ELECTRICITY AND ELECTRONICS (866)

The syllabus is not intended to be used as a teaching syllabus, or to suggest teaching order. It is expected that teachers will wish to develop the subject in their own way.

In the examination, questions will be aimed more at testing the candidates' understanding of fundamental principles, and the application of these principles to problem situations, than to their ability to remember a large number of facts. Some questions will include simple calculations.

An experimental approach to the subject is envisaged and it is assumed that candidates will spend adequate time on individual experimental work. Questions may be set requiring descriptions of experimental procedures. Candidates should also know how to exhibit the results of experiments graphically and how to make deductions from graphs, e.g. from intercepts and gradient in the case of straight-line graphs, deductions by interpolation.

Candidates will be expected to be conversant with SI units.

CLASS XI

There will be one paper of three hours duration of 100 marks.

The paper will be divided into two parts.

***Part I**: will consist of short answer questions. This part will be compulsory.*

***Part II**: will consist of **eight** questions. Candidates will be required to answer **five** questions.*

1. Introduction to electricity. Structure of atoms; the model atom, nucleus, electrons. Unit of charge; coulomb. Potential difference and electromotive force. Production of electricity by friction, magnetism and chemical action.
2. Electric circuit. Electric current I = Qt. Ampere as rate of flow of charge. Ohm's law as applied to a single resistance (V/I=R) and to a whole circuit (E/I= total R).
3. Equivalence. Cell groupings. Resistances in series and parallel. Resistivity; R = Pl/A. Calculation of resistance of wire. Temperature coefficient of resistance. Ammeter shunts; voltmeter multipliers; series ohmmeter.
4. Work, power and energy. Work and energy. The joule. E =V/t (QV). Unit of power and energy; the watt, the kilowatt, the watt-hour and kilowatt-hour. Use of wattmeter. Calculation of electrical energy and power. Local tariff system.
5. Heating effect of an electric current. Application of heating effect, e.g. heating appliances, filament lamps, electric welding, electric carbon arc, and use of fuses.
6. Electromagnetism. Simple phenomenon of magnetism. Ferromagnetic properties of iron and steel. Magnetic effect of an electric current. The magnetic field associated with a current flowing in a straight wire, a circular coil, and a solenoid. Force on a current-carrying conductor in a magnetic field; the right-hand and corkscrew rules. Magnetic flux density. Permeability.
7. Electromagnetic induction. Phenomenon of electromagnetic induction. Faraday's law; Lenz's law. Induced e.m.f.; a straight conductor cutting flux; $E = - d\varphi/dt = Blv$. Self-inductance; $E = - Ldi/dr$. Mutual inductance; the induction coil.
8. Elementary electrostatics. Electric field; E = V/d. Capacitance and the factors affecting capacitance. Electric flux density; D = Q/A. Permittivity; m = D/E. Energy of charged capacitors in series and in parallel.
9. Alternating current. Generation of an a.c. with a single loop coil. Sinusoidal wave form. Peak values; r.m.s. values (Only ratios will be expected.) Simple a.c. circuits.
10. Transformer. Principle of the single-phase transformer, and iron loss (hysteresis and eddy current).