

**द्वितीयपत्र(Paper II) : Technical Subject**

**Section (A) - 20 Marks**

**1. Machine Design and Drawing**

- 1.1 Design analysis: Types of loads and stresses, theories of failure, factor of safety.
- 1.2 Design of machine components: Design of parts subjected to tension, compression, shear, bending, design of shafts, keys, splines, couplings, fasteners, power screws, helical compression springs, knuckle joints, riveted joints and welded connections.
- 1.3 Design of power transmission elements: Belt drives, selection of flat and V belts, design of pulleys and flywheels, design of gear drives, spur, helical, bevel and worm gear drives.
- 1.4 Design of bearings: Hydrodynamic journal bearings, pressure fed and self-contained bearings and rolling contact bearings
- 1.5 Load lifting devices: Selection of steel wire ropes for hoists and cranes, crane hooks, design of hook block, sheaves and rope winding drums.
- 1.6 Pressure vessels: classification, material selection, loads and types of failures.
- 1.7 Types of projections, production drawings, Computer Aided Design
- 1.8 Design standardization: Importance of standardization, international organizations for standardization

**Section (B) - 30 Marks**

**2. Industrial Engineering**

- 2.1 Plant location and layout: Factors affecting location of factory plant building and service facilities, product or line layout, process or functional layout and fixed position layout
- 2.2 Production planning and inventory control: Forecasting techniques- time series, moving average, exponential smoothing, trend and seasonality. Inventory-functions, cost, classification, deterministic and probabilistic inventory models
- 2.3 Operation research: Linear programming, problem formulation, simplex method, duality and sensitivity analysis, transportation and assignment models, PERT and CPM methods of project management
- 2.4 Quality Management: Concept of quality, statistical quality control, acceptance sampling, zero defects, six sigma, quality circle, quality assurance, total quality management
- 2.5 Ergonomics: Productivity and working environment, man-machine systems, illumination, noise and vibration, ventilation, air conditioning, temperature control, anthropometry, work-space layout
- 2.6 Safety: Workplace hazards and risks, hazard identification and risk assessment, risk control, causes and prevention of accidents, fire prevention and firefighting equipment, electrical safety, safe handling of chemicals, material handling and material safety data sheets

3. **Maintenance Management**

- 3.1 Maintenance: Reliability, maintainability, total life cycle, routine, fixed time, break down and shut down maintenance, maintenance work load and budget, documentation and recording, maintenance audit
- 3.2 Preventive and Predictive maintenance: Condition monitoring, signature analysis, online and off-line maintenance, non-destructive test, wear particles and oil analysis, thermography, scanning electron microscope
- 3.3 Corrosion: Types of corrosion, corrosion testing, control and prevention
- 3.4 Tribology: Surfaces, friction and wear, lubrication, surface topography measurement
- 3.5 Total Productive Maintenance (TPM): Types of losses, measures to control losses, basics of TPM, cost estimation and safety measures

**Section (C) - 20 Marks**

4. **Environmental engineering**

- 4.1 Air Pollution: Pollution from combustion and atmospheric pollution, types of pollutants, sources of pollutants, particulate control, control of gaseous pollutants, indoor air pollution control
- 4.2 Noise Pollution: Measurement of noise, noise control
- 4.3 Water Pollution: Causes and effects, Waste water treatment
- 4.4 Solid Waste Management: Recycling, energy recovery, incineration, land filling
- 4.5 Global impacts: Green-House Effect, acid rain, climate change, ozone layer depletion

5. **Energy Resources**

- 5.1 Energy consumption scenario of Nepal, commercial and non-commercial energy resources
- 5.2 Hydroelectricity, national potentials, achievements and utilization
- 5.3 Solar energy and its applications: Solar thermal, solar photovoltaic
- 5.4 Biomass energy, wind energy
- 5.5 Methods of enhancing energy efficiency & energy conservation

**Section (D) - 30 Marks**

6. **Engineering Economics**

- 6.1 Time Value of Money: Simple interest, Compound interest, Continuous compound interest
- 6.2 Project Evaluation Techniques: Payback period method, NPV method, Future value analysis, IRR method
- 6.3 Benefit and Cost Analysis: Cost benefit ratio, breakeven analysis, make or buy decision
- 6.4 Engineering economics decisions
- 6.5 Corporate tax system in Nepal
- 6.6 Depreciation and its types

**7. Professional Practice**

- 7.1 Ethics and Professionalism: Perspectives on morals, codes of ethics and guidelines of professional engineering practice, Nepal Engineering Council Act and Rules
- 7.2 Contract Act and Rules
- 7.3 Procurement and procurement procedure, Public Procurement Act, Rules and Guidelines in Nepal
- 7.4 Introduction to Intellectual Property: copy right, trademark, industrial design, patent, unfair competition, World Intellectual Property Organization (WIPO)

**8. Construction Equipment, Planning and Management**

- 8.1 Construction equipment, their types and uses: Earthmoving equipment, Hauling equipment, Hoisting equipment, Finishing equipment, Drilling equipment, Blasting equipment, Tunneling equipment, Pile driving equipment
- 8.2 Equipment life and replacement procedures: Physical life, profit life, economical life, replacement analysis, replacement decision making
- 8.3 Planning of equipment: Equipment selection, fleet standardization, resources management for operation, maintenance and service facilities

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लोक सेवाआयोग

नेपाल इञ्जिनियरिङ्ग सेवा मेकानिकल समूह अन्तर्गतका जनरल मेकानिकल र निर्माण उपकरण संभार उपसमूहहरूको राजपत्राङ्कित तृतीय श्रेणीका पदहरूको खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र लिइने सामूहिक परीक्षण (Group Test) को लागि

**सामूहिक छलफल (Group Discussion)**

यस प्रयोजनको लागि गरिने परीक्षण १० पूर्णाङ्क र ३० मिनेट अवधिको हुनेछ, जुन नेता विहिन सामूहिक छलफल (Leaderless Group Discussion) को रूपमा अवलम्बन गरिने छ। दिइएको प्रश्न वा Topic का विषयमा पालैपालोसँग निर्दिष्ट समय भित्र समूह बीच छलफल गर्दै प्रत्येक उम्मेदवारले व्यक्तिगत प्रस्तुति (Individual Presentation) गर्नु पर्नेछ। यस परीक्षणमा मूल्याङ्कनको लागि देहाय अनुसारको ३ जनाको समिति रहनेछ।

आयोगका अध्यक्ष वा सदस्य	-	अध्यक्ष
मनोविज्ञ	-	सदस्य
दक्ष/विज्ञ (१ जना)	-	सदस्य

**सामूहिक छलफलमा दिइने नमूना प्रश्न वा Topic**

उदाहरणको लागि - उर्जा संकट, गरीबी निवारण, स्वास्थ्य बीमा, खाद्य सुरक्षा, प्रतिभा पलायन जस्ता Topics मध्ये कुनै एक Topic मात्र दिइनेछ।