120 – APPLIANCE MAINTENANCE

EXAMINATION STRUCTURE

The trade consists of the following trade related courses:

191 – General Metal Work (CME 11)

193 – Building/Engineering Drawing (CTD 11, 12 & 13)

194 – Basic Electricity (CEI 11)

The trade will also be examined under the following components or subjects groupings:

1. 121 – Domestic Electrical Appliances, Sound, film Projector and Medical Appliances (CAM 12, 17 & 18)
2. 122 – Sewing, Washing, Typewriters and Reproductive Machines (CAM 13, 14, 15 & 16)

EXAMINATION SCHEME

121 – Domestic Electrical Appliances, Sound, Film projector and Medical Appliances

The examination will comprise of two papers:

121-1 – PAPER I : This will consists of two sections, viz:

SECTION A: OBJECTIVE: this will be forty (40) multiple choice questions. Candidates will be required to answer all in 40 minutes. This section carries forty (40) marks.

SECTION B: ESSAY: this will be a written paper of seven (7) questions, out of which five (5) questions will be answered in 2 hours. This Section carries sixty (60) marks.

121-2 – PAPER II: PRACTICAL: This paper is a practical examination on all three modules i.e. (CAM 12, 17 & 18). The paper which is of three (3) hours duration carries 100 marks.

122 – Sewing, Washing, Typewriters and Reproductive Machines

This subject grouping consists of two papers:

122-1 – PAPER I : This will consists of two sections, viz:

SECTION A: OBJECTIVE: this will be forty (40) multiple choice questions. Candidates will be required to answer all in 40 minutes. This section carries forty (40) marks.

SECTION B: ESSAY: this will be a written paper of seven questions. Candidates are to answer five questions in 2 hours. This Section carries sixty (60) marks.

122-2 PAPER II: PRACTICAL: This paper is a practical examination covering all the areas of the four modules for a duration of three (3) hours; and it carries 100 marks.

121 – DOMESTIC ELECTRICAL APPLIANCES, SOUND, FILM PROJECTOR AND MEDICAL APPLIANCES (CAM 12, 17 & 18)

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK
1.	**Cable Types and Preparation** 1. Explain with label diagram what a cable is. 2. Workshop safety, rules, clothing and protective devices. 3. Identify cable sizes in connecting home appliances and prepare main cables and flex to terminating appliances into socket observing statutory regulations.	1. Types of termination cables and flex electrical appliances: electric kettle, toaster, iron, grinder, etc. 2. Explain these terms: a. termination b. electrical appliance c. plugs d. connectors and e. machine installation	1. Prepare main cable and flexes used for terminating plugs and sockets into appliances like electric iron, kettle, cooker etc. 2. Carry out the above assignment observing the appropriate statutory regulations. 3. Stress the need for proper terminal of cables into plugs and appliances.
2.	**Principles and application of Electric Motors** 1. State and explain the various types of D.C. Motors and their principles of operations. 2. State and distinguish the various types of A.C. motors and identify the component part of a single phase induction motor. 3. Distinguish the A.C. Motors and explain the working principle of a single phase motor. 4. State the applications of the above motor and observe the current statutory regulations applicable to electric motors.	1. Types of D.C. Motors, series motor universal motor, shunt motor, compound motor. 2. The principles of D.C, motors (explain the use of dry cell, battery commutators). 3. Types of A.C. Motors: a. capacitor start – induction run. b. Shaded pole motor c. Synchronous motor d. Variable speed motor, and e. Split phase motor. 4. The various component parts; coils, armature, brushing casting etc. 5. The difference between A.C. motor and D.C. motors: a. by dismantling them b. locating the poles c. starters d. separate attachment e. single/three phase 6. The working principle of a single phase motor, explanation of function of amature, coils, brushes etc. 7. General application of mechanically driven appliances e.g. grinders/blenders, mixers etc. 8. Current regulations and codes as regard to electric motor etc. 9. The various methods used in coupling and decoupling DC/AC motors.	1. Dismantle D.C. motors and show the component parts. 2. Explain the function of various component parts of the D.C. motors. 3. Identify the various parts of an A.C. Motors. 4. Dismantle and identify component parts of A.C. motor. 5. Identify the individual application of different types of A.C. and D.C. Motor. 6. Reassemble and test component parts in A.C. and D.C. motor. 7. Emphasize the importance of the following: a. Proper installation and termination into the appliance b. Safety measure regulations. c. Test for proper performance. d. Explain the current statutory regulation. 8. Reassemble and carry out open and short circuit test.
3.	**Fault Diagnosis on Motors** 1. Explain the common faults in electric motor and carry out various tests on a motor. 2. distinguish between maintenance and repairs. 3. Carry out the repairs of	Domestic Electrical Appliances 2. Common faults open circuit, short circuit, earth fault etc. 3. Test on both D.C. and A.C. Motors a. open circuit b. short circuit test c. earth fault test d. insulation resistance test	1. List the common faults 2. Carry out some tests to establish the faults. 3. Carry out the repairs 4. Emphasize the importance of proper insulation.

