

लोक सेवा आयोग
नेपाल इन्जिनियरिङ्ग सेवा, मेकानिकल समूह, जनरल मेकानिकल र निर्माण उपकरण संभार
उपसमूहको राजपत्राङ्कित तृतीय श्रेणीका पदहरूको खुला र आन्तरिक प्रतियोगितात्मक परीक्षाको
पाठ्यक्रम

पाठ्यक्रमको रूपरेखा :- यस पाठ्यक्रमको आधारमा निम्नानुसार दुई चरणमा परीक्षा लिइने छ :

प्रथम चरण :- लिखित परीक्षा पूर्णाङ्क :- २००
द्वितीय चरण :- अन्तर्वार्ता पूर्णाङ्क :- ३०

प्रथम चरण – लिखित परीक्षा योजना (Examination Scheme)

पत्र	विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्न संख्या X अङ्कभार	समय
प्रथम	मेकानिकल इन्जिनियरिङ्ग	१००	४०	वस्तुगत बहुउत्तर (Multiple Choice)	१००X१ = १००	१ घण्टा १५ मिनेट
द्वितीय	उपसमूह सम्बन्धी विषय	१००	४०	विषयगत (Subjective)	१०X१० = १००	३ घण्टा

द्वितीय चरण

विषय	पूर्णाङ्क	परीक्षा प्रणाली
व्यक्तिगत अन्तर्वार्ता	३०	मौखिक

- लिखित परीक्षाको माध्यम भाषा अंग्रेजी वा नेपाली, अथवा अंग्रेजी र नेपाली दुवै हुन सक्नेछ ।
- माथि उल्लिखित समूहहरूको पाठ्यक्रमको प्रथम पत्रको विषयवस्तु एउटै हुनेछ । द्वितीय पत्रका विषयवस्तु समूह अनुसार फरक फरक हुनेछन् ।
- माथि उल्लिखित उपसमूहहरूको प्रथम पत्रको परीक्षा संयुक्त वा छुट्टाछुट्टै हुन सक्नेछ भने द्वितीय पत्रको परीक्षा छुट्टाछुट्टै हुनेछ ।
- प्रथम पत्रको एकाईहरूको प्रश्नसंख्या निम्नानुसार हुनेछ भने द्वितीय पत्रको प्रत्येक एकाईको प्रश्नसंख्या सम्बन्धित पाठ्यक्रममै उल्लेख गरिएकोछ :

प्रथम पत्रका एकाई	1	2	3	4	5	6	7	8	9
प्रश्न संख्या	10	20	10	10	10	10	15	10	5

- द्वितीय पत्रको विषयगत प्रश्नहरूको स्वरूप निम्नानुसार हुन सक्नेछ :
 - ५.१ लामो उत्तर दिने १० अङ्कका पूरा प्रश्नहरू सोध्न सकिनेछ ।
 - ५.२ एउटै प्रश्नलाई दुई वा दुई भन्दा बढी भागमा (Two or more parts of a single question) विभाजन गरी सोध्न सकिनेछ ।
 - ५.३ एउटा प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरू (Short notes) सोध्न सकिने छ ।
- प्रथम पत्रमा वस्तुगत बहुउत्तर (Multiple Choice) प्रश्नहरूको उत्तर सही दिएमा प्रत्येक सही उत्तर बापत १ (एक) अङ्क प्रदान गरिनेछ भने गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अर्थात् ०.२ अङ्क कट्टा गरिनेछ । तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन ।
- यस पाठ्यक्रममा जेसुकै लेखिएको भएता पनि पाठ्यक्रममा परेका ऐन, नियमहरू परीक्षाको मिति भन्दा ३ (तीन) महिना अगाडि (संशोधन भएका वा संशोधन भई हटाइएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा रहेको सम्झनु पर्दछ ।
- प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र द्वितीय चरणको अन्तर्वार्तामा सम्मिलित गराइनेछ ।
- यस भन्दा अगाडि लागू भएका माथि उल्लिखित उपसमूहहरूका पाठ्यक्रमहरू खारेज गरिएका छन् ।
- पाठ्यक्रम लागू मिति :- २०६२/२/२३ देखि

लोक सेवा आयोग

नेपाल इन्जिनियरिङ्ग सेवा, मेकानिकल समूह, जनरल मेकानिकल र निर्माण उपकरण संभार
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पाठ्यक्रम

