

## नेपाल आयल निगम लिमिटेड

### आन्तरिक प्रतियोगितात्मक परीक्षाको लागि पाठ्यक्रम एवं परीक्षा योजना

स्तर : अधिकृत, सेवा : प्राविधिक, समूह : इञ्जिनियरिङ्ग, तह : ७,

पद : उप प्रबन्धक (मेकानिकल/इण्डष्ट्रियल)

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 प्रणालीको अवधारणा र नेपालमा यसको प्रयोग ।
३. सरकारको कार्यक्षेत्र, काम, कर्तव्य र अधिकार ।
४. कार्यपालिका, व्यवस्थापिका र न्यायपालिका विचको अन्तर सम्बन्ध ।
५. सुशासन, पारदर्शिता, उत्तरदायित्व, निष्पक्षता र व्यावसायिकता ।
६. राजनीति र सार्वजनिक प्रशासन बीचको सम्बन्ध र सीमा ।
७. सार्वजनिक प्रशासन र नेपालमा प्रशासन सुधारका आधारभूत पक्षहरू ।
८. सार्वजनिक सेवा प्रवाह तथा सार्वजनिक व्यवस्थापनका अवधारणा ।
९. विद्युतीय शासन प्रणाली ।
१०. नागरिक वडापत्रको अवधारणा ।
११. कानूनी राज्य, मानव अधिकार ।
१२. सामाजिक न्याय र सामाजिक सुरक्षा ।
१३. नेपालमा भ्रष्टाचार नियन्त्रण सम्बन्धी प्रयास ।
१४. उपभोक्ताको हक हित संरक्षण सम्बन्धी अवधारणा ।

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

१. सार्वजनिक संस्थानको आवश्यकता, उद्देश्य, गठन, संचालन तथा व्यवस्थापन
२. सार्वजनिक संस्थानको स्वायत्तता र उत्तरदायित्व
३. सार्वजनिक संस्थानको कार्यकुशलता मापनका आधार
४. सार्वजनिक संस्थानका कार्य सम्पादन सुधारका पक्षहरू
५. नेपालमा सार्वजनिक संस्थान निजीकरणको अवस्था, सम्भाव्यता र आवश्यकता
६. नेपालमा सार्वजनिक संस्थान संचालनमा सरकारको नीति तथा कार्यक्रम र सो सम्बन्धमा रहेका समस्या र चुनौतीहरू
७. नेपाल सरकारको निजीकरण सम्बन्धी कार्यक्रम र सो सम्बन्धमा देखिएका समस्या र चुनौतीहरू
८. उदारीकरणको सन्दर्भमा सार्वजनिक संस्थानको सान्दर्भिकता
९. संस्थागत सुशासनको विकासक्रम र यसका आधारभूत सिद्धान्त
१०. नेपालमा संस्थागत सुशासनका सम्बन्धमा रहेका कानूनी नीतिगत र संस्थागत व्यवस्था
११. नेपाल आयल निगमबाट संस्थागत सुशासनका लागि गरिएका प्रयासहरू

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

१५. नेपाल आयल निगमको उद्देश्य, काम, कर्तव्य र अधिकार तथा समस्या र चुनौती
१६. निगम संचालक समितिको भूमिका, दायित्व तथा उत्तरदायित्व
१७. नेपाल आयल निगमको कर्मचारी प्रशासन, कर्मचारीका आचारण, कर्तव्य र उत्तरदायित्व
१८. नेपाल आयल निगमको खरिद कार्यविधि सम्बन्धी व्यवस्था
१९. नेपालमा पेट्रोलियम पदार्थ आयात, ढुवानी तथा बिक्री वितरण सम्बन्धी व्यवस्था
२०. पेट्रोलियम पदार्थ गुणस्तर नियन्त्रण सम्बन्धी व्यवस्था
२१. पेट्रोलियम पदार्थको स्वचालित मूल्य निर्धारण सम्बन्धी व्यवस्था
२२. पेट्रोलियम पदार्थ र यसबाट वातावरणमा पर्ने असर, प्रभाव, समस्या र समाधानका उपायहरू
२३. अन्तर्राष्ट्रिय तेल बजार : उत्पादन, बिक्री वितरण तथा मूल्य निर्धारण प्रणाली
२४. कम्पनीको स्थापना तथा खारेजी प्रक्रिया सम्बन्धी कानूनी व्यवस्था
२५. करार तथा सम्झौताका आधारभूत पक्षहरू ।

