मनमोहन प्राविधिक विश्वविद्यालय

सेवा आयोग

शिक्षण सेवा, इलेक्ट्रिकल इन्जिनियरिङ समूह, पाँचौं तहको ल्याब टेक्निसियन पदको
खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

पदको विवरण

सेवा : शिक्षण	समूह : इलेक्ट्रिकल इन्जिनियरिङ
पद : ल्याब टेक्निसियन	तह : पाँचौं

पाठ्यक्रमको रूपरेखा

यस पाठ्यक्रमको आधारमा निम्नानुसार दुई चरणमा परीक्षा लिइनेछ ।

प्रथम चरण : लिखित परीक्षा — पूर्णाङ्क : १५०

द्वितीय चरण : (क) कम्प्युटर सीप परीक्षण — पूर्णाङ्क : ३०

(ख) अन्तर्वार्ता — पूर्णाङ्क : २५

तालिका (१)

प्रथम चरण : लिखित परीक्षा

पत्र	विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्न संख्या	समय
प्रथम	खण्ड(क): विश्वविद्यालय सेवासम्बन्धी कानुनी व्यवस्था	७५	३०	वस्तुगत बहुवैकल्पिक प्रश्न	२५प्रश्न X १ अंक =२५	२५मिनेट
	खण्ड(ख): सेवासम्बन्धी विषय			वस्तुगत बहुवैकल्पिक प्रश्न	५०प्रश्न X १ अंक =५०	५० मिनेट
द्वितीय	सेवासम्बन्धी विषय	७५	३०	विषयगत छोटो उत्तर आउने प्रश्न	९ प्रश्न X ५ अंक = ४५	२ घण्टा ३० मिनेट
				विषयगत लामो उत्तर आउने प्रश्न	३ प्रश्न X १० अंक = ३०	

तालिका (२)

द्वितीय चरण : कम्प्युटर सीप परीक्षण र अन्तर्वार्ता

विषय	पूर्णाङ्क	परीक्षा प्रणाली	समय
कम्प्युटर सीप परीक्षण	३०	प्रयोगात्मक	३० मिनेट
अन्तर्वार्ता	२५	मौखिक	

द्रष्टव्य :

१. यो पाठ्यक्रमको योजनालाई प्रथम चरण र द्वितीय चरण गरी दुई भागमा विभाजन गरिएको छ ।

२. माथि उल्लेखित सेवा/समूह, तह र पदको खुला/आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम उपर्युक्त बमोजिम हुनेछ ।

३. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी वा नेपाली र अंग्रेजी दुवै हुनेछ ।

४. वस्तुगत बहुवैकल्पिक प्रश्नहरुको गलत उत्तर दिएमा प्रत्येक गलत उत्तरवापत सही उत्तर दिँदा पाउने अंकको २० प्रतिशत अङ्क कट्टा गरिनेछ । तर उत्तर नदिएमा अङ्क कट्टा गरिने छैन ।

५. वस्तुगत बहुउत्तर हुने परीक्षामा परीक्षार्थीले चारवटा उत्तरमध्ये एउटा मात्र उत्तरको नम्बर लेख्नु पर्नेछ ।

६. विषयगत प्रश्नका हकमा तोकिएको अंकका लागि एउटा प्रश्न वा एउटै प्रश्नका दुई वा दुई भन्दा बढी भाग वा दुई वा बढी प्रश्नहरु सोध्न सकिनेछ ।

७. परीक्षामा सोधिने प्रश्न संख्या, अंक र अङ्कभार सम्बन्धित पत्र/विषयमा दिईए अनुसार हुनेछ ।

८. परीक्षामा परीक्षार्थीले मोवाइल, प्रोग्रामेवल क्यालकुलेटर, स्मार्ट-वाच वा यस्तै प्रकारका विद्युतीय उपकरण परीक्षा हलमा लैजान पाइने छैन ।

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

१०. प्रथम चरणको लिखित परीक्षामा छनौट भएका उम्मेदवारहरूको प्राप्ताङ्क र द्वितीय चरणको प्रयोगात्मक परीक्षा तथा अन्तरवार्ताको अंकको कूल योगका आधारमा अन्तिम परीक्षाफल प्रकाशित गरिनेछ ।

