ELECTRICAL INSTALLATION AND MAINTENANCE WORK

PREAMBLE

This examination syllabus emanates from the senior secondary school trade curriculum on electrical installation and maintenance work. It does not replace the curriculum. It is designed to assess candidates’ skills in electrical installation and maintenance work in terms of basic knowledge and application of electricity, faults finding in electrical installations as well as maintenance and repair of electrical machines. It is also designed to test candidates’ knowledge of setting up and managing small scale business in electrical installation and maintenance work.

AIMS AND OBJECTIVES

The aims and objectives of the syllabus are to test candidates’ knowledge and understanding of

1. safety rules and regulation in electrical installation and maintenance work.
2. electrical installation tools, materials and accessories.
3. wiring of buildings.
4. installation of electrical machines and repairs.
5. rewinding of electrical machines.
6. entrepreneurship skill in electrical installation and maintenance.

EXAMINATION SCHEME

There will be two papers, Papers 1 and 2; both of which will be a composite paper to be taken at one sitting.

PAPER 1: Will consist of forty multiple choice objective questions to be answered in 45 minutes for 40 marks.

PAPER 2: Will be essay and test of practical work paper, covering the entire syllabus. It will be in two sections; Sections A and B as follows:

Section A: Will consist of three essay questions out of which candidates will be required to answer two questions in 1 hour for 50 marks.
Section B: Will be a test of practical work and will contain two compulsory questions drawn from Sections B and C of the syllabus. Candidates will be required to answer the questions in 1 hour 15 minutes for 50 marks.

The paper will therefore take 2 hours 15 minutes and carry 100 marks.

DETAILED SYLLABUS

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<th>CONTENT</th>
<th>NOTES</th>
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<tr>
<td><strong>A. WORKSHOP SAFETY RULES AND REGULATIONS</strong></td>
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<td>2. Dangers in electrical workshop.</td>
<td>Dangers arising as a result of faulty equipment and tools, chemicals, water, poor joint and insulation strains and moving machines.</td>
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<td>3. Precautions in handling electrical tools and materials.</td>
<td>Care and maintenance of electrical tools.</td>
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<td>4. First-aid for electrical accidents.</td>
<td>Contents of first-aid box, treatment for cuts, burns and electrical shock. Procedures for first aid (e.g. removing casualty from contact with live wire and administering artificial respiration).</td>
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<td>5. Statutory regulations.</td>
<td>Various statutory regulations (electricity supply regulations, factory acts and IEE regulations). Importance, aims and objectives of statutory regulations and applications of statutory regulations.</td>
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**B. ELECTRICAL INSTALLATION TOOLS, MATERIALS AND**
**ACCESSORIES**

1. Measuring, marking and striking tools.
   - Types and uses of measuring instruments. Types and uses of marking and striking tools.

2. Types and preparation of cables.
   - Types, sizes and preparation of cables. Types of armoured cables, reasons for armouring, parts of armoured cables, joints and terminations of armoured cables.
   - Types of data cables (e.g. computer cable, fibre optics and co-axial cable) and their uses.
   - Other types of cables (sheathed, screened or H-type, gas pressured impregnated and MICC cables).

3. Electrical accessories.
   - Types of electrical accessories (switches, sockets, lamp holders, ceiling roses, joint boxes, plugs etc.) and their uses. Regulations guiding their uses.

4. Cells
   - Types of cells (primary and secondary), working Principles of cells and construction of a simple cell.

**C. WORKSHOP PRACTICE**

1. Working drawing.
   - Draw and identify electrical BS symbols (switches, lamp holders, sockets, cooker control units etc.).

2. Generation, transmission and distribution systems.
   - Drawing and interpretation of circuit diagrams of generation, transmission and distribution systems.
   - Wiring drawing and scale drawing of a living room.

