

vectors; vector composition, vector triangle and parallelogram, principle of work, leading to an elementary treatment of parallel forces; moments; elementary mechanical devices such as levers, wedge, simple pulley-blocks.

INTERMEDIATE EXAMINATION FOR ELECTRICAL FITTERS.

1. *Drawing.*

The main objects of the course will be to enable the students (i) to produce a dimensioned sketch from which the part could be constructed, and (ii) to read mechanical drawings correctly. The course will include measuring and sketching machine parts and electrical parts and appliances, with explanations of their functions; conventional methods of representation of details in electrical and mechanical work; lists of material and part numbers; methods of marking off and machining.

2. *Mechanics, Applied Mechanics, and Practical Mathematics.*

A fuller treatment of the syllabus for the preliminary examination, with the following additions: Polygon of forces, equilibrium of bodies; further applications of the principle of work to simple machines such as Weston and other geared pulley-blocks, inclined plane, screw, and screw gearing; displacement, velocity and acceleration; mass, force, momentum, inertia; relations of force, mass, and motion; energy and work; moment of inertia; rotation and rotational energy; mechanical, thermal, and electrical units of energy and their ratios for conversion; friction and lubrication; efficiency; power of engines, brakes, motors, and their mechanical efficiency; transmission of power; properties of belts; slip of belts; effective diameters of pulleys; care of belts; speeds; fastenings; gearing; velocity-ratios of wheel trains; teeth of wheels; pitch; diametral pitch; module; rules for the design of wheels for constant velocity ratio.

Mechanical properties of materials commonly used in mechanical and electrical engineering.

3. *Electrical Fitters' Practice and Theory.*

A.

(1) *Fundamental Ideas, terms and units employed:—*

(a) The electrical circuit: Electrical current, pressure, and resistance; Ohm's law; voltage-drop and potential gradient; distribution of current and voltage in series and parallel circuits; application of Ohm's law to parts of circuits; simple calculations of line-drop.

(b) The magnetic circuit: Generation, characteristics and effect of lines of magnetic force; magnetic and non-magnetic substances; elementary consideration of the magnetic properties of iron and steel; permanent magnets, and their uses in practice.

(c) Electro-magnetic induction: Elementary treatment of the electro-magnet; induction of electrical currents by variation of magnetic flux through an electric circuit.

(2) *Materials.*—Conductors and insulators; their electrical properties; resistance; specific resistance; simple calculations of resistance from dimensions, effect of heat on conductors and insulators; variation of resistance with temperature; thimbles and bad joints.

(3) *Heating and Lighting Properties of the Electric Current.*—Simple calculations of losses; effect of voltage on efficiency of heating and lighting and of power-transmission; consumption of energy by consuming-devices; resistance wires; incandescent lamps; hot-wire instruments; fuses; capacity of switch contacts; elementary principles of illumination, candle-power, foot-candle; photometry.

(4) *Electrolytic Properties of the Electric Current.*—Primary cells; Leclanche and dry cells; mode of operation; polarization; local action; maintenance of storage cells; lead-plate and Edison construction; rating; installation, testing, charging, maintenance; advantages; electrolysis and electroplating.

(5) *Measuring-instruments and Measurements.*—Principles of galvanometers; moving iron and moving coil ammeters and voltmeters and their suitability for A.C. or D.C.; damping, shielding, &c.; approximate accuracy of commercial instruments; bearing of instrumental inaccuracy on errors of results calculated from instrumental readings; measurement of resistance, by substitution, by voltmeter and ammeter, by voltmeter and wattmeter, by voltmeter, watt-hour meter, and time; use of Wheatstone bridge; inductive and non-inductive resistances on A.C. or D.C.

(6) *Generators.*—Generation of electro-motive force; principle of A.C. generator and modification for D.C.; elementary principles underlying the construction of each part; characteristics of series, shunt, compound, and interpole generators; starting and reversing; faults in operation.