## द्वितीय पत्र - सेवा सम्बन्धी

### **Mechanical Engineering/Industrial Engineering (Full Marks - 100)**

#### **1. Basic Thermodynamics**

- 1.1 Basic Concepts: Thermodynamic System, Thermodynamic Property, Pure Substance, Zeroth Law.
- 1.2 First Law of Thermodynamics: Control mass and Control volume formulation
- 1.3 Second Law of Thermodynamics: Heat engine, Refrigerator and Heat Pump, Kelvin Planck and Clausius Statement, Entropy
- 1.4 Thermodynamic Cycles: Carnot cycle, Otto cycle, Diesel Cycle, Brayton cycle, Rankine cycle
- 1.5 Modes of heat transfer: Conduction, Convection and Radiation
- 1.6 Heat exchangers

#### **2. Fluid Mechanics**

- 2.1 Fluid Properties: Viscosity, Surface tension, Compressibility, Vapor Pressure
- 2.2 Fluid Statics: Pressure variations in static fluid, Pressure head, Manometer, Force on submerged surfaces
- 2.3 Equations of Fluid Flow: Types of flow, Continuity equation, Bernoulli's equation and Momentum equation
- 2.4 Viscous Effects: Reynolds number, Boundary layer, Frictional resistance to flow in pipes
- 2.5 Flow measurement: Pitot-static tube, Orifice, Venturimeter, Nozzle, Rotameter

#### **3. Engineering Material**

- 3.1 Major Types of Engineering Material (Stones-characteristics, Ceramic material: ceramic tiles, Mosaic Tile, brick types and testing etc. Cementing materials: types and properties of lime and cement; Timber and wood: types and properties of wood; Miscellaneous material: Asphaltic material (Asphalt, Bitumen and Tar); paints and varnishes; polymers; Soil properties and its parameters; Materials Selection
- 3.2 Imperfections Atomic Arrangement: Slip and Twinning, Dislocation, Points and Surfaces Defects
- 3.3 Mechanical Properties and Testing: Tension, Impact, Fatigue, Hardness Test
- 3.4 Metals: Steel, types and properties; Alloys

#### **4. Engineering Economics**

- 4.1 Types of engineering economics decisions
- 4.2 Time value of Money: Simple Interest, Compound Interest, Continuous compound Interest
- 4.3 Project Evaluation Techniques: Payback Period method, NPV method, Future value analysis, IRR method
- 4.4 Benefit and Cost Analysis: Cost benefit ratio, breakeven analysis
- 4.5 Corporate tax system in Nepal
- 4.6 Depreciation and its types

#### **5. Management**

- 5.1 Role of Production/Operation Management and System Concepts
- 5.2 Plant Location and Plant Layout Design
- 5.3 Production Planning and Control: Selection of materials, methods, Projects scheduling, machines and manpower
- 5.4 Network methods: PERT, CPM
- 5.5 Inventory Control: Inventory costs and Inventory models
- 5.6 Forecasting Techniques: Requirements of forecasting, Time series and Moving average methods, Regression analysis
- 5.7 Quality Management: Important of quality, Statistical process control
- 5.8 Statistical Analysis: Measurement of central tendency, Deviation, Distribution

## **6. Environmental Engineering**

- 6.1 Air Pollution: Cause and Effects
- 6.2 Water Pollution: Cause and Effects, Waste water treatment
- 6.3 Industrial Waste: Collection and disposal
- 6.4 Indoor Air Quality: Indoor pollutants, Effects of indoor pollutants and Control of indoor pollutants
- 6.5 Global impacts: Green house effects, Acid rain
- 6.6 Global-warming phenomena
- 6.7 Types of sources of pollution: point/non-point (for air and water)
- 6.8 Concepts of Cleaner Production

