

*Power-supply.* (Four papers—three hours each)*Paper (a) : Generation*

Essential connections of main cables and control cables between generators, switchgear, and transformers ; main switchgear sectionalizing arrangements and use of reactors. Action of oil-filled, air-blast, and other types of circuit-breakers. Neutral earthing arrangements, earthing resistors and transformers. Control of voltage, frequency, and reactive loading. Parallel operation of generators. Calculation of short circuit kVA and breaking requirements of switchgear. Protective systems for generators, transformers, and bus-bars. Generator synchronizing equipment. Exciter systems, stability and control.

*Transmission.*—Electrical principles of the design and testing of overhead transmission-lines. Voltage distribution on insulators and insulator strings. Cable testing. Principles of operation of unearthed systems, solidly earthed systems, multiple earthed systems and Peterson coil earthed systems. Method of protection of transmission-lines, location of faults, calculation of fault currents, voltage drop and voltage rise, charging current and corona. Surges. Lightning and surge protection, sag and tension calculations, spacing of conductors, vibration, types of support, maintenance of lines and accessories.

*Paper (b) : Distribution and Distribution Systems*

Layout of distribution systems in cities, urban and rural areas. Use of single-phase, three-phase, and D.C. distribution. Diagram of connections of switchgear, isolators, and transformers in a substation. Voltage regulating devices and methods of power-factor adjustment. Testing and fault location in networks. Voltage regulation. Choice of conductor sizes. The operation of fuses and circuit breakers. Underground cables, types, temperatures, and spacing. Calculation of line drop by vector and symbolic methods. Effect of low-power factor. Earthing. Substation design, location, ventilation, and fire protection. Pole substations. Maintenance of substations, transformer and switchgear.

*Paper (c) : Consumers' Installations*

Principles, supply characteristics, and design of power, lighting, heating, and ventilating installations. Rectifiers. Battery-charging installations. Fundamental characteristics of D.C. and A.C. motors. Selection of types for different duties and requirements. Starting torque. Speed-variation, overload capacity, power factor, types of enclosure. Electric furnaces, welding-plant, electrolytic plant. Lifts and control equipment.

Conductors, switchgear, and protective installation. Supply characteristics and essential connections of electric cookers and hot-water installations. Layout of hot-water systems (space-heating, water-heating, hot-water services). Comparisons with other sources of power. Metering and tariff.

*Paper (d) : Electrical Apparatus, Plant, and Machinery*

*Meters and Instruments.*—The application, testing, and maintenance of meters, relays, and instruments.

*Transformers.*—Types and characteristics. Voltage control. Tap-changing equipment. Regulation. Parallel operation. Testing. Determination of efficiency. Heating. Equivalent circuit. Vector diagram. Symbolic methods, auto transformers, instrument transformers. Induction and regulating transformers.