

Nepal Telecom
Nepal Doorsanchar Company Ltd.

Syllabus

**Part II (Specialized subject for Electrical Engineer Level 7 Tech.-
For Telecom Maintenance Engineer)**

Time: 2 hours

Full Marks: 100

Pass Marks: 40

Part II (Specialized Module) All the Questions are Compulsory

Types of question	Number of questions	Marks	Total Marks	Remarks
Objective Questions	30	1	30	1/4 marks will be deducted for each incorrect answer
Short Questions	10	4	40	
Long Questions	3	10	30	
			100	

Use of non-programmable calculator is permitted in the examination hall.

1. Basic Electricity

(Weightage 10%-20%)

Electric current, EMF and Voltage, Resistance and Ohm's law, Basic circuit elements – Resistors, Capacitors, Inductors, Basic concepts on R-L-C Circuits, Delta/Star and Star Delta transformations, Kirchhoff's law, Electrical Circuit and Network theorems, Series and parallel circuits, Thevenin's equivalent circuit, Norton's equivalent circuit, Reciprocity theorem, Superposition theorem, Maximum Power transfer, Nodal and mesh method of network analysis, Millman's theorem, Magnetism and Electromagnetism.

2. AC circuit analysis

(Weightage 5%-15%)

Generation of alternating voltage, average values, RMS values, RMS or effective values of any types of alternating voltage and current wave form, Phasor algebra, steady state response of circuits, Concept of admittance, reactance, instantaneous power, average real power, reactive power, resonance in series and parallel RLC circuit, bandwidth, effect of Q-factors in resonance.

3. Electric Machines

(Weightage 10%-20%)

Magnetic circuit concepts: Ampere's laws, Faraday's laws, Lenz law, Ferromagnetic material, Hysteresis current, Hysteresis and eddy current losses, Basic concepts of Electrical machines: DC generators and motors, Alternators, Transformers, Synchronous and Induction motors, Controls of DC Machines in the Steady state, Insulating materials, conducting materials, superconductors, semiconductors, natural and force cooling.

4. Power System Analysis

(Weightage 5%-15%)

Generating Plants (Hydro, Gas, Diesel, Nuclear), Fundamentals of Transmission and Distribution Systems, Three Phase Power Systems (balanced, unbalanced), Power system Load Flow Calculation, Power systems Stability, transmission lines, advantages of three phase system, star and delta connected supply and load circuit, line and phase voltage current relations.

5. **Renewable energy** **(Weightage 3%-7%)**
Basic concepts of solar energy, Solar power supply system, Solar regulator.
6. **Industrial Electrification** **(Weightage 15%-25%)**
Illumination, Design of Electrical Heating System, Electrical Installation Systems, Emergency and backup electrical supplies, Battery: Lead acid, Charging / Discharging characteristics, Difference between solar and conventional batteries, Deep discharge and battery life, Maintenance free batteries, Over voltage and under voltage protection of batteries, UPS, Self-start Engines, Inverter, Thyristor controlled rectifier, Three phase Rectifier, DC/DC converter, SMPS, Voltage regulator, Materials Used in the Electrical Equipments, Power Cables, Electrical drawing, design and cost estimation.
7. **Switchgear and protection** **(Weightage 3%-7%)**
Principles of Power system Protection, Protective Relays, Types of Circuit Breakers, Generator Protection, Transformer Protection and Transmission Protection, Power/Frequency Control.
8. **Instrumentation and Measurement** **(Weightage 5%-15%)**
Principles of moving coil instrument, Measurement of voltage and current, various electrical measuring instruments: galvanometer, voltmeter, sensitivity of voltmeter, ammeter, ohmmeter, Megger, Earth resistance meter, multi-meter, and oscilloscope, Wheatstone bridge, inductance and capacitance bridges, probability of error and calibration.
9. **Control system** **(Weightage 3%-7%)**
Open loop and closed loop control system, System Stability and Sensitivity, System transfer functions and responses, Poles and Zeros locations and their significance, Root locus method, Frequency response method, Laplace transform method in solutions of differential equations, Ziegler-Nicholas tuning methods based controller tuning.
10. **Safety Engineering** **(Weightage 3%-7%)**
Electric Shock Hazards, Earthing and Shielding Techniques for electrical equipments, Electrical induction into communications lines, surge protection, Industrial radiation hazards, Lightning Protection