

**Syllabus for Limited Departmental Competitive Examination for promotion
from JTO (Electrical) to SDE (Electrical)
PAPER I (Multiple-choice)
ELECTRICAL ENGINEERING-I
(Maximum Marks = 100 – Time 3 hours)**

- 1. GENERAL: (5 Marks)**
BSNL Mission and Vision, Role of Electrical wing in BSNL, BSNL CDA Rules.
- 2. ACTS (10 Marks)**
Salient Feature of various Act such as RTI 2005, Energy Conservation Act 2001, Electricity Act 2003, I.E. Rules, Energy Conservation Building Code (ECBC).
- 3 SPECIFICATIONS (10 Marks)**
CPWD specifications for Electrical Works (Internal and External), Sub station.
- 4. TENDERING PROCEDURES (10 Marks)**
Contract and its type, Preparation of P.E and Plinth Area Rates, Preparation of D.E and Market Rates Analysis, Preparation of NIT and publicity, Sale of Tenders, Receipt of Tenders , EMD, Security Deposit, Award of work, Extra, Substituted and Deviated Items of works, EOT, Site Order book, Hindrance Register and MAS Register.
- 5. ENERGY CONSERVATION & NEW TRENDS (20 Marks)**
BSNL's Strategies for Energy Conservation in Air Conditioning, Lighting System, Power System,. Energy Efficient Motors & Pumps. Renewable Energy sources for BSNL application. Brief description and use of Solar energy, Wind energy, Tidal energy, Geothermal energy and Non conventional fuel viz. Agro waste, rice husk, coconut shell etc. Labeling & star rating of Equipments. High sensible AC for telecom applications.

- 6. TELECOM SYSTEM OVERVIEW (10 Marks)**
Telecommunication system over view, Power system for Telecom Installations, Power Plants- Type and working principle, Battery system types, Environmental requirement in Telecommunication application.
- 7. ENERGY AUDIT (15 Marks)**
Energy Audit (Methodology and instruments used) No Cost Measures, Low cost and High cost measures, Energy Core Group in BSNL, Energy Audit of Telecom Buildings, CDM and carbon trading.
- 8. LIGHTING : (10 Marks)**
Principles of indoor and outdoor lighting design, Units and standards, types, characteristics and application of lamp in fittings and luminaries. Modern trend in Energy efficient lighting installations.. Advantage and disadvantage of CFL & LED Lighting.
- 9. OPERATION AND MAINTENANCE : (10 Marks)**
Preventive and day to day maintenance checks in respect of all the electrical/ electro-mechanical services in telecom installations, frequency of various tests prescribed by BSNL/DOT and equipment manufacturers.

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ELECTRICAL ENGINEERING-II
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1. MEASUREMENT AND INSTRUMENTATION :- (10 marks)

Units and Standards, measurement of current, Voltage, power, Power-factor and energy. Measurement of resistance, inductance, Capacitance and frequency. Electronic measuring instruments. Digital Voltmeter and frequency counter. Transducers and their applications to the measurement of non-electrical quantities like temperature, pressure, flow-rate displacement, acceleration, noise level etc.

2. POWER ELECTONICS (10 Marks)

Fundamentals and Principles in case of Power semi conductor devices- diodes, Thyristors, power bipolar and transistors, MOSFETs their characteristics, AC/DC converters, Principles of Single phase and 3-phase inverters.

**3. ELECTRICAL MACHINES AND POWER TRANSFORMER:-
(10 Marks)**

Magnetic Circuits, Power transformers, Losses and efficiency, Regulation, Auto-transformer, 3 phase transformer, Parallel operation. Basic concepts in rotating machines. EMF, Torque, Types of machine, Leakage, losses and efficiency.

D.C. Machines, Construction, Excitation methods.. Armature reaction and commutation. Characteristics and performance analysis. Generators and motors. Starting and speed control. Testing, Losses and efficiency. Induction Machines. Construction. Principle of operation. Rotating fields. Characteristics and performance analysis, speed control.

4. POWER SYSTEM (10 Marks)

Different types of A.C. Switchgears, H.R.C. fuses and their application, rupturing capacity. Outdoor switchgear. Different type of Bus bars system, connections, current carrying capacity, control board and switchboard.

5. SUB STATION (10 Marks)

Substations, its need, classification , factors governing the location of substation, Space planning, Short circuit calculations for symmetrical and unsymmetrical faults, use of current limiting reactors, determination of the rating of circuit breakers and switchgear. Selection of capacity of Transformer and DG Set. Protection devices and safeties in Sub Station, their testing and calibrations. Power factor improvement capacitors & their selection.

6. DG Set: (10 Marks)

Diesel power generation, Base load, Peak load, choice of sets (air cooled vs, water cooled, conventional vs. silent canopy). Combustion phenomenon, Fuel system, air & cooling circuit, Lubrication and cooling system, protection/safety devices, Manual and Automatic mains failures start. General layout, installation, performance and testing of DG sets, classes of governor, turbochargers, Remote monitoring and alarms. RTU DG sets and CPCB Norms.

7. AIR CONDITIONING: (10 Marks)

General principles of Refrigeration and Air-conditioning, Terminology, Factors affecting A.C.Load, Psycho-metric chart, Evaporative cooling and ventilation, comfort air conditioning, General principles of window / split air conditioners, package units, Maintenance aspects of A.C. System, Environmental requirements for Electronics and BTS. Scheme of air conditioning, redundancy, filtration and efficiency etc. Specifications for installation, Acceptance and Testing of Package A.C Units.

8. EARTHING : (10 Marks)

Design, layout, and installation procedures for Building/ Exchange earth, Lightning protection and Surge protection devices.

9. PUMPS :

(10 Marks)

Various types of water lifting Pumps, their selection and application, installation procedures and specifications.

10. FIRE DETECTION AND FIRE FIGHTING:

(10 Marks)

Different type of fire – extinguishers, their use and applications, Various type of Fire – detectors, their selection, Specifications, installation and testing procedures. Dry and wet-riser Fire fighting installations, sprinkler systems, design and installation criterion, acceptance testing.