११. यो पाठ्यक्रम मितिः २०७९/१०/०९ देखि लागु हुनेछ ।

लिखित परीक्षाका विषयवस्तु

प्रथमपत्र

खण्ड (क): सेवासम्बन्धी कानुनी व्यवस्था (बहुवैकल्पिक प्रश्न) २५ X १ = २५

(क) नेपालको संविधान (भाग १, ३, ५ र अनुसूचीहरू)

(ख)मनमोहन प्राविधिक विश्वविद्यालय ऐन २०७६

(ग) मनमोहन प्राविधिक विश्वविद्यालय शिक्षक तथा कर्मचारी सेवाका सर्त र सुविधासम्बन्धी नियमावली, २०७८

(घ) मनमोहन प्राविधिक विश्वविद्यालय आर्थिक प्रशासनसम्बन्धी नियमावली, २०७८

(ङ) मनमोहन प्राविधिक विश्वविद्यालय सेवा आयोगसम्बन्धी नियमावली, २०७८

(च) मनमोहन प्राविधिक विश्वविद्यालय संरक्षण समितिसम्बन्धी नियमावली, २०७८

(छ) मनमोहन प्राविधिक विश्वविद्यालय शैक्षिक प्रशासनसम्बन्धी नियमावली, २०७८

(ज) भ्रष्टचार निवारण ऐन, २०५९ (परिच्छेद २ कसूर र सजायसम्बन्धी व्यवस्था)

(झ) विद्युत ऐन २०४९ एवं नियमावली, २०५०

खण्ड (ख): सेवासम्बन्धी विषय ५०X १ = ५०

द्वितीय पत्रको सेवासम्बन्धी विषयको पाठ्यक्रम नै पहिलो पत्रको खण्ड "ख" को पाठ्यक्रम हुनेछ ।

Model Questions

Multiple choice questions (each question carries 1 marks)

1. The unit for inductive reactance is
   a. Ohm b. Henry
   c. Farad d. Ampere
2. Which of the following components of a D.C. generator plays vital role for providing direct current of a D.C. Generator.
   a. Dummy coils b. Cummutator
   c.Eye bolt d. Equalizer rings
3. As per rule of the maximum number of points of light, fans and light socket outlets that can be connected in one sub circuit is
   a. 2 b. 10
   c 8 d. 20

द्वितीय पत्रः सेवासम्बन्धी विषय ७५

1. Basic electrical circuit 15

1.1 Basic concept of electrical circuit, current, Voltage, Resistance, power and energy.

1.2 Resistivity, effect of temperature on resistance, temperature co - efficient of resistance. EMF, P.D. and voltage.

1.3 Voltage and current source, roll of internal resistance on terminal voltage, source conversion method.

1.4 ohm's Law, Kirchhoff's Law, current and voltage divider rule

1.5 Series circuit, parallel circuit, mixed circuit, open circuit, close circuit and short circuit.

1.6 D.C circuit analysis: Nodal analysis, Mesh analysis, Superposition theorem, Y/Δ and Δ/y transformation, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem.

1.7 General concept of capacitance, Factors affecting capacitor, types of capacitor, capacitor in series and parallel, energy stored, Charging and discharging of capacitor.

1.8 General concept of Inductance. Self inductance and mutual inductance. Inductor in series and parallel. Energy stored in a magnetic field.

1.9 A.C circuit terminologies, Generation of alternating emf. Average and RMS value, form factor peak factor.

1.10 Pure resistive, inductive and capacitive circuit analysis. RL, RC and RLC series and parallel circuit analysis. Resonance and quality factor.

1.11 Powers in A.C circuit, power factor, causes of low P.F, effects and improvement of law P.F.

1.12 Basic concept of three phase system. Advantages of three phase system .Generation of three phase emf. Interconnection of three phase, connections of three phase loads, balance and unbalance load analysis. Line and phase quantities.

2. Electrical Machine 5

2.1 Construction details, operating principle, types, three phase synchronous generator and operating characteristics, testing and performance analysis of following electric machines-Transformer (Single phase and three phase), dc generator, dc motor, three phase induction motors, single phase induction motors, three phase synchronous generator, three phase synchronous motor.