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK
	the identified faults. 4. Mention types of maintenance. 5. List tools used in maintenance work.	4. Detail explanation of maintenance, types of maintenance and repairs, tools etc. 5. State the uses of maintenance manual.	
4.	**Maintenance and Repair of Single phase Practical Horse Power Motors** 1. Dismantle electric motors, clean, examine and replace or repair faulty parts. 2. Lubricate the motor and reassemble and test for effectiveness	1. Fractional Horse Power motors. 2. Various parts of the motor 3. Faults, replacement 4/5 lubrication or reassemble of the motor.	1. Dismantle the electric motors using the appropriate tools. 2. Clean and examine the various parts of the motor. 3. Repair or replace faulty parts 4. Emphasize the importance of proper insulation.
5.	**Electric Kettle** 1. Sketch the circuit diagram and explain the construction and the principle of operation of an electric kettle. 2. Generation of heat through electricity. 3. State the rating of the heater element and descale the element. 4. Test for leakages and other faults and repair or replace faulty parts and test for correct operation. 5. Sketch the circuit diagram of an electrical thermostat.	1. Types of heater elements: a. construction and principles of operation with circuit diagram. b. Rating of the heater c. Maintenance d. Test for leakages, open circuit, insulation resistance earthing. e. Repair 2. Heating effect of electricity, heat control of electricity.	1. Prepare standard circuit diagram of an electric Kettle. 2. Explain with aid of the circuit diagram the construction and principle of operation of an electric kettle. 3. Dismantle the heater element. 4. Descale the heater element using wire brush. 5. Test for leakages open circuit, insulation, resistance and earthing 6. Emphasize the importance of proper insulation. 7. Repair or replace faulty parts and test for effectiveness.
6.	**Electric Toaster** 1. Sketch the circuit diagram and explain the construction and principle of operation of an electric toaster. 2. Dismantle clean and test the heater elements for faults and check the automatic switch and thermostat. 3. Repair or replace faulty parts and reassemble and test for correct operation	Types of the heating elements, thermostat and automatic switch: a. Circuit diagram of an electric toaster. b. Diagrams of construction and principles of operation. c. Switch and thermostat d. Maintenance and Repair. e. Tests.	1. Prepare standard circuit diagram of an electric toaster. 2. Dismantle and identify the component parts. 3. Clean the component parts and test the heater elements for earth leakage, open circuit etc. 4. Emphasize the importance of proper insulation. 5. Check the automatic switch and adjust the thermostat. 6. Repair or replace identified faulty parts. 7. reassemble and test for effectiveness.
7.	**Electric Iron**	1. Types of electric irons including steam	1. Prepare standard circuit

