CONTENTS

CHAPTER	1—THE ELECTRIC CIRCUIT. ELECTRICAL	PAGE
	Circuit conditions, Ohm's law. Series and parallel circuits. Kirchhoff's laws. Internal resistance of supply source. Electromotive force and terminal p.d. or voltage. The series-parallel circuit. Ammeters and voltmeters. Range ex- tension of ammeters and voltmeters	1—17
CHAPTER	2—THE ELECTRIC CIRCUIT (CONTINUED). ELECTRICAL UNITS The SI system. Mechanical units of force, work and energy, power. Elec- trical units of current, quantity, volt- age and resistance. Examples relating	
	mechanical and electrical energy. Effi-	
CHAPTER	ciency. Grouping of cells	18—36
CHAPTER	 electrical and heat energy ELECTROCHEMISTRY Electrolysis. Electrolytic cells. Voltammeters (water and copper). Quantitative laws of electrolysis (Faraday's). The electro-chemical equivalent, chemical equivalent, valency and atomic weight. Back e.m.f. of electrolysis. Resistance of electrolytes. Power expended during electrolysis. Primary and secondary cells. The simple voltaic cell,—cell e.m.f. Electromotive series. Polarisation. The primary cell,— 	37—57

CHAPTER 4—Continued

Daniell (energy and e.m.f.). The Leclanché cell (wet and dry types). The secondary cell,—capacity and efficiency. Charging procedure

5-MAGNETISM. ELECTROMAGNETISM CHAPTER. Natural and artificial magnets. The magnetic field.—flux and flux-density. Molecular theory of magnetism. Electromagnetism. Fields due to long. straight, current-carrying conductor, loop and solenoid,—introduction of an iron core. Force on a currentcarrying conductor in a magnetic field, units of ampere, flux-density and flux. The magnetic circuit, magnetising force or magnetic field strength. Magnetising force of a current-carrying conductor. Permeability of free space $(\mu_{\alpha}).$ 6-ELECTROMAGNETIC INDUCTION

CHAPTER Flux-linkages. Faraday's and Lenz's laws of electromagnetic induction. Static induction.-e.m.f. of self and mutual induction. Dynamic induction. -magnitude of e.m.f. The weber. Direction of induced e.m.f.-Fleming's right-hand rule. The simple magneto-dynamo. The simple d.c. generator, commutation, and practical requirements,-windings. A.C. and d.c. theory.--introduction

CHAPTER 7—BASIC A.C. THEORY

The a.c. waveform. Representation of sinusoidal alternating quantities, trigonometrical and phasor representation. Addition and subtraction of alternating quantities,—graphical and mathematical methods. Root mean square and average values. Form factor. Peak factor

CHAPTER 8—THE D.C. GENERATOR D.C. machine construction,—field system and armature, D.C. armature winding arrangements. The d.c. generator,—e.m.f. equation, no-load 58-86

87-110

111-137

138-158

characteristics. Associated magnetic circuit effects. Generator characteristics. Types of d.c. generator,-permanent magnet and separately-excited types. The shunt-connected generator, -theory of self-excitation. The magnetisation curve or O.C.C. and critical resistance. Load characteristic. The series-connected generator, self-excitation and load characteristic. The compound-connected generator. Types of connection. Load characteristic ...

CHAPTER Impedance, inductance, inductive reactance. Circuits with pure resistance, pure inductance and resistance and inductance in series,-power factor,true and apparent power. Capacitance, capacitive reactance. Circuits with pure capacitance, and resistance and capacitance in series. The series circuit. inductive impedances in series and inductive and capacitive impedances in series. The general series circuit.resonance

