नेपाल खाद्य संस्थान

६ तह मिल मेकानिक्स पदको खुला/आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

पाठ्यक्रमको रुपरेखा :– यस पाठ्यक्रमको आधारमा निम्नानुसारका चरणमा परीक्षा लिइने छ :

प्रथम चरण :– लिखित परीक्षा पूर्णाङ्क :– २००

द्वितीय चरण :– अन्तर्वार्ता पूर्णाङ्क :– ३०

परीक्षा योजना (Examination Scheme)

१. प्रथम चरण : लिखित परीक्षा (Written Examination) **पूर्णाङ्क :- २००**

पत्र	विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्नसंख्या X अङ्क	समय
प्रथम	मेकानिकल इञ्जिनियरिङ्ग I	१००	४०	वस्तुगत	५० प्रश्न X २ अङ्क = १०० अङ्क	४५ मिनेट
द्वितीय	मेकानिकल इञ्जिनियरिङ्ग II	१००	४०	विषयगत	१० प्रश्न X १० अङ्क = १०० अङ्क	३ घण्टा

२. द्वितीय चरण : अन्तर्वार्ता (Interview) **पूर्णाङ्क :- ३०**

विषय	पूर्णाङ्क	परीक्षा प्रणाली
व्यक्तिगत अन्तर्वार्ता	३०	मौखिक

द्रष्टव्य :

१. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी हुनेछ ।

२. प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।

३. लिखित परीक्षामा यथासम्भव पाठ्यक्रमका सबै एकाईबाट प्रश्नहरु सोधिनेछ ।

४. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरुको गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अङ्क कट्टा गरिनेछ । तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन ।

५. यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरु परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्क्रममा परेको सम्झनु पर्दछ ।

६. प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।

७. पाठ्यक्रम लागू मिति :–

नेपाल खाद्य संस्थान

६ तह मिल मेकानिक्स पदको खुला/आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

प्रथम पत्र :– मेकानिकल इञ्जिनियरिङ्ग I

1. **Workshop Technology and Metrology**
   - 1.1 Basic tools and Basic hand operations
   - 1.2 Machine tools: Lathe, Milling, Drilling, Grinding and Shaper machines
   - 1.3 Metal Joining: Soldering, Brazing, Electric Arc Welding & Arc Cutting, Gas Welding
   - 1.4 Limits, Fits and Tolerances
   - 1.5 Errors in measurement
   - 1.6 Measuring and Gauging: Vernier Caliper, Micrometer, Depth Gauge, Dial Gauge, Block Gauge, Length Bars, Comparators

2. **Thermodynamics and Heat engine**
   - 2.1 Basics concepts: Thermodynamic system, Thermodynamic property, Heat and Work, Pure substance, Zeroth Law
   - 2.2 First Law of Thermodynamics: First law for closed system, Control mass and control volume formulation
   - 2.3 Second Law of Thermodynamics: Heat engine, refrigerator and heat pump, Kelvin Planck and Clausius statements, entropy, entropy generation
   - 2.4 Refrigeration: Reversed Carnot cycle, Vapor compression cycle, Vapor absorption cycle, Refrigerants and their properties
   - 2.5 Air conditioning: Psychometric properties and psychometric chart, heating, cooling, humidification, dehumidification process, Air conditioning systems
   - 2.6 Thermodynamic cycles: Carnot cycle, Otto cycle, Diesel cycle, Dual cycle, Brayton cycle, Rankine cycle
   - 2.7 Internal combustion engines: Classifications, components, two-stroke and four-stroke operations, performance of internal combustion engines, Ignition system, Cooling system, Lubrication system, EFI machine
   - 2.8 Modes of heat transfer: Conduction, Convection and Radiation

3. **Electric Machines and Pumps**
   - 3.1 DC Motors: Shunt field, series field and compound field motors, Torque-speed characteristics
   - 3.2 DC Generators: Shunt, series and compound field machines, voltage/speed/load characteristics, effects of variable load, variable torque
   - 3.3 Synchronous and induction machines: Basic structure of synchronous machines, Generator on isolated load, generator on large system, synchronous motor
   - 3.4 Pumps: Centrifugal pump and reciprocating pump (working principle and characteristics); Gear, Vane and Piston pumps

4. **Material Science and Metallurgy**
   - 4.1 Types of materials and material selection
   - 4.2 Mechanical properties and testing: Tension, Compression, Bending, Torsion, Impact, Fatigue and Hardness Tests

4.3 Cold working and Hot working
4.4 Types of metals, ceramics, and polymers
4.5 Phase Transformation and Heat Treatment: Iron-Carbon Equilibrium Diagram, Hardening, Tempering, Annealing, Normalizing

5. **Fluid Mechanics**
   5.1 Fluid Properties: Viscosity, Surface tension, Compressibility, Vapor Pressure
   5.2 Fluid Statics: Fluid Pressure, Pressure variations in static fluid, Pressure head, Manometer, Force on submerged surfaces: plane horizontal, vertical and inclined surfaces
   5.3 Equations of Fluid Flow: Types of flow, Continuity equation, Bernoulli's equation, and Momentum equation
   5.4 Viscous Effects: Reynolds number, Boundary layer, Frictional resistance to flow in pipes
   5.5 Flow measurement: Pitot-static tube, Orifice, Venturimeter, Nozzle, Rotameter

6. **Energy Resources**
   6.1 Energy consumption scenario of Nepal
   6.2 Different types of energy resources and their application