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	1. Sketch circuit diagram and describe the different types of electrical irons. 2. Dismantle, test the element of different types of electric iron. 3. Check for leakages of stem on spray types and replace/repair faulty parts and reassemble and test the correct operation.	spray types. 2. Types of heater elements and thermostat: a. replacement/repairs of faults. b. Stem iron and its checks and repairs. c. Circuit diagram or an electric iron. d. Test of element and thermostat. e. Check the plugs and test the terminals/fuse. f. Test the iron cable for open and short circuit g. Check for arcing of the thermostat. h. Clean and set it back	diagram of an electric iron. 2. Dismantle and identify the component parts. 3. Test the element and thermostat for open circuit, continuity, insulation, resistance, earthing faults. 4. Repair or replace identified faulty parts. 5. Reassemble and test for correct operation. 6. Emphasize on the proper earthing and insulation. 7. Use of correct termination wire and plug.
8.	**Electric Grinder/Blender** 1. Description features and principle of operation of grinders/blenders. 2. Dismantle, clean and check the blades and electric system and the gear system. 3. Replace or repair faulty parts.	1. Types of grinders and blenders. 2. Types of blades. 3. Types of drive assembly and hoppers: a. Maintenance b. Tests of electrical system c. Repairs of faults	1. Dismantle clean and identify various component parts of a vacuum cleaner. 2. Check the motor windings and brushes. 3. Test for continuity, earthing, open and short, circuits and insulation resistance. 4. Effect repairs on the identified component parts. 5. Re-assemble and test for correct operation. 6. Emphasize the importance of use of correct termination wire, plug and socket. 7. Exercise on termination of cable into plug and socket.
9.	**Electric Cooker** 1. Describe the features and principles of operation of electric cookers. 2. State power ratings, types and sizes of cables of electric cookers. 3. Draw the connecting diagram showing low, medium and high switching and read the temperature scale correctly. 4. Prepare the main cable and flex of plug and socket termination and	General construction and principles of operation 1. Types of heater elements, cables, flexes, plugs and sockets for terminations. 2. Types of thermostat: a. Power rating of electric cooker b. Types and sizes of cables c. Connecting diagram of an electric cooker showing low, medium and high switching maintenance and repair 3. Check earthing connection of the cooker and emphasize on the fuse rating protective devices.	1. Dismantle and examine the individual units of the cooker. 2. Clean and check for physical defects. 3. Test for open and short circuits, earthing faults etc. 4. Repair or replace faulty parts. 5. Re-assemble the cooker units. 6. Adjust the thermostat and timing devices and test for correct operation. 7. Emphasize the importance

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	wire electric cooker. 5. Dismantle and identify parts, clean, test for faults and effect repairs.		of use of correct termination wire, plug and socket. 8. Proper insulation and earthing. 9. connect electric cooker in low, medium and high switching position.
10.	**Gas Cooker** 1. Describe the features and with diagram explain the principles of operation of a gas cooker. 2. State appropriate agents used for detecting leakage and explain with diagram the principle of operation of a gas detector. 3. Dismantle identify parts and test for leakage and blockage. 4. Check joints, clean and replace	1. Types of gas cookers – table and cabinet types with oven etc. Constructional features of gas cooker. 2. Types of burners assembly. 3. Types of materials for top burners aluminium, bronze and cast iron. 4. Types of agent for detecting leakage – water, soap-surd, gas detector etc. a. Principle of operation of gas detector. b. Parts of gas cooker c. Test for leakage of gas, blockage in system. d. Maintenance and repair.	1. Test gas leakage using the following agents: a. water b. soap-surd c. gas detector 2. Test for gas blockage. 3. Dismantle the gas cooker 4. Check the joints for proper connection. 5. Clean the various component parts and check for physical defects. 6. Repair or replace faulty parts. 7. Re-assemble the component parts and the test for correct operation. 8. emphasize the importance of the system being kept leakage free at all time.
11.	**Incubators-Construction and Principle Operation** 1. Identify the various parts and explain the working principles of incubators. 2. Explain the constructional feature and the functions of various components parts. Diagnosis of Faults 1. Test the incubators for safety and dismantle for visual inspection. 2. Carry out electrical tests. Maintenance and Repair 1. Clean various parts and replace or repair faulty parts. 2. Re-assemble the parts and test for correct operation. 3. Carry out routine servicing.	1. Types and sizes of incubators. 2. Working principle of an incubator. 3. Circuit diagram of an incubator. 4. Common faults of an incubator. a. short and open circuit test b. continuity and insulation resistance tests. i. General maintenance of incubators. ii. Replacement and repair of faulty parts. iii. Routine servicing	1. Draw the circuit diagram of an incubator. 2. Dismantle an incubator and identify the various component parts. 3. Clean the various parts of the incubator for visual inspection. 4. Test for the following faults: 5. Repair or replace identified faulty parts. 6. Emphasize on the proper safety precaution.
12.	**Electric Fan** 1. Description features and types of electric fan.	1. Types of fan; standing fan, table fan, ceiling fan etc. 2. Identification 0of component parts of	1. Dismantle, clean and identify the component parts.

