

ASSISTANT SERVICE TECHNICIAN (REFRIGERATOR)(STRF)

Core Qualification File Syllabus

Details of Theory Syllabus

Sl. No.	CONTENT	DETAILS	Hours
1	General safety and trade related hazards.	1.1 Personal protection in workplace. 1.2 Personal safety and prevention of accidents. 1.3 Basic First Aid 1.4 Safety sign for danger, warning, caution and personal safety message 1.5 Use of fire extinguisher 1.6 Electrical safety precautions 1.7 Hazards due to leakage of refrigerant and precautionary measures. 1.8 Hazards due leakage of lubricant and water and precautionary measures. 1.9 Electrical Safety precautions 1.10 Safety precaution to be taken during the use of different tools and equipment required for servicing Refrigerator such as hammers, saw, screw drivers, wrenches, pliers, clamps, metal snips, files, torque wrench, flaring tool set, swaging tool, bending spring external type for copper tube, pipe cutter for copper tube, pinch of tool for copper tube, pipe cutter with built in reamer and space cutter for copper tube, pipe/tube bender lever type, puller 3 legged with flexible arm, multimeter, gas leak detector for halogen gas, electronic leak detector, compressor tester for hermetic compressor, evacuating and charging station, two stage rotary vacuum pump etc. 1.10 Use of PPE's during servicing of Refrigerators.	6
2	Introduction	2.1 Definition of refrigeration 2.2 Definition of Refrigerating effect 2.3 Definition of COP 2.4 Definition of Ton of refrigeration 2.5 Major application areas of refrigeration	6
3	Refrigeration System	3.1 Flow Diagram and function of each components of the following refrigeration system a. Vapour Compression Refrigeration System (VCRS) b. Vapour Absorption Refrigeration System (VARs) c. Basic electrical circuit for refrigerator.	6
4	Refrigerant	4.1 Classification of refrigerant 4.2 Nomenclature of refrigerant 4.3 Desirable properties 4.4 Name and symbols of commonly used refrigerants 4.5 Eco friendly refrigerant (GWP, ODP etc)	6
5	Components	5.1 Types, working principle and construction of following	10

	Refrigeration system	<p>components of Vapour Compression Refrigeration System (VCRS).</p> <ul style="list-style-type: none"> • Compressor • Condenser • Expansion Devices • Evaporator 	
6	Control Devices	<p>6.1 Identification, location and purpose of following control devices.</p> <ol style="list-style-type: none"> Operating Controls : Thermostat Fluid Flow Controls: Solenoid valve Evaporator pressure regulating valve Safety controls: Pressure Switch (High Pressure & Low Pressure), Pressure relief valve, Oil-safety switch, Anti-freeze thermostat, Flows witch, Time delay relay (TDR), Electrical overloads protectors (Bimetal type) and Motor winding protection thermostat. 	6
7	Drier	<p>7.1 Causes of presences of moisture in refrigeration system</p> <p>7.2 Functions of drier</p> <p>7.3 Types of drier</p> <p>7.4 Drying agents</p>	4
8	Servicing Tools	<p>8.1 Identification and uses of different tools and equipment required for servicing of refrigerator such as such as hammers, saw, screw drivers, wrenches, pliers, clamps, metal snips, files, torque wrench, flaring tool set, swaging tool, bending spring external type for copper tube, pipe cutter for copper tube, pinch of tool for copper tube, pipe cutter with built in reamer and space cutter for copper tube, pipe/tube bender lever type, puller 3 legged with flexible arm, multimeter, gas leak detector, compressor tester for hermetic compressor , evacuating and charging station, two stage rotary vacuum pump. etc.</p>	6
9	Trouble Shooting	<p>9.1 Common problems in direct cool refrigerator and possible causes such as-</p> <ul style="list-style-type: none"> ➤ No cooling due to leakage of gas/compressor not started. ➤ Leakage of water ➤ Poor cooling due to improper setting of controls/ compressor trips frequently/ moisture in the system. <p>Remedy of the above problems.</p> <p>9.2 Common problems in Frost Free Refrigerator and possible causes such as</p>	6

		<ul style="list-style-type: none"> ➤ No cooling due to Filter drier choked / Compressor not started. ➤ Poor cooling due to partially choked capillary tube/malfunctioning of Bimetal thermo, Defrost