



प्राविधिक शिक्षा तथा व्यावसायिक तालीम परिषद्
नेपाल बनेपा पोलिटेक्निक ईन्स्टिच्यूट
पदपूर्ति उप-समिति
बनेपा, काभ्रेको

विद्युत/इलेक्ट्रिकल प्रशिक्षक
(इलेक्ट्रिकल उप-समूह) (अधिकृत स्तर तृतीय श्रेणी प्राविधिक) पदको
लिखित परीक्षाको पाठ्यक्रम

सेवा : प्राविधिक तथा प्रशिक्षण	प्रशिक्षण समूह : इन्जिनियरिङ्ग प्राविधिक प्रशिक्षण	उपसमूह : इलेक्ट्रिकल
पद : विद्युत/इलेक्ट्रिकल प्रशिक्षक	स्तर : अधिकृत स्तर तृतीय	
पाठ्यक्रमको रूपरेखा : यस पाठ्यक्रमको आधारमा निम्नानुसार दुई चरणमा परीक्षा लिइनेछ।		
प्रथम चरण : लिखित		परीक्षा पूर्णाङ्क : १००
द्वितीय चरण : अन्तरवार्ता		पूर्णाङ्क : २५

प्रथम चरण: लिखित परीक्षा योजना

पत्र	बिषय	खण्ड	परीक्षा प्रणाली	प्रश्न संख्या	अंक भार	समय	पूर्णांक	उत्तीर्णांक
द्वितीय	सेवा सम्बन्धी प्राविधिक विषय	सेवा सम्बन्धी समूह/उपसमूहको प्राविधिक विषय	बस्तुगत बहुउत्तर (Multiple Choice)	२५	२५X२=५०	३० मिनेट	१००	४०
			विषयगत (Subjective)	५	५X१०=५०	१ घण्टा ३० मिनेट		

द्वितीय चरण :: अन्तरवार्ता योजना

बिषय	पूर्णांक	परीक्षा प्राणली
अन्तर्वार्ता	२५	मौखिक

विद्युत/इलेक्ट्रिकल प्रशिक्षक
(इलेक्ट्रिकल उप-समूह) (अधिकृत स्तर तृतीय श्रेणी प्राविधिक) पदको
लिखित परीक्षाको पाठ्यक्रम

विषय: सेवा सम्बन्धी सम्बन्धित प्राविधिक विषय

पूर्णाङ्क - १००

1. D.C Circuit Analysis

- 1.1 Circuit elements: Resistor, Indicator and capacitor
- 1.2 Ohm's Law Kirchhoff's Law, node and mesh analysis.
- 1.3 Network Theorem: Thevenin's theorem, Norton's theorem super position theorem maximum power transfer theorem.
- 1.4 Transient response of RLC circuit excited by D.C. source.

2. AC Circuit Analysis

- 2.1 Relationship between frequency speed and number of pole
- 2.2 Alternating voltage and current peak value R.M.S. value average value
- 2.3 RLC series and parallel circuit.
- 2.4 Single phase system and three phase system.
- 2.5 Transient response RLC circuit excited by A.C. sources
- 2.6 Volt amperes, power and reactive volt-amperes in a three phase system
- 2.7 Inter connection of star and delta connection system

3. Electrical Machine

- 3.1 Transformer: construction, working principle, equivalent circuit, loss efficiency, power transformer distribution transformer auto transformer, three phase transformer, testing of transformer, parallel operation of transformer.
- 3.2 D.C. machine: construction and working principle of d.c. motor / d.c. generator. Type of d.c. motor, back emf of d.c. motor, type of d.c. generator, voltage build up process, armature reaction, speed control of d.c. motor, characteristics and application of d.c. motor.
- 3.3 Induction machine: working principle of single phase induction motor. Type of single phase induction motor, characteristics and applications construction and working principle of 3- phase induction motor, equivalent circuit torque speed characteristics, efficiency of 3 phase induction motor.
- 3.4 Synchronous machine: construction and working principle of synchronous generator / synchronous motor phase diagram and power angle characteristics armature reaction. Parallel operation synchronous generator. Leading p.f., lagging p.f., unit p.f. of synchronous motor.

4. Transmission and distribution

- 4.1 Overhead and underground transmission advantages and limitation of high voltage transmission.
- 4.2 Conductor size, insulator stay wire cross arm pole, power, vibration damper, anti climbing device, earth wire, sag tension calculation A.C.S.R conduction, ABC conductor.
- 4.3 Power distribution system: primary and secondary distribution, voltage, levels feeder distributor, service main pole mounting transformer poles / insulator / conductor, accessories protection coordination in distribution system.
- 4.4 Type of transmission line: short transmission line, medium transmission line, long, transmission line, efficiency voltage regulation. High voltage direct current (HVDC) transmission line. Flexible AC transmission system (FACTS).

5. Power Plant Engineering

- 5.1 Steam power plant: construction and working principle of steam power plant.
- 5.2 Diesel power plant: construction and working principle of diesel power plant.
- 5.3 Nuclear power plant: construction and working principle of Nuclear power plant.
- 5.4 Hydro power plant, types, construction working principle, classification.