प्रथम पत्र :- मेकानिकल इन्जिनियरिङ्ग

- 1. Work shop technology and Metrology 10%**
 - 1.1 Basic tools and Basic hand operations
 - 1.2 Machine tools: Lathe, Shaper, Milling, Grinding, Drilling Machines
 - 1.3 Metal Joining: Soldering, Brazing, Gas welding, Arc welding
 - 1.4 Types of fits
 - 1.5 Linear Measurement: Block Gages, Length Bars, Comparators
 - 1.6 Errors in measurement
- 2. Thermodynamics and heat engines 20%**
 - 2.1 Basic Concepts: Thermodynamic System, Thermodynamic Property, Pure Substance, Zeroth Law
 - 2.2 First Law of Thermodynamics: Control mass and Control volume formulation
 - 2.3 Second Law of Thermodynamics: Heat engine, Refrigerator and Heat pump, Kelvin Planck and Clausius Statements, Entropy
 - 2.4 Refrigeration: Reversed Carnot cycle, Vapor compression cycle, Absorption refrigeration systems, Refrigerants and their properties
 - 2.5 Air Conditioning: Psychometric properties and psychometric chart, Heating, cooling, humidification and dehumidification process, Air conditioning systems
 - 2.6 Thermodynamic Cycles: Carnot cycle, Otto cycle, Diesel Cycle, Brayton cycle, Rankine cycle
 - 2.7 IC engines: Classifications, components, two stroke and four stroke operations, performance of IC engines, Ignition system, Cooling system, Lubrication system
 - 2.8 Modes of heat transfer: Conduction, Convection and Radiation
- 3. Fluid Mechanics 10%**
 - 3.1 Fluid Properties: Viscosity, Surface tension, Compressibility, Vapor Pressure
 - 3.2 Fluid Statics: Pressure variations in static fluid, Pressure head, Manometer, Force on submerged surfaces
 - 3.3 Equations of Fluid Flow: Types of flow, Continuity equation, Bernoulli's equation, and Momentum equation
 - 3.4 Viscous Effects: Reynolds number, Boundary layer, Frictional resistance to flow in pipes
 - 3.5 Flow measurement: Pitot-static tube, Orifice, Venturimeter, Nozzle, Rotameter
- 4. Hydraulic and Electric Machines 10%**
 - 4.1 Water turbines: Pelton, Francis, Kaplan and Cross flow (Working principle and Characteristic)
 - 4.2 Pumps: Centrifugal pump and Reciprocating pump (Working principle and Characteristic), Hydraulic ram
 - 4.3 DC Motors: Shunt field, Series field and Compound field motors, Torque-speed characteristics
 - 4.4 DC Generators: Shunt, Series and Compound field machines, Voltage/speed/load characteristics, Effects of variable load, variable torque
 - 4.5 Synchronous and Induction Machines: Basic structure of synchronous machines, Generator on isolated load, Generator on large system, Synchronous motor

- 5. Material Science and Metallurgy 10%**
- 5.1 Types of Materials, Material Selection
 - 5.2 Imperfections in Atomic Arrangement: Slip and Twinning, Dislocation, Points and Surface Defects
 - 5.3 Mechanical Properties and Testing: Tension, Impact, Fatigue, Hardness Test
 - 5.4 Cold working and Hot working
 - 5.5 Types of steel
 - 5.6 Phase Transformation and Heat Treatment: Iron-carbon equilibrium diagram, Hardening, Tempering, Annealing, Normalizing
- 6. Machine Component Design and Drawing 10%**
- 6.1 Types of Projection
 - 6.2 Production Drawings
 - 6.3 Terminologies of Mechanisms, Mobility and Degrees of Freedom
 - 6.4 Design Process
 - 6.5 Factors Affecting Choice of Materials for Design: Strength, Toughness, Durability, Hardness
 - 6.6 Loading: Tensile, Compressive, Shearing, Bending, Bearing and Torsion
 - 6.7 Common Types of Failure: Theories of failure, Stress concentration effects, Ductile and brittle materials, Factor of safety
- 7. Industrial Engineering and Management 15%**
- 7.1 Role of production/Operation Management and System Concepts
 - 7.2 Plant Location and Plant Layout Design
 - 7.3 Production Planning and Control: Selection of materials, methods, machines and manpower
 - 7.4 Network methods: PERT, CPM
 - 7.5 Inventory Control: Inventory costs and Inventory models
 - 7.6 Forecasting Techniques: Requirements of forecasting, Time series and Moving average methods, Regression analysis
 - 7.7 Quality Management: Importance of quality, Statistical process control
 - 7.8 Statistical Analysis: Measurement of central tendency, Deviation, Distribution
- 8. Engineering Economics 10%**
- 8.1 Types of engineering economics decisions
 - 8.2 Time Value of Money: Simple interest, Compound interest, Continuous compound interest
 - 8.3 Project Evaluation Techniques: Payback period method, NPV method, Future value analysis, IRR method
 - 8.4 Benefit and Cost Analysis: Cost benefit ratio, breakeven analysis
 - 8.5 Corporate tax system in Nepal
 - 8.6 Depreciation and its type
- 9. Professional Practice 5%**
- 9.1 Ethics and Professionalism: Perspective on morals, Codes of ethics and guidelines of professional engineering practice
 - 9.2 Legal aspects of Professional Engineering in Nepal: Engineering Council act, Provision for private practice and employee engineers
 - 9.3 Contract law
 - 9.4 Tendering and contract documents
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वस्तुगत बहुउत्तर नमूना प्रश्नहरू (Sample questions)

1. Which of the following is not a part of shaper?
A. Ram B. Table C. Knee D. Cross slide
Correct Ans. (C)

2. The internal energy of an ideal gas is a function of
A. Pressure only B. Absolute temperature only
C. Pressure and volume D. Pressure, volume and temperature
Correct Ans. (B)

3. Which of the following process is not associated with diesel cycle?
A. Constant volume B. Constant pressure
C. Isothermal D. Adiabatic
Correct Ans. (C)

4. The continuity equation represents conservation of
A. Mass B. Momentum C. Energy D. Vorticity
Correct Ans. (A)

5. An impulse turbine is
A. Is most suited for high head installations B. Always operates submerged
C. Makes use of draft tube D. Is not exposed to atmosphere
Correct Ans. (A)

6. A hardened steel component needs tempering to
A. Make it brittle B. Improve its rollability
C. Remove any dislocation in the internal structure D. Soften its surface
Correct Ans. (D)

7. Stress concentration in a machine component results from
A. Abrupt changes in the cross-section of the component
B. Pressure at points of the component at which the load is applied
C. Point to point variation of in the properties of the material of the component
D. Any one of the above
Correct Ans. (A)

8. All the machines and equipment are arranged according to the nature or type of operations in
A. Process layout B. Product layout
C. Group layout D. Fixed position layout
Correct Ans. (A)

9. In which of the following method, time value of money is not considered?
A. Payback period B. Internal rate of return
C. Net present value D. All of the above
Correct Ans. (A)