7. **Professional Practice**
   7.1 Ethics and Professionalism: Perspective on morals, code of ethics and guidelines of professional engineering practice
   7.2 Legal aspect of professional engineering in Nepal: Provision for private practice and employees engineers
   7.3 Contract law
   7.4 Tendering and contract documents
   7.5 Nepal Engineering Council: Guidelines and Act

8. **Environmental Engineering**
   8.1 Air pollution : causes, effects and control
   8.2 Water pollution : causes and effects, waste water treatment
   8.3 Indoor air quality : Indoor pollutants, effects of indoor pollutants and control of pollutants
   8.4 Global impacts : Green house effects, Acid rain, Global warming, Montreal protocol waste water treatment

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नेपाल खाद्य संस्थान

६ तह मिल मेकानिक्स पदको खुला/आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

द्वितीय पत्र :– मेकानिकल इञ्जिनियरिङ्ग II

1. **Machine Component Design and Drawing**
   - 1.1 Types of projection
   - 1.2 Production drawing and shop drawing
   - 1.3 Terminologies of mechanisms, mobility and degree of freedom
   - 1.4 Design process
   - 1.5 Design of Shafts, Couplings, Bearing, Belts and Gears
   - 1.6 Factors affecting choice of materials for design: strength, toughness, durability, hardness
   - 1.7 Loading: tensile, compressive, shearing, bending, bearing and torsion
   - 1.8 Common types of failure: Theories of failure, stress concentration effects, ductile and brittle materials, factor of safety

2. **Automotive System**
   - 2.1 Diesel and Petrol engines and their components
   - 2.2 Transmission system; Suspension system; Cooling system; Lubrication system; Exhaust system; Electrical system, Fuel system
   - 2.3 Instruments and controls
   - 2.4 Testing of IC Engine-Instruments and Controls

3. **Industrial Engineering and Management**
   - 3.1 Role of production/Operation Management and System concepts
   - 3.2 Plant Location and Plant Layout Design
   - 3.3 Production Planning and Control: Selection of materials, methods, machines and manpower
   - 3.4 Network methods: PERT, CPM
   - 3.5 Inventory Control: Inventory costs and Inventory models
   - 3.6 Workshop layout and design
   - 3.7 Forecasting Techniques: Requirements of forecasting, Time series and Moving average methods, Regression analysis
   - 3.8 Quality Management: Importance of quality, Statistical process control
   - 3.9 Statistical Analysis: Measurement of central tendency, Deviation, Distribution

4. **Engineering Economics**
   - 4.1 Cost classification and analysis
   - 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 and IRR method
   - 4.4 Benefit and Cost Analysis: Cost benefit ratio, breakeven analysis
   - 4.5 Depreciation and its types
   - 4.6 Taxation system in Nepal

5. **Maintenance Management**
   - 5.1 Workshops and Stores
   - 5.2 Spare parts management
   - 5.3 Types of maintenance system
   - 5.4 Preventive maintenance and its necessity
   - 5.5 Break down maintenance
   - 5.6 Predictive Maintenance: Condition monitoring technologies
   - 5.7 Maintenance work of mechanical equipment and facilities

6. **Miscellaneous**
   - 6.1 Basic knowledge of heavy equipment: Loader, Bulldozer, Grader, Excavator, Roller, Crane & Forklift
   - 6.2 Safety rules and regulations for operation and maintenance of mechanical equipment and facilities
   - 6.3 Materials Handing Equipments : Conveyers, Cranes, Industrial trucks and Hoisting equipments

7. **संविधान, ऐन र नियमहरु तथा खाद्य संस्थान सम्बन्धी**
   - 7.1 नेपालको वर्तमान संविधान, २०७२
   - 7.2 संस्थान ऐन, २०२१
   - 7.3 नेपाल खाद्य संस्थान कार्यालय सञ्चालन तथा कर्मचारी सेवा शर्त र सुविधा सम्बन्धी विनियमावली २०६४
   - 7.4 खाद्य ऐन, २०२३ र खाद्य नियमावली, २०२७
   - 7.5 करार ऐन, २०५६
   - 7.6 कम्पनी ऐन, २०६३
   - 7.7 सार्वजनिक खरिद ऐन, २०६३ र सार्वजनिक खरिद नियमावली, २०६४
   - 7.8 उपभोक्ता संरक्षण ऐन, २०५४
   - 7.9 वातावरण संरक्षण ऐन, २०५३
   - 7.10 भ्रष्टाचार निवारण ऐन, २०५९
   - 7.11 विदेशी लगानी तथा प्रविधि हस्तान्तरण ऐन, २०४९
   - 7.12 नेपाल खाद्य संस्थानको परिचय, संगठनात्मक संरचना, कार्यक्षेत्र, विधमान अवस्था, सम्भावना र चुनौतीहरु
   - 7.13 अन्तर्राष्ट्रिय खाद्य तथा कृषि सम्बन्धी संघ संस्थाहरुः इफड (IFAD), खाद्य तथा कृषि संगठन (FAO), विश्व खाद्य कार्यक्रम (WEP) र विश्व व्यापार संगठन (WTO) सम्बन्धी जानकारी
   - 7.14 नेपालमा खाद्यान्न उत्पादनको वर्तमान अवस्था, माग र आपूर्ति तथा बजार व्यवस्था
   - 7.15 खाद्य सुरक्षा र खाद्य सम्प्रभुता