6. Measurement and Instrument

- 6.1 Absolute and relative errors accuracy.
- 6.2 Deflection type measuring instrument, construction, working principle (such as Ammeter, voltmeter, voltmeter, wattmeter watt hour meter frequency meter power factor meter)
- 6.3 Megger: working principle and construction.
- 6.4 Measurement of low, medium high resistance by ohm meter method.
- 6.5 Connection of synchroscope in bus bar.
- 6.6 Operation amplifier, signal, amplification. 6.7 Analog and digital Oscilloscope, operating principle.
- 6.8 Analog to digital to analog converters
- 6.9 Microprocessor base instrument
- 6.10 Potentiometer: AC/DC construction working principle.

7. Switchgear and protection

- 7.1 Fuse / MCB / MCCB type and characteristics and working principle.
- 7.2 Isolator: type construction and operating principle.
- 7.3 Electro magnetic contactor, construction, operation principle, connected circuit diagram.
- 7.4 Circuit breaker ACB, O, CB VCB and SF6 circuit breaker operating principle and construction.
- 7.5 Relays: induction relay and static relay over circuit relay earth fault relay, impedance relay directional relay.
- 7.6 Protection schemes: differential distance under voltage, over current protection.
- 7.7 Grounding : System an equipment grounding safe value of current and voltage, touch and step potential, lightning arrester.
- 7.8 Calculate of short direct MVA for symmetrical fault.

8. Power Electronics

- 8.1 Power electronic devices: Power transistor power diode, MOSFET IGBT. SCR characteristics
- 8.2 D.C. Choppers: Step up, step down, working principle. 8.3 Inverter: Circuit, operation (single phase, voltage inverter, three phase voltage inverter)
- 8.4 A.C. voltage controller: With resistive load and inductive load.

9. Microprocessors:

- 9.1 Micro computer: Construction basic function.
- 9.2 Type of buses 8085 micro computer.
 - 9.2.1 Adder Bus, Data bus, Control bus
- 9.3 Microprocessor based speed control of separately excited DC motor.
- 9.4 Various applications of micro processors in control system.

10. Digital Electronics

- 10.1 Half adder, full adder, binary adder.
- 10.2 Controlled inverted by digital electronic
- 10.3 The functions of: Arithmetic logic unit (ALU) registers counters, encoders; decoders.

11. Basic Electronic

- 11.1 Construction of Bi-polar transistor, operating characteristics, use as amplifier, and switching.
- 11.2 Rectifier: Rectifier using diode - half wave full wave, capacitor and inductor filter.
- 11.3 Zener diode as voltage stabilizer.
- 11.4 Type of diode: Varactor diode, tunnel diode, photo diode.
- 11.5 Type of field effect transistor and characteristics.

12. Utilization of Electrical Energy

- 12.1 Tariff: Objective, affecting tariff, type of tariff.
- 12.2 Lamp: In candescent lamp arc lamp sodium lamp fluorescent lamp vapor lamp.
- 12.3 Load characteristics: diversity factor, low power factor and its disadvantage improving power factor.

12.4 Illumination: Illumination luminance efficiency, law of illumination design in door lighting scheme.

12.5 Selection: Selection motor industry's application.

13. Engineering Management

13.1 Organization planning design and development.

13.2 Management planning and control.

13.3 Management economic 13.4 Human Resource Management

13.4.1 Acquisition, Utilization, Development

13.5 Project appraisal Techniques

13.6 Institution support for entrepreneurship in Nepal.

13.7 Role of entrepreneurship in economic development.

14.1 Control System Component

14.1.1 Task of control engineers

14.1.2 Working of servo mechanism

14.1.3 Close loop open loop feedback system used real world control system.

14.2. Sensors and Transducers

14.2.1 Function of sensors in control system

14.2.2 Explain strain gauge potentiometer tachogenerator, thermocouple.

14.2.3 Operating principle of ; hydraulic and pneumatic system.

14.2.4 Function: Actuator, controller

14.3. Controller

14.3.1 Lead lag network realization by electrical circuits.

14.3.2 PID controller with operational amplifiers.

14.3.3 Working of PLC (Program Logic Controller): Interpretation ladder logic diagram. 14.3.4 Tuning a process control system.

15. Micro hydro power

15.1 Role of MHP plant for rural development

15.2 Historical background and current status of MHP in Nepal.

15.3 Component of MHP: Wire intake canal desalting basin and spillway, forebay penstock powerhouse etc.

15.4 Types: Types of turbine using in micro hydro power.

15.5 Speed Governing: Hydraulic mechanical governor electronic load controller (ELC) basic principle.

Types of ELC - AC voltage controller based FLG, DC, Chopper based ELC discrete resistance type ELC.

15.6 Voltage control: AVR for synchronous generator VAR compensator (Thyristor switching capacitor fixed capacitor thyristor control reactor) for inductor generator.

15.7 Measurement of discharge at site: Bucket method, velocity method weir method.

15.8 Measurement of head at site: Using clinometers using a water filled tool using altimeter.

15.9 Power calculation, selection and sizing of turbine and generator.

15.10 Draw: Single line diagram, generator turbine panel board with measuring and protective device in MHP.

15.11 Plant operator: Starting up procedure, shut down procedure, training of operation. (MHP)

॥ समाप्त ॥