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	2. Explain the principle of operation and test the windings. 3. Dismantle and identify parts and check the mechanical parts for defects. 4. Repair/replace faulty parts. 5. Identify and replace new fan motor/connection	fans; motors, blades, control, the main frame etc. a. General constructional features of an electric fan. b. Principles of operation c. Testing of winding d. Maintenance and Repair. e. Mention common faults of each component parts.	2. Check the mechanical parts defects. 3. Test the electrical winding of open or short circuit, insulation resistance and earthing faults. 4. Repairs or replace identified faulty parts. 5. Grease the mechanical parts. 6. Replace a new fan.
13.	**Projector and Construction and Principles of Operation** 1. Identify the various modes of projectors and their various components parts. 2. Dismantle and identify the features of projectors and its principle of operation. Circuit Diagram 1. Draw the sound circuit diagram and locate the electrical and mechanical parts. 2. Read and interpret circuit diagram of a projector. Faults finding and Repairs 1. Clean, Lubricate and check moving parts for defects. 2. Carry out electrical tests and repair/replace identified faults. 3. Explain with diagram what projectors do and their features.	1. Types of projectors 2. Test open circuits, short circuits, earthing and continuity 3. Repair/replace any identified faulty parts servicing as the instruction on the projector.	1. Draw the sound circuit diagram of a 16mm projector. 2. Dismantle the projector and identify the component parts. 3. Clean and lubricate all moving parts of the projector using appropriate tools and lubricants. 4. Check the mechanical parts for defects. 5. Carry out the following electrical tests: a. open circuit b. short circuit c. earthing d. continuity 6. Re-assemble and test for correct operation. 7. Emphasize the importance of routine servicing of projectors.
14.	**Boilers Construction and Principle of Operation** 1. Identify and describe the features of various types of boilers. 2. Explain with diagrams its principle of operation. Diagnosis of Faults 1. Test for safety and dismantle. 2. Test for various faults. Maintenance and Repair 1. Clean, examine, repair/ replace faulty parts. 2. Re-assemble and test for correct making operation	1. Types and size of boilers auto claves sterilizers and steam boilers. 2. Types of safety valves, inlet, outlet. 3. Types of steam generated. 4. The constructional features of boilers. 5. The principles of operation of boilers. 6. Common faults on boilers. 7. Test on short and open circuit tests; continuity and insulation. Periodic Maintenance 1. Test for correctness of operation 2. Types of gauges; pressure gauge; temperature gauge; level gauge.	1. Carry out boiler test for safety. 2. Dismantle the boiler for visual inspection. 3. Clean and examine the various parts of the boiler. 4. List out the common faults on boilers. 5. carry out routine maintenance on boilers. 6. Emphasize on the importance of safety valve. 7. Carry out leakages and blockage tests on the gauges.

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK
	and carry out routine servicing.		8. Dismantle and inspect the components parts.
15.	**Gauge Construction and Principles of Operation** 1. Identify the types of gauges and describe their constructional features. 2. Explain with diagrams the operation of the gauges. Diagnosis of Faults 1. Test for leakage and blockage and dismantle for visual inspection. Repairs and Maintenance of gauges 1. Clean report/replace and reassemble faulty parts. 2. Test for correct operation and perform routine servicing.	1. Physical features of gauges. 2. Maintenance. 3. Common faults on gauges. 4. Test for correctness of operation 5. Routine servicing on gauges.	1. Clean and check for physical defects. 2. Re-assemble the parts and test for correctness of operation. 3. Emphasize on the importance of making the gauges leakage proof.

