



मनमोहन प्राविधिक विश्वविद्यालय  
सेवा आयोग

शिक्षण सेवा, इलेक्ट्रिकल इन्जिनियरिङ समुह, छैटौं तहको असिस्टेण्ट लेक्चरर पदको  
आन्तरीक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

पदको विवरण

सेवा : शिक्षण	समूह : इलेक्ट्रिकल इन्जिनियरिङ
पद : असिस्टेण्ट लेक्चरर	तह : छैटौं

पाठ्यक्रमको रूपरेखा

यस पाठ्यक्रमको आधारमा निम्नानुसार दुई चरणमा परीक्षा लिइनेछ ।

प्रथम चरण : लिखित परीक्षा

पूर्णाङ्क : ६०

द्वितीय चरण : (क) प्रयोगात्मक परीक्षा

पूर्णाङ्क : ४०

(ख) अन्तर्वार्ता

पूर्णाङ्क : २५

तालिका (१)

प्रथम चरण : लिखित परीक्षा

पूर्णाङ्क ६०

पत्र	विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्न संख्या	समय
प्रथम	खण्ड (क) सेवासम्बन्धी कानुनी व्यवस्था	२०	२४	वस्तुगत बहुवैकल्पिक प्रश्न	७ प्रश्न X १ अङ्क = ७	२० मिनेट
	खण्ड (ख) सेवासम्बन्धी विषय			वस्तुगत बहुवैकल्पिक प्रश्न	१३ प्रश्न X १ अङ्क = १३	
द्वितीय	सेवासम्बन्धी विषय	४०		विषयगत प्रश्न	८ प्रश्न X ५ अंक = ४०	१ घण्टा ४० मिनेट

तालिका (२)

द्वितीय चरण : प्रयोगात्मक परीक्षा र अन्तर्वार्ता

विषय	पूर्णाङ्क	परीक्षा प्रणाली	समय
प्रयोगात्मक	४०	प्रयोगात्मक	१ घण्टा 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 उपर्युक्तबमोजिम हुनेछ ।
३. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुनेछ ।
४. वस्तुगत बहुवैकल्पिक प्रश्नहरूको 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 चार वटा उत्तरमध्ये एउटा मात्र उत्तरको नम्बर लेख्नुपर्नेछ ।
६. विषयगत प्रश्नका हकमा तोकिएको अंकका लागि एउटा प्रश्न वा एउटै प्रश्नका दुई वा दुईभन्दा बढी भाग वा दुई वा बढी प्रश्नहरू सोध्न सकिनेछ ।
७. परीक्षामा सोधिने प्रश्नसंख्या, अंक र अङ्कभार सम्बन्धित पत्र /विषयमा दिइएअनुसार हुनेछ ।
८. परीक्षामा परीक्षार्थीले मोबाइल, प्रोग्रामेबल क्यालकुलेटर, स्मार्ट-वाच वा यस्तै प्रकारका विद्युतीय उपकरण परीक्षा हलमा लैजान पाइने छैन ।
९. प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।
१०. प्रथम चरणको लिखित परीक्षामा छनौट भएका उम्मेदवारहरूको प्राप्ताङ्क र द्वितीय चरणको प्रयोगात्मक परीक्षा तथा अन्तर्वार्ताको अंकको कूल योगका आधारमा अन्तिम परीक्षाफल प्रकाशित गरिनेछ ।
११. प्रथम र द्वितीय पत्रको परीक्षा एकै दिन हुनेछ । प्रथम पत्रको परीक्षाको उत्तरपुस्तिका बुझाउने बित्तिकै द्वितीय पत्रको परीक्षा सुरु हुनेछ ।
१२. यो पाठ्यक्रम मिति: २०७९/१०/०९ देखि लागू हुनेछ ।

**लिखित परीक्षाका विषयवस्तु**

**प्रथमपत्र**

खण्ड (क): सेवासम्बन्धी कानुनी व्यवस्था (बहुवैकल्पिक प्रश्न)

७X १ = ७

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

(झ) विद्युत ऐन २०४९ एवं नियमावली, २०५०

(ञ) नेपाल इन्जिनियरिङ्ग परिषद् ऐन २०५५ तथा नियमावली

खण्ड (ख): सेवासम्बन्धी (बहुवैकल्पिक प्रश्न)

१३ X १ = १३

द्वितीयपत्रको सेवासम्बन्धी विषयको पाठ्यक्रम नै पहिलो पत्रको खण्ड “ख” को पाठ्यक्रम हुनेछ ।

## Model Questions

### Multiple choice questions (each question carries 1 marks)

1. The ohm's law deals with the relation between  
(a) charge and resistance      (b) charge and capacity  
(c) current and p.d      (d) charge and p.d.
2. The rating of an electric lamp is 220v, 100 watt. If it is operated at 110v, the power consumed by it will be  
(a) 50w      (b) 75w  
(c) 25w      (d) 25w
3. Transformer core is laminated  
(a) because it is difficult to fabricate solid core  
(b) because laminated core provides high flux density  
(c) to avoid eddy current losses  
(d) to avoid hysteresis losses