3. Surface wiring.
   - Materials for surface wiring (cables-1mm², 1.5mm², clips, nails etc.). Tools for surface wiring (hammers, screw drivers, pliers etc.). Factors.
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<td>4. Conduit wiring.</td>
<td><strong>Conduit wiring.</strong> Explain conduit wiring, types (e.g. PVC, galvanized, surface and concealed), advantages and disadvantages. Identification and uses of conduit wiring. Procedures for conduit installation (piping, wiring and fitting). Types of conduit boxes and fittings (end box, angle, tee-4-way, 2-hole loop-in, junction box, knock-out box, couplers etc.). Tools for conduit wiring (bending spring, bending machine, hammer, chisel, hacksaw stove etc.). Materials for conduit wiring (union gum, conduit box, conduit pipes etc.)</td>
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<td>6. Soldering</td>
<td><strong>Soldering</strong> Types of solders and fluxes. Operations and maintenance of blow-lamps. The use of pot and ladle in soldering cable of big sizes. Soldering of joints. Types of conducting materials (e.g. copper, aluminum and silver) and their advantages and disadvantages. Significance of heat transfer on conductors.</td>
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<td>7. Joints and termination of cables.</td>
<td><strong>Joints and termination of cables.</strong> Tools and materials used in cable jointing; e.g.</td>
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<td><strong>8. Installation</strong></td>
<td>soldering bit, blow-lamp, solder, soldering iron, propane gas, pot and ladle, insulated wire and flux. Types of insulating materials (e.g. PVC rubber, paper, mica and bakelite). Types of joints (e.g. tee, married, twist, telescope and scarf). Preparation of cable for joints and terminations.</td>
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<td><strong>10. Overhead wire installation.</strong></td>
<td>Types of cable for underground electrical installation work; e.g. sheathed, screened or H-type and gas pressured impregnated. Trench preparation, laying of underground cables, tools and materials for underground cable installation. IEE regulations for underground cable installation.</td>
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<td><strong>11. Inspection and testing of domestic installation.</strong></td>
<td>Tools, cables/wires and equipment used in overhead distribution/transmission. Types of insulation used for overhead distribution/transmission. Types and uses of stay wires. Drawing of lines and cross-arms. Joints and terminations and electrical continuity. Types and sequence of test; e.g. polarity, insulation resistance, earthing and continuity of ring circuit. Importance of testing and inspection. Instruments</td>
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<td>14. Installation of machines.</td>
<td>Types of enclosure and their applications. Selection of suitable starter for different motors; (e.g. star-delta, direct-on-line and auto transformer) and their principles of operations. Test for correct rotation, short circuit and earth fault. Installation of AC and DC machines.</td>
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<td>15. Tools and equipment for rewinding jobs.</td>
<td>Identification of tools and equipment for rewinding jobs; (hammers screwdrivers spanners, crimpings, winding machine, mallets etc.).</td>
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18. Armature, commutator and slip rings.

D. PROTECTIVE DEVICES AND MAINTENANCE

1. Installation of protective devices.

- Protective devices (fuses and circuit breakers—voltage and current operated). Working principles and application of fuses and circuit breakers.
- Regulation guiding installation of protective devices.

2. Maintenance of electrical equipment.

- Types of maintenance (preventive and corrective).
- Procedures for machine and equipment maintenance. Grades of lubricants and their application. Constructional features of some electrical appliances (electric heater, boiler, pressing iron etc.).

3. Dismantling and assembling of machines.

- Procedures for dismantling machines. Methods of collecting data from the name plate. Assembling of machine parts.

4. Repair of electrical machines, equipment and installation.

- Causes of faults and breakdown. Signs and symptoms of faults and breakdown. Interpretation of circuit diagrams. Trouble shooting techniques (e.g. detection of bad bearing and other parts).
- Inspection and testing of machines (e.g. performance test).
- Sources of fund and sourcing for fund for business takeoff. Proposal writing, budgeting and management of business outfit for small scale business. Government rules and regulations as they relate to electrical installation.

E. ENTREPRENEURSHIP IN ELECTRICAL INSTALLATION.
LIST OF FACILITIES AND MAJOR EQUIPMENT/MATERIALS REQUIRED:

(1) Multi-meter
(2) Soldering iron
(3) Tester
(4) Soldering lead
(5) Plier (different types)
(6) Set of screw drivers
(7) Safety chart
(8) Cable chart
(9) Hammer
(10) Megger (Insulation Resistant Tester)
(11) Fishing Tape
(12) Measuring tape 3m and 50m
(13) Pen knife
(14) Stripper
(15) Hacksaw
(16) Bending spring (20mm)
(17) Bending machine
(18) Workbench
(19) Vice
(20) Handdrilling machine
(21) Single phase electric motor