3. Basic of Generation, Transmission and Distribution 10

3.1 Generation of Electrical Energy.

3.1.1 Types of power plants, their classification.

3.1.2 Hydro power plant: layout and elements of hydro power plants, working principle, classification, merits and demerits, types of turbine.

3.1.3 Diesel power plant: Merits and demerits, components of diesel power plant.

3.1.4 Solar power plant: Solar cell and its types, Effect of temperature on solar cells, Tubular and Flat plate batteries, Charge controllers, Isolated PV system and its functional block diagram.

3.2 Substation: Types of substation: their advantage and disadvantage, various equipments of a substation and its typical layout.

3.3 Transmission Lines: Short and medium transmission line, Medium transmission line nominal π and T-model, main components of overhead line - conductors, line supports; guys and stays, insulators, phase and danger plates, jumpers, construction of underground cable, methods of laying underground cable, selection of cables, conductor spacing, sag, tension, skin and corona effect.

3.4 Distribution System: Single phase 2-wire and 3-phase four wire distribution, primary and secondary distribution system, typical layouts, service mains, distributor, feeder and its types.

4. Electrical Measurements & Instrument 10

4.1 Measuring Instrument: Permanent magnet moving Coil Instrument, Moving iron Instrument, Dynamometer type instrument, Induction type instrument.

4.2 Ammeter, Voltmeter, Power factor meter, Multi- range ammeter and Voltmeters.

4.3 Resistance Measurement: Ohmmeter, Wheatstone bridge, Megger: construction, operation and its application, continuity tester, measurement of earth resistance and soil resistivity.

4.4 Potentiometer: D.C potentiometer and types, practical application, A.C potentiometer: advantages and limitations of A.C potentiometers and applications.

4.5 Wattmeter, Induction type watt meters, single phase power measurement without wattmeter, polyphase wattmeter, Energy meter, Single phase induction type Energy meter, Routine testing of energy meters.

4.6 Power measurement in three phase circuit: three watt meter method, two watt meter method and one wattmeter method.

4.7 Maximum demand meter: working principle and application, Frequency meter: working principle and application.

4.8 Cathode ray oscilloscope: basic construction, operation, maintenance and application.

5. Utilization of Electrical Energy 5

5.1 Various terms used in illumination, Laws of illumination.

5.2 Types of lamps, construction and working principle of Tungsten Filament and Fluorescent lamp.

5.3 Types of lighting schemes, factory and street lighting

5.4 General concept of electric traction, classification, advantage and disadvantage of electric traction.

5.5 Air-conditioning System (Summer and Winter), Types of air-conditioning system, Exhaust fans, Industrial fans, Fan selection.

5.6 Resistance and Induction type of heating, DC and AC electric arc furnace.

5.7 Tariff and its types, Tariff system in Nepal.

5.8 Load characteristics: base and peak load, Load curve.

6. Switchgear and Protection 5

6.1 Fuse and fuse element materials, Fusing current, Fusing factor, time-current characteristics, Fuse types, Rewirable fuse(kit kat type), cartridge fuse, drop-out fuse, HRC fuse its construction and application, MCB and MCCB.

6.2 Isolators and Contactors: construction, operation and application.

6.3 Circuit Breaker: arc phenomena and extinction, restriking voltage, Types of circuit breaker, operating principle and construction of ACB, ABCB, OCB, VCB and SF_6 circuit breaker, Application and selection of Circuit breakers.

6.4 Grounding: its importance, Equipment and System grounding, Methods of Neutral grounding, earthing mat.

6.5 Safe value of current through human body, step potential touch potential.

6.6 Lightning arrestor and its characteristics, Surge absorbers and its types.

6.7 Relay and its type, construction and working principle of Induction disc relay, IDMT relay and Buchholz's relay, Over-current and Distance relay, application of different relays, Differential protection.

7. **Electrical Installation and Wiring** 15

7.1 General rules of wiring.

7.2 Typical house wiring circuit diagram, Distribution board and tree system of distribution of electrical energy.

7.3 Methods of wiring (Tee and Loop-in system), Systems of wiring (cleat wiring, wooden casing and capping wiring, PVC sheathed wiring, conduit wiring, underground wiring, choice of wiring system.