द्वितीय पत्र : सेवासम्बन्धी विषय

पूर्णाङ्क : ४०

#### 1. D.C Circuit Analysis

- 1.1 Electric current, voltage, p.d and EMF. Resistance, Law of resistance, Resistivity, conductance, conductivity, effect of temperature on resistance, temperature co-efficient of resistance. Electrical power and Electrical Energy. simple calculations.
- 1.2 Series circuit, parallel circuit, mixed circuit complex circuit current divider rule voltage divider rule. Ohm's law, its limitation and application. Kirchhoff's law. Simple calculations.
- 1.3 Voltage source, current source, V/I characteristics, conversion of sources.
- 1.4 D.C.network theorem: Nodal analysis, Mesh analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Delta- star and star delta transformation, Simple calculations.
- 1.5 Capacitance, charging and discharging of capacitor, capacitor in series and parallel.
- 1.6 Inductance, energy stored in a magnetic field, self-inductance, mutual inductance, inductors in series and parallel.

## **2. AC Circuit Analysis**

- 2.1 Alternating voltage and current, advantages of A.C., Generation of sinusoidal A.C. emf. different terms used in A.C.: Instantaneous value, Amplitude, RMS value, Average value, Form factor, Peak factor
- 2.2 Pure Resistive, pure inductive and pure capacitive circuit, RL series, RC series, RLC series, RLC parallel circuit.
- 2.3 Three phase system, Advantages of 3 phase system, Generation of 3 phase emf. Interconnection of three phases: star connection, Delta connection. Relation between line and phase quantities in star and delta connection. Power in 3 phase circuits.
- 2.4 Power measurement in 3 phase circuits: One wattmeter method, Three wattmeter method and Two wattmeter method. Effect of p.f. on the wattmeter readings in two wattmeter method.

## **3. Electrical Machine.**

- 3.1 Transformer: Construction and working principle, ideal and real transformer, emf equation, equivalent circuit, losses and efficiency, voltage regulation, transformer on load and no-load operation, auto transformer tests on transformer (polarity, no load and load). Three phase transformer, constructional details and connection methods ( $\Delta/y$ ,  $y/\Delta$ ,  $y/y$ ,  $\Delta/\Delta$ ), power and distribution transformer, parts of transformer, efficiency, cooling of transformer, parallel operation of transformer.
- 3.2 D.C Generator: construction, slip ring and commutator, emf equation, types, working principle, characteristics curves, armature reaction, commutation, losses, voltage build up process, application of d.c generators.
- 3.3 D.C. motor: construction, working principle, back emf and mechanical power developed, torque equations, types and application, necessity of a starter, 3-point starter, series motor starter, speed control, motor characteristics, losses, universal motor.
- 3.4 Induction motor : construction and working principle, of 3-phase induction motor, equivalent circuit, slip and motor frequency, starting torque, condition for maximum torque, torque-slip characteristics, losses and power flow diagram, efficiency, no load test and blocked rotor test necessity of starter and starting methods, speed control method, application.
- 3.5 Single phase induction motor: working principle types based on starting methods application. Reversing the rotation of rotor.

- 3.6 Induction Generator: working principle, necessity of capacitor bank, application of induction generators.
- 3.7 synchronous Generator: construction and working principle, emf equation, armature reaction, voltage regulation, power equation and power angle characteristics, excitation system AVR, parallel operation of synchronous generator.
- 3.8 Synchronous motor: working principle, hunting and its reduction, application.

#### **4. Transmission and distribution**

- 4.1 Choice of transmission and distribution voltage, economic size of line conductors, advantages and limitations of adopting high voltage for transmission, comparison between overhead and underground system. Comparison between HVDC and HVAC transmission system.
- 4.2 Main components of overhead lines, single and double circuit, stranded and bundled conductors, conductor materials and conductor spacing, earth wire, sag and tension calculation, clearance above ground, types of insulators, corona effect and its reduction, skin effect, proximity effect, Ferranti effect, transposition and its significance.
- 4.3 Classification of transmission lines, ABCD constants, voltage regulation, efficiency, reactive power and voltage control in the receiving end. Calculation of shunt capacitor and reactor for VAR compensation.
- 4.4 Unsymmetrical faults and symmetrical faults, transient and temporary over voltages, counter measures to limit the over voltages.
- 4.5 Distribution system: primary and secondary distributors, underground cable, types of cable faults and its location finding method.

