Gandaki University
गण्डकी विश्वविद्यालय

Syllabus for Written Examination

Post: **Electrician (5^{th} level)**

1. **Fundamentals on Electrical Engineering:**
   (a) Concept of electric current, charge, potential, EMF, conductor, semiconductor, insulator.
   (b) Laws of resistance and specific resistance, inductance, capacitance, cells and batteries, their connections, units, engineering materials, work, energy, power.
   (c) Ohm's laws, Kirchhoff's laws and its application, fundamentals on AC, efficiency.
   (d) Concept of phase difference in different configurations of R, L, C circuits, analysis of series and parallel resonance circuits.
   (e) Generation of three phase voltage, phase sequence, star-delta/ delta-star connection, balanced and unbalanced system.
   (f) Circuit analysis, electrical symbols, diagrams, building drawing.
   (g) Fundamentals on Computer Aided Drafting (CAD).
2. **Power Generation:**
   (a) Sources of electrical energy, single line diagram of power supply system.
   (b) Hydroelectric power plant, its layout, main components, advantages and disadvantages, site selection, classification, turbine types.
   (c) Substation types, substation equipment and their characteristics, bus bar and their arrangements.
   (d) Diesel generator plant, its operation, characteristics, applications.
   (e) Solar power generation and its characteristics, wind power generation and its characteristics.
   (f) Automatic Voltage Regulator, Uninterrupted Power Supply.
3. **Transmission, Distribution and Consumer Services**
   (a) Single line diagrams of distribution system, installation, connection and protection of 11kV/ 400V distribution transformer, substation.
   (b) Handling electrical tools and equipment, selection of protective devices, electrical fittings, electrical diagrams, wiring and types, concept of illumination, PVC casing capping, conduit surface and concealed wiring, installation and wiring lighting circuits, power circuits.
   (c) Transmission Lines: Necessity of high voltage transmission, line parameters, choice of voltage level, conductor spacing, voltage regulation, efficiency, sag, tension, clearance, supports, cross arms, insulating materials and their classification, vibrations and dampers, Overhead Lines and underground cables.
   (d) Distribution System: Layout, voltage regulation, distribution transformer, single phase two wire configuration, three phase four wire configuration, selection of supports, conductor types, consumer supply connection, Energy meter, their construction, principle, errors, testing.
   (e) Estimating and costing of distribution system for different electrical loads, load curve, load duration curve, load factor, diversity factor, plant factor, capacity factor, utilization factor.

(f) Utilization of electrical energy on different sector, domestic connection and its components, power factor and measures to correct low power factor.

4. **Electric Machines:**

   (a) Magnetic circuits, losses, hysteresis loop.

   (b) Transformer, its construction, basic principle, transformer tests, efficiency, voltage regulation, auto-transformer, current transformer, potential transformer, parallel operation, Buchholz protection.

   (c) DC Generator and types, characteristics, armature reaction, parallel operation.

   (d) DC and AC motors with their basic construction, working principles, characteristics, applications, speed control techniques.

   (e) Induction machines operating principle, torque - slip characteristics, speed control, starting techniques.

   (f) Synchronous machines basic construction, operating principle, alternator on no-load.

5. **Protection System and Repair/ Maintenance:**

   (a) Fuses: time-current and cut-off characteristics, types, rating, applications.

   (b) MCB, MCCB, magnetic contactors, ACB, VCB, SF6 circuit breakers, minimum oil circuit breaker.

   (c) Protecting relays: principle of operation, IDMT relay, Plug Setting Multiplier (PSM), Time Dial Setting (TDS), pickup current.

   (d) Lightening Arrestor - Characteristics; metal-oxide lightening arrestor – construction and operating principle; installation of building lightening arrestor.

   (e) Handling of ammeter, voltmeter, wattmeter, multi meter, insulation tester and earth tester, power analyzer, maximum demand meter, TOD meter.

   (f) Repair and maintenance of different electrical appliances, domestic/ commercial/ industrial installation, single phase AC motor, three phase AC motor (balanced and unbalanced), generator set, single phase low voltage transformer, inverters, converters.

6. **Electrical Safety Rules, Laws and Regulations:**

   (a) Electric shocks, first aid, equipment earthing and its types, fire hazards and fire fighting techniques, electrical safety tests, circuit tests.

   (b) Lightning Protection, Earthing resistance, method of rod earthing, pipe earthing, plate earthing and chemical earthing, Isolating switches,

   (c) Concept of electrical energy development in Nepal, Rules for – consumer, standard voltage for distribution, Concept of NEA code of practice, export – import links for power exchange with India.

   (d) NEA distribution rules & regulations for 11kV and 400/ 230 V overhead line construction standards.

   (e) Electricity Act 2049, Electricity Regulations 2050, Hydropower Development Policy 2058, Environment-Protection-Rules-2077, Electricity Regulation Commission Act, 2017.

   (f) Tariff structure for different consumer category.

7. **Basic Electronics:**

   (a) Diode characteristics, zener diode and characteristics, thyristor, power transistor, rectifier circuits, filter circuits, oscilloscope, biasing, data amplification, logic gates.