122 – SEWING, WASHING, TYPEWRITERS AND REPRODUCTIVE MACHINES

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK
1.	**Manually Operated Sewing Machines** 1. Identify the various types of sewing machines, describe the general principle of operation of manually operated sewing machine. 2. Dismantle and identify the component parts of manually operated sewing machine.	1. Types of manually operated sewing machines – table hand operated, foot operated etc. 2. General construction and operation of sewing machines. 3. Parts of sewing machines. 4. Faults of sewing machines 5. Machine testing 6. Maintenance of manually operated sewing machine.	1. Dismantle the projector and identify the component parts. 2. Clean and check physical defects. 3. Lubricate the moving parts. 4. Carry out routine servicing on the machine. 5. Test for correct operation of the machine.
2.	**Repair of Manually Operate Sewing Machine** 1. Clean moving parts and identify faults in manually operated sewing machines. 2. Replace or repair faulty parts, and re-assemble the units.	1. Types of electrical sewing machine – table and cabinet types 2. General construction of: a. motors b. table c. head 3. Identification of component parts. 4. maintenance.	1. Draw a typical circuit diagram of an electric sewing machine. 2. Dismantle, clean and identify component parts of an electric sewing machine. 3. Emphasize on the importance of regular servicing of the machine.
3.	**Electric Sewing Machine** 1. Describe the general construction and principle of operation of an electric sewing machine. 2. Dismantle, identify the components parts of electric sewing machine.	1. Give detail conversion of electrical energy to mechanical energy. 2. Explain the type of protective and speed control of this type of motor.	1. Check the starter and name the component parts of the starter. 2. Open, check and carry out routine servicing of the starter 3. Check the belt drive, clean and replace.
4.	**Repair of Electric Sewing Machine** 1. Draw the circuit diagram of the sewing machine and carry out circuit tests. 2. Lubricate moving parts identify faults and replace or repair faulty parts. 3. Reassemble the units and test for correct operation of the machine and perform routine servicing.	1. The diagram of an electric sewing machine, showing the block diagrams and circuit drawings. 2. Identification of parts. 3. Windings: brushes and armature 4. Fault in an electric sewing machine. 5. Tests for the faults: open circuits, short circuit test. 6. Earthing test: Lubrication, Faults Identification, Maintenance, Tests.	1. Identify the motor winding and brushes. 2. Test for open circuit earthing faults etc. 3. Check for physical defects. 4. Test for correct operation of the machine.
5.	**Operation of Washing Machine and Spin Driers** 1. Identify the various types of washing machine and sin driers and describe their general constructional features. 2. Explain their principles of operation. Circuit Diagrams	1. Types and component parts of washing machines and spin driers. 2. Rotating drum, water fittings, electronic motor, electronic control and switches and motor drive assembly. 3. The main frame (cabinet). General constructional features of washing machine and spin drier. 4. The principle of operation of washing machine and spin drier.	1. Prepare standard circuit diagrams of a washing machine and spin drier. 2. Locate on the diagram all the component parts. 3. Dismantle a washing machine and spin drier and identify the component parts. 4. Clean and lubricate the

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK
	1. Draw the circuit diagram of a washing machine and a spin drier. 2. Locate their component parts and carry out routine servicing. Repair of Washing Machine and Spin Drier 1. Dismantle, clean, lubricate their moving parts and perform fault finding tests. 2. Re-assemble the unit and test for correct operations and carry out routine servicing.	5. Circuit diagram of washing machine and spin driers routine servicing. 6. Maintenance and repairs. 7. Fault finding tests: a. Open circuit test b. Earthing and continuity tests.	moving parts. 5. Carry out the following electrical tests: 6. Repair or replace the identified faulty parts. 7. Emphasize on the proper installation of water supply. 8. Check the automatic control and regulators.
6.	**Construction and Operation of a Typewriter** 1. Identify the various types of typewriters, and describe its general construction and principle of operation. Repairs of Typewriters 1. Dismantle various types of typewriters, state various types of cleaning agents and maintain. 2. Draw block and schematic diagram of electric typewriters and identify their faults. 3. Repair or replace faulty parts and reassemble typewriters and test.	1. Types and component parts of typewriters such as manual and electric typewriters. 2. Types of cleaning agents and lubr5icants. 3. Circuit and block diagram of electric and typewriters. 4. Types of typewriters – manual, electric and electronics typewriters. 5. block ad schematic diagrams of electric and electronic typewriters. 6. Maintenance and repairs 7. Fault finding process and repairs. 8. Routing servicing	1. Prepare the block and schematic diagrams of electric and electronic typewriters. 2. Dismantle, identify the component parts. 3. Clean with appropriate cleaning agent and tools. 4. Lubricate the moving parts. 5. Test the electrical and electronic component parts of open circuit, short circuit, continuity etc. 6. Re-assemble the component parts and test the typewriters for correct operation. 7. Emphasize on the importance of using appropriate cleaning agents, tools and regular servicing of typewriters. 8. Prepare schedule for routine servicing.
7.	**Duplication Machine** 1. Identify types, component parts and general constructional features and principle of operation of duplicating machine. 2. Draw block diagrams of electric and hybrid duplicating machines and read and interpret their circuit diagrams. 3. Dismantle, clean, lubricate and check mechanical parts for	1. Types of duplicating machine - manual, electric and hybrid type etc. 2. Common faults on duplicating machines. 3. Circuits and block diagram of electric and hybrid duplicating machines. 4. Types of cleaning agents and lubricants, for servicing duplication machines. 5. Tests on duplicating machines. 6. List maintenance practices of manual and electric duplicating machines. 7. Carry out routine and periodic maintenance.	1. Draw the block diagram of electric and hybrid duplicating machines. 2. Dismantle the duplicating machine,s clean and lubricate with appropriate cleaning agents and lubricants. 3. Carry out the following tests on the electric and hybrid duplicating machines. 4. Repair or replace faulty parts.