#### **5. Switchgear and protection**

- 5.1 Necessity of protection and basic requirements of protection scheme.
- 5.2 Fuse and its type, characteristics of HRC fuse application.
- 5.3 MCB, MCCB, working principle, characteristics, advantages, application.
- 5.4 Isolators, contactors, application.
- 5.5 Circuit breaker: types, operating principle and construction, application and selection of CB.
- 5.6 Relays and its classification, PMMC, over current, earth fault relay, impedance relay directional relay Buchholz relay.
- 5.7 Protection scheme: differential and distance relay. Its type and characteristics, tower footing resistance, shielding, grading rings.
- 5.8 Earthing: importance, system and equipment earthing, safe value of current and voltage, methods of neutral earthing.

## **6. Power Plant :**

- 6.1 Hydro power plant: layout and elements of hydro power plants. Working principle, classification, merits and demerits, selection of site, hydro turbines, types, classification and selection.
- 6.2 Microhydro power plant: Role of microhydro power plant for rural development, Governor, ELC, AVR, start up and shut down procedure load factor, diversity factor and utilization factor.
- 6.3 Diesel power plant: merits and demerits, components, working principle, and application of diesel power plant.
- 6.4 Steam power plant: merits and demerits, components, general layout and working principle, site selection.
- 6.5 Solar power plant: solar cell and its types, factors to be considered while choosing battery for a solar PV system. Charge controllers and its type, Isolated and grid connected PV system.

## **7. Measurements and Instruments :**

- 7.1 Classification of measuring instrument, moving iron and moving coil instruments.
- 7.2 Instrument transformer (CT, PT), their characteristics and application.
- 7.3 Wattmeter power factor meter and energy meter, their introduction and application.
- 7.4 Megger, construction, working principle, application.
- 7.5 Measurement of earth resistance and soil resistivity.

## **8. Electronics**

- 8.1 Semiconductor devices: diode, transistor, thyristor
- 8.2 Rectifier circuit their connection and working principle.
- 8.3 Inverters: single phase and three phase inverters, PWM type inverters.

## **9. Utilization of electrical Energy :**

- 9.1 Load characteristics: Load and diversity factor base and peak load, load curve, load duration and energy load curve.
- 9.2 Heating: resistance, induction and dielectric heating.
- 9.3 Refrigeration and air conditioning: types and working principle.
- 9.4 Illumination: General terms, incandescent and discharge Lamps, tungsten and filament lamps. Fluorescent tube light, types and design of lighting schemes. Method of lighting calculations.
- 9.5 Tariffs and its types; tariff system used in Nepal.

## **10. Electrical Installation and wiring.**

- 10.1 General rules of wiring, methods and choice of wiring system.

10.2 Types of cable for internal wiring. Design of main distribution board and sub distribution board.

10.3 Determining number of points, total load, number of sub-circuits, rating of main switch and distribution board, size of conductor. Simple layout of wiring system.

10.4 Safety rules of wiring and installation.

## 11. Curriculum overview

11.1 Curriculum Overview: Preparation of Teaching Plan, Lesson Plan and Session Plan

### Marks allocated:

Chapter No.	Marks
1 & 2	5
7 & 8	5
3,4, 5, 6 & 11	5×5 =25
9 & 10	5
<b>Total</b>	<b>40</b>

### प्रयोगात्मक परीक्षा

समय : १ घण्टा ३० मिनेट

पूर्णाङ्क : ४०

उत्तीर्णाङ्क : १६

प्रयोगात्मक परीक्षा अन्तर्गत सेवा सम्बन्धी विषयमा उल्लेखित विषयवस्तु मध्ये तोकिएको इकाईबाट एउटा पाठ शिक्षण गर्न दिइनेछ। प्रत्येक उम्मेद्वारको लागि फरक फरक इकाई तोकनु पर्नेछ। उम्मेद्वारले शिक्षण गर्दा स्लाईड तयार गरि पावरपईन्टबाट प्रस्तुतिकरण गर्नु पर्नेछ। प्रयोगात्मक कार्यको मुल्याङ्कन देहाय बमोजिम गरिनेछ।

क कक्षा सञ्चालन सम्बन्धी पाठ योजना तयारी	(५)
ख विषयवस्तु प्रस्तुतीकरण	(३०)
१ विषयवस्तुको ज्ञान	(१०)
२ शिक्षण विधीको प्रयोग	(१०)
३ कक्षाको वातावरण	(५)
४ समय व्यवस्थापन	(५)
ग सिकाइ मुल्याङ्कन	(५)

जम्मा: ४०

## Model Questions

### Short Answer questions (each question carries 5 marks)

1. What are the factors affecting the resistance of a conductor; How they affect its value? (3+2)
2. An alternating current is represented by  $i = 70.7 \sin 520t$ , determine (a) the frequency (b) the current 0.0015 sec after passing through zero, increasing positively (c) form factor. (2+2+1)
3. Classify and compare different types of CB that are used in power system protection (2+3)

☆☆☆