



## NATIONAL BANK FOR AGRICULTURE AND RURAL DEVELOPMENT

### SYLLABUS FOR THE WRITTEN EXAMINATION FOR THE POST OF ASSISTANT MANAGERS IN GRADE 'A'

#### ELECTRICAL ENGINEERING

(The syllabus is illustrative and not exhaustive. The syllabus should not be considered as the only source of information while preparing for the examination. Keeping in view the nature of examination, all matters falling within the realm of the subject concerned will have to be studied by the candidate as questions can be asked on all relevant matters under the subject. Candidates appearing for the examination should also prepare themselves for answering questions that may be asked on the current/latest developments/Acts taking place under the subject(s) although those topics may not have been specifically included in the syllabus.)

**Electromagnetic Theory** Electromagnetic fields in magnetic, dielectric and conductive materials. Various laws related to flow of current and field development. Plane Wave propagation in various mediums.

**Materials** Insulators for electrical and electronics applications, magnetic materials, properties of materials, Electrical Circuits, Circuit Theory, Kirchoff's laws, Network Theorems and application, Three phase circuits etc.

#### **Measurements and Instrumentation**

Units and standards, Measurement of Current, Voltage and Power, Power Factor and Energy, Indicating Instruments, Measurement of resistance, Inductance, capacitance and frequency etc. Digital Voltmeter and other measuring instruments and measurements etc.

#### **Control Systems**

Control System Analysis, Control System Components, Electromechanical, hydraulic, pneumatic components etc.

#### **Electrical Machines**

**Transformer** : Magnetic circuits-analysis and design of Power and distribution transformers. Construction and testing. Equivalent circuits. Losses and Efficiency. Regulation, Auto, single and three phase Transformers and

parallel operation. selection criteria, fault level and vector group etc.

**Rotating machines** : Basic concepts of. Emf and torque etc. Rotating fields, operating characteristics and performance analysis. f.C/DC single and three phase generators, induction motors, synchronous alternator, motors, DC motors, speed control of motor, traction and braking, varidrives, electromechanical and soft starter, capacitor and capacitor banks etc. Parallel operation of alternators etc.

Maintenance of equipment's etc.

### **Cables and Conductors**

Various types of cables and conductors, construction details, selection criteria, Short circuit rating and current carrying capacity, etc. Methods of laying of cables etc.

### **Transmission and Distribution**

Transmission line, design criteria, performance various equipment's and accessories, radial and loop system of power distribution. Voltage control, Load flow studies. Optimal Power System operation Fault Analysis. Internal and external wiring system, control wiring, etc.

### **Protection. Relay and Metering System**

Circuit breakers, switches, MCCB, fuses, isolators, etc. Basic theory and selection/ installation criteria, fault level calculations. Lighting, arrestors and selection criteria, Earthing system. Various types of relays. Relay selection and settings, etc. Metering system, trivector electromechanical / electronic meters, etc.

### **Economic Aspects**

Schematic diagrams, estimation, rate analysis, tariff calculations.

### **Illumination**

Design / selection of lamps and fittings etc.

### **Electronics**

Small signal Amplifiers, biasing circuits. Multistage amplifiers, transducers etc. Application Of Microprocessors in power system etc.

### **Electro mechanical works**

Basic concepts of selection and installation of elevators, fire alarm, fire detection and fire fighting system. Building Automation System (BAS). EPABX LAN/ WAN system. Computer applications. Knowledge of Pumps, centrifugal and submersible, selection and installation, etc.

### **Principles of Thermodynamics**

Basic concepts of Thermodynamics, thermal cycles, etc. Principles of air-conditioning. Basic concepts of thermal and hydroelectric power plants with various components, basic design / estimation of plants. Cost estimation, economics of generation, etc.

### **Power Plants**

Basic concepts of thermal and hydro electric power plants with various components, basic design/ estimation of plants. Cost estimation, economics of generation, etc.

### **Project Management**

Project planning, estimation. Project scheduling and monitoring techniques of project monitoring PERT/CPM etc. SCADA system of data management and supervision.