## **7. Operational Safety & Health**

- 7.1 Effects of non-ionizing electromagnetic fields on human body
- 7.2 Physical effects of electric shocks
- 7.3 Safety and precaution
- 7.4 Safety rules and regulation
- 7.5 Safety tools and devices for fuel handling
- 7.6 Explosions of fuel storage tank and fuel handling equipment in premises and precautions to be taken
- 7.7 Fire hazards, Fire fighting techniques and equipment
- 7.8 Noise hazard, sources, Control and effect on health
- 7.9 First aid requirements for post-event treatment
- 7.10 Safety culture; storage of dangerous materials
- 7.11 Hazards due to high pressure & explosions, dust & vapor cloud explosions, vacuum temperature, inflammable materials, toxic materials, chemicals, chemical reactions and operations, electrostatic, ionizing radiation etc.
- 7.12 Safety protection, equipment's for personal & plant for various hazards. Safety procedures
- 7.13 Disaster management, insurance, worker's safety Act

## **8. Engineering Chemistry**

- 8.1 Purification of organic compounds by crystallization's sublimation & different types of distillation.
- 8.2 Preparation & Chemical Properties and uses of: Chloroform, carbon, tetra chloride, Iodoform, ethanol, ethylene glycol, glycerin, formaldehyde, acetaldehyde, acetone, lactic-, oxalic-, citric-, and succinic acids, diethyl ether, acetoacetic ester, malonic esters
- 8.3 Preparation and industrial uses of organometallic compounds: lead, zine, lithium and magnesium organometallic compounds.
- 8.4 Aromatic halogenations, sulphonation, nitration, alkylation, acrylation and addition reactions & their mechanisms.
- 8.5 Study of aniline, acetanilide, dimethylaniline, phenol Quinol, benzoicnaphthalene, furan
- 8.6 Oxidation: Definition and Types, Oxidizing agents, Liquid phase oxidation with oxidizing agents and oxygen. Oxidation of toluene with MnO<sub>2</sub> Mfg (Manufacturing) of Acetaldehyde form Acetic acid and mfg. of Acetic acid from Ethanol. Vapor phase oxidation of Mehanol. Benzene and Naphthalene, Apparatus and M/s. (Machine) for oxidation reactions
- 8.7 Hydrogenation: Definition and its scope, properties of hydrogen and sources of hydrogen, gas catalytic hydrogenation and hydrogenolysis, factors affecting it, Apparatus and M.c.(Machine), Industrial hydrogenation of fat & oil, Mfg. of methanol from CO<sub>2</sub> & H<sub>2</sub>
- 8.8 Hydrolysis: Definition and types of hydrolysis, Hydrolyzing agents, equipment's of hydrolysis, Industrial Hydrolysis of fat, hydrolysis of carbohydrates, starch to dextrose, Mfg. of ethanol from ethylene (shell process) Mfg. of phenol from benzene sulfonic
- 8.9 Polymerization: Introduction & chemistry of polymerization reactions, classifications of polymers, methods of polymerization

## **9. Process Calculation**

- 9.1 Mathematical Techniques in Chemical Engineering
- 9.2 Gas Laws and phase equilibrium
- 9.3 Humidity, Saturation and Crystallization
- 9.4 Combustion and Chemical Processes
- 9.5 Material balance involving recycles, bypass and purge systems
- 9.6 Thermo physics: Heat capacity calculation
- 9.7 Enthalpy changes of reactions, Dissolution & Laws of Thermochemistry
- 9.8 Effect of Pressure & Temperature on heat of reactions
- 9.9 Combined material & energy balances for single stage processes.
- 9.10 Material & Energy balance calculations for industrial processes.

## **10. Equilibrium Stage of Operation**

- 10.1 Concepts of molecular diffusion and mass transfer coefficient; interphase mass transfer
- 10.2 The equilibrium stage approximation
- 10.3 Conservation relations
- 10.4 Reflux
- 10.5 Constant molal overflow
- 10.6 Batch distillation
- 10.7 Ponchon-Savarit and McCabe-Thiele analysis of binary distillation; introduction to multi-component distillation;
- 10.8 Equilibrium solubility of gases in liquids
- 10.9 Counter-current multistage absorption
- 10.10 Multi-component systems; absorption with chemical reaction

## **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, hacking, cracking), Unicode

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