, integration & adder
- 3.8 Operating principles of Analog and Digital Oscilloscope
- 3.9 Analog to Digital and Digital to Analog converters
- 3.10 Digital instrumentation: Fundamentals principles, interfacing to the computers, Microprocessor based instrumentation

4. ELECTRICAL SUPPLY SYSTEMS
  - 4.1 Power Plants: components of Hydro power plant, Steam power plants and Diesel power plants: Turbine classifications, Governing systems, Plant use factor, Load sharing between base load and peak load plants
  - 4.2 Transmission system: Overhead and underground transmissions, EHV AC and HDVC Transmission.
  - 4.3 Electrical and Mechanical design for Over head AC transmission, Selection of conductor size and configuration, supports and cross arms, insulators, sag and tension calculation.
  - 4.4 Power Distribution System: primary and secondary distribution, Distribution network layouts, protection coordination in distribution system
5. POWER SYSTEM ANALYSIS
  - 5.1 Computation of transmission line parameters, GMD and GMR, proximity effect and skin effect
  - 5.2 Transmission line performances: Per unit system representation, Single line diagram, Lumped and distributed parameter modeling, ABCD parameters, efficiency & regulations calculations, Ferranti effect, surge impedance loading
  - 5.3 Load flow: Basic Load flow equation, Gauss-Seidal and Newton- Raphson methods
  - 5.4 Over voltages in transmission lines: Power frequency, switching and lightning over voltages, surge arrestors
  - 5.5 VAR compensation: Real and reactive power flow through transmission line, series and shunt compensations
  - 5.6 Fault calculations: Symmetrical and unsymmetrical faults
  - 5.7 Power system stability studies: Steady state & transient stability limits, swing equations, equal area criterion, stability enhancement techniques
  - 5.8 Corona: corona inception voltage, power loss, waveform deformation, RI and AN due to corona
6. SWITCHGEAR AND PROTECTION
  - 6.1 Fuse: Types, characteristics and operating principles
  - 6.2 Magnetic Contactors: Types, construction and operating principles
  - 6.3 Isolators (Disconnecting switches): types, construction and operating principles
  - 6.4 MCB and MCCB: Construction, operating principles and characteristics
  - 6.5 Relays: Electromagnetic and Static Relays, Over Current Relay, Impedance Relay, Directional Relay
  - 6.6 Circuit Breakers: ACB, OCB, ABCB, RCB and SF<sub>6</sub> CB; construction, operating principles and applications
  - 6.7 Protection schemes: Over Current, under voltage, differential, distance protection
  - 6.8 Grounding: System and equipment grounding, electric shock, safe value of current and voltages, touch and step potentials, Ground Fault Current Interrupters
  - 6.9 Swing curve and sewing equation, equal area criterion
  - 6.10 Economic operation of power system and auto economic load dispatch
7. UTILIZATION OF ELECTRICAL ENERGY
  - 7.1 Economic considerations: Cost classification; interest and depreciation
  - 7.2 Load characteristics: load curves, load duration curve, demand factor; load factor diversity factor, causes of low power factor and its disadvantages, power factor improvement and its economics
  - 7.3 Plant use factor; load sharing between base load and peak load plants
  - 7.4 Tariff: objective, factors affecting tariff, types of tariff

- 7.5 Illumination: Illumination and luminance, radiant efficiency, plane and solid angles, laws of illumination: polar curves, illumination requirement, design of indoor and outdoor lighting scheme.
- 7.6 Lamps: Incandescent lamps, arc lamps, sodium discharge lamps, mercury fluorescent lamps, high pressure mercury vapor lamps
- 7.7 Electrical energy conservation and analysis
- 8. FEEDBACK CONTROL SYSTEM
  - 8.1 Environmental condition (sensitivity), time of response
  - 8.2 Feedback compensator to eaton
  - 8.3 Restriction of feedback components
  - 8.4 General types of A.C. feedback control
  - 8.5 Hybrid control system, A.C. control system
  - 8.6 A.C. compensator
- 9. AMPLIDYNE SERVO MECHANISM
  - 9.1 Bi-polar junction transistor: construction, operating, characteristics, use as amplifier and switch
  - 9.2 Logic circuit: Decimal, Binary and Hexadecimal system logic gates, adder, Encoder, Decoder, Multiplexer, and Demultiplexer.
  - 9.3 DC chopper: Step down chopper, Step up chopper
  - 9.4 Cyclo-converter Single phase and three phase
- 10. POWER ELECTRONICS
  - 10.1 Devices: Power Transistor, Power Diodes, Thyristor, Triac, MOSFET, UJT, GTO - Construction and their characteristics
  - 10.2 Rectifier: Rectifier using diodes-half wave , full wave, single phase, three phase, capacitor and inductor filters, Controlled rectifier using thyristors - half wave , full wave, single phase, three phase.
  - 10.3 Inverter: Single phase voltage inverter, three phase voltage inverter, current source inverter.
  - 10.4 AC voltage controller - with resistive load and inductive load
  - 10.5 Electronic control of A.C., D.C. motor and generator.
- 11. PROFESSIONAL PRACTICE
  - 11.1 Ethics and Professionalism: Perspective on morals, codes of ethics and guidelines of professional engineering practice
  - 11.2 Legal aspects of Professional Engineering in Nepal. Provision for private practice and employee engineers
  - 11.3 Nepal Engineering Council Act, 2055 and regulations, 2056
  - 11.4 Relation with clients, contractor and fellow professionals.
  - 11.5 Public procurement practices for works, goods and services and its importance
- 12. COMPUTER AND INFORMATION SYSTEM
  - 12.1 Computer Structure (I/O devices, Storage devices, Memories) and typical processor architecture, CPU and memory organization, buses , Characteristics of I/O and storage devices, Processing Unit, memory systems ( main, auxiliary, virtual, cache).
  - 12.2 Digital Networks (LAN, WAN)
  - 12.3 Data types, Concept of Management Information System, concept of Operating Systems, Application software, Basic Concept on internet, e-mail and webpage ( such as DNS,IP,URL, http, ftp, IRQ, Routers ). Server (Web, email, printer), General concept of Cyber security (digital signature, SPAM, VIRUS, WORM, hiking, cracking), Unicode

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