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK
	defects. 4. Identify, maintenance schedule of duplicating machine. 5. Emphasize on routine and periodic maintenance.		5. Prepare circuit diagrams of electric and hybrid duplicating machines. 6. Emphasize the importance of regular servicing of duplicating machines.
8.	**Photo-copier Principle of Operation** 1. Identify the various model and the component parts of photocopying machine. 2. Describe the general features and explain the principles of operation. Circuit Diagrams 1. Draw block diagram read and interpret the circuit diagram of a photocopier. Fault finding and repair 1. Dismantle, clean, lubricate and check the photocopier. 2. Perform electrical test and replace or repair detected faults. 3. Re-assemble, test and carry out routine servicing.	1. Types of photo-copying machine, table and cabinet types. 2. Common faults of photo-copying machine. 3. Block and circuit diagram of a photo-copier. 4. Types of tools for repair and maintenance. 5. Tests and photo-copier. 6. Open and short circuit tests. 7. Earthing and continuity tests.	1. Draw the block diagram of photo-copier and name the component parts. 2. Prepare the circuit diagram of a photocopier. 3. Dismantle a photocopier, clean and identify the component parts. 4. emphasize the importance of routine servicing of photocopiers. 5. Check mechanical parts for physical defects. 6. Test for open and short circuits, earthing and continuity on the electrical component units. 7. Ensure stabilized voltage supply. 8. Repair or replace the identified faulty parts. 9. Re-assemble and test for correct operation. 10. Emphasize on the importance of routine servicing of the scanners. 11. Install in an air-conditioned room. 12. Ensure stabilized voltage supply.
9.	**Scanning Machine** 1. Identify the components and describe the general features of scanning machine. 2. Explain with diagram the function of its parts and the principles of operations of the machine. 3. Explain its uses. Circuit Diagram 1. Draw block diagram and read and interpret circuit diagram of a scanner. Fault Findings 1. Dismantle, clean lubricate and check the mechanical parts for defects.	1. Types of scanning machine. 2. Circuit and block diagrams of scanning machine. Principle of operation and uses of scanning machine. 3. Common faults of a scanning machine.	1. Prepare circuit diagram of a scanning machine. 2. Draw the block diagram of a scanning machine and labels the component parts on the diagram. 3. Identify various models and types of photo-copiers. 4. Dismantle a photo-copier and identify the component parts. 5. Clean and lubricate with appropriate cleaning agents and lubricants. 6. Test for open and short circuits, earthing and continuity (fault test).

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK
	2. Carry out various electrical tests and repair/replace faulty parts 3. Re-assemble, test for effectiveness and carry out routine servicing.		7. Repair or replace faulty parts. 8. Re-assemble and test for effectiveness. 9. Emphasize on the importance of regular routine/servicing on scanning machine.