CHAPTER 10-THE D.C. MOTOR

Direction of force.-Fleming's lefthand rule. Magnitude of force. Back e.m.f. of a motor. Voltage, current and speed equations. Speed controlling factors. Types of d.c. motor, shunt, series and compound. The power and torque equations. Torque controlling factors. Motor characteris-The shunt motor,--electrical tics. characteristics (speed and torque). mechanical characteristic. The series motor. — electrical characteristics (speed and torque), mechanical characteristic. The compound motor,--electrical characteristics (speed and torque), mechanical characteristics. Cumulative and differential connection of fields,-strength of shunt and series fields. Motor starters. Speed control,-field and voltage control .. 223-246

192-222

158-191

PAGE

CHAPTER 11-A.C. CIRCUITS (CONTINUED) AND SYSTEMS Power in the a.c. circuit. Active and reactive components. The parallel circuit. Inductive impedances in parallel. Inductive and capacitive impedances in parallel, Parallel resonance, Powerfactor improvement, advantages of p.f. improvement. kW. kVA and kVAr. Power-factor improvement (kVA method). Polyphase working, --threephase systems. Star or Y connection, -use of the neutral. Balanced and unbalanced loads. Delta or Δ (mesh) connection. Three-phase power Threephase kVA, kW and kVAr . .

CHAPTER 12—ELECTROMAGNETISM (CONTINUED) Permeability of free space (μ_o) . Magnetising force due to a long, straight, current-carrying conductor, inside a solenoid and inside a toroid. Ferromagnetism. Relative permeability (μ_r) . The B-H or magnetisation curve. Absolute permeability (μ) . Reluctance (S). The composite magnetic circuit, series and parallel arrangement. Magnetic fringing and leakage. Iron losses, —the hysteresis loop, hysteresis and eddy-current losses. Pull of an electromagnet ...

CHAPTER 13-THE ELECTRON THEORY, BASIC ELECTRONICS AND ELECTROSTATICS Constitution of matter. The structure of the atom. Current flow as electron movement, ionisation. Electric field. The electroscope. Potential difference. Electrostatic charging,---induction. Distribution of charge. Electrostatic fields of force. Electrostatic flux. Electric potential. The capacitor. Capacitor systems, --- series and parallel connection, capacitor current. Energy stored in an electric field or dielectric. Relative and absolute permittivity $(\varepsilon, \text{ and } \varepsilon)$. Permittivity of free space (ε_0) . Capacitance of parallel-plate capacitor 301 - 323

247---275

276---300

CHAPTER 14—MISCELLANEOUS CIRCUIT CONDITIONS AND METHODS OF SOLUTION. SPECIAL APPLICATIONS

D.C. networks. Applications of Kirchhoff's laws. Maxwell's circulating current theorem. The super-position of current theorem. Conductance, susceptance and admittance,—the series and parallel circuit. The Wheatstone bridge. Measurement of resistance. Temperature measurement. The potentiometer. The thermocouple. Temperature measurement, compensating leads or cables, instrumentation ...

CHAPTER 15—ELECTRONICS

Thermionic devices. Electron emission. The vacuum diode, static characteristic. dvnamic characteristic.-load line. diode as a rectifier. Ionisation. Discharge lamps, The fluorescent lamp (low-pressure). The fluorescent lamp (high-pressure). Cold-cathode lamps. The cathode-ray oscilloscope. The cathode-ray tube (C.R.T.), operation, focussing, deflection. Time-base. Solidstate devices. Semiconductors. Basic theory, co-valent bonding. Conduction control, intrinsic conductivity, impurity (extrinsic) conductivity, N-type germanium, P-type germanium, ionisation. The P-N junction. The junction diode, forward bias, reverse bias, diode characteristic. Rectifier operation, static and dynamic operation ... 350-385

SOLUTIONS TO PRACTICE EXAMPLES	386-480
SECOND CLASS EXAMINATION QUESTIONS	481—488
SOLUTIONS TO SECOND CLASS QUESTIONS	489—507
FIRST CLASS EXAMINATION QUESTIONS	508517
SOLUTIONS TO FIRST CLASS QUESTIONS	518554
INDEX	555558

324-349