7.4 Types of cable for internal wiring, main switch and distribution board, power circuits, Conduits: types, accessories and fittings.

7.5 Lighting accessories and fittings, MCB and ELCB, Thermal overload relay.

7.6 Determining number of points, total load, size of main switch and distribution board, determination of size of conductor.

7.7 Earthing electrode and earthing lead, factors affecting earth resistance, methods of reducing earth resistance, methods of earthing (plate and pipe earthing

8. Laboratory Safety Rules & Record Keeping 10

8.1 Safety in laboratory; Causes of Accidents, Safety Measures in Lab.

8.2 Handling of equipment in Laboratory and workshop.

8.3 Materials management: Demand form, Inventory, Procurement, Store keeping.

8.4 Estimation of repair works

8.5 Importance of record keeping

8.6 Role of a lab technician

विषय : प्रयोगात्मक परीक्षा

समय : ३० मिनेट प्रश्न संख्या: ६

पूर्णाङ्क : ३० उत्तीर्णाङ्क : १२

कम्प्युटर सिप परीक्षणसम्बन्धी प्रयोगात्मक परीक्षा योजना

विषयवस्तु शीर्षक	प्रयोगात्मक अंक	समय
English Typing	३	४ मिनेट
Devanagari Typing	३	४ मिनेट
Windows Basic, Email and Internet	३	३ मिनेट
Word Processing	८	७ मिनेट
Electronics Spreadsheet	८	७ मिनेट
Presentation System	५	५ मिनेट
Total	**३०**	**३० मिनेट**

प्रयोगात्मक परीक्षाका विषय वस्तु

1. Windows basic, Email and Internet
    - Introduction to Graphical User Interface
    - Use & Update of Antivirus Concept of virus, worm, spam etc.
    - Starting and shutting down Windows
    - Basic Windows elements - Desktop, Taskbar, My Computer, Recycle Bin etc
    - Concept of file, folder, menu, toolbar
    - Searching files and folders
    - Internet browsing& searching the content in the web
    - Creating Email ID, Using email and mail client tools
    - Basic Network troubleshooting (checking network& internet connectivity)
2. Word Processing
    - Creating, saving and opening documents
    - Typing in Devanagari and English
    - Copying, Moving, Deleting and Formatting Text
    - Paragraph formatting (alignment, indentation, spacing etc.)
    - Creating lists with Bullets and Numbering

- Creating and Manipulating Tables
- Borders and Shading
- Creating Newspaper Style Documents Using Column
- Security Techniques of Document
- Inserting header, footer, page number, Graphics, Pictures, Symbols
- Page setting, previewing and printing of documents
- Mail merge

3. Presentation System
    - Introduction to presentation application
    - Creating, Opening& Saving Slides
    - Formatting Slides, Slide design, Inserting header& footer
    - Slide Show
    - Animation
    - Inserting Built-in picture, Picture, Table, Chart, Graphs, and OrganizationChart etc
4. Electronic Spreadsheet
    - Organization of Electronic Spreadsheet applications (Cells, Rows, Columns,Worksheet, Workbook and Workspace)
    - Creating, Opening and Saving Work Book
    - Editing, Copying, Moving, Deleting Cell Contents
    - Formatting Cells (Font, Border, Pattern, Alignment, Number , Protection,Margins and text wrap)
    - Formatting Rows, Column and Sheets
    - Using Formula with Relative and Absolute Cell Reference
    - Using Basic Functions (IF, SUM, MAX, MIN, AVERAGE etc)
    - Sorting and Filtering Data
    - Inserting Header and Footer
    - Page Setting, Previewing and Printing

Model Questions

Short Answer questions (each question carries 5 marks)

1. What is the transformer? Write its necessity in the power system. (3+2)
2. Write 10 general rules of wiring. $(0.5\times 10 = 5)$
3. Draw a neat layout diagram of a hydropower plant and explain the function of various elements. (2+3)

Long Answer questions (each question carries 10 marks)

1. Explain the working principle of D.C. generator with neat sketch. Derive its emf equation also. (7+3)
2. With the help of connection and phasor diagram, derive the expression for active power, reactive power and p.f of a balanced three phase load using two wattmeters method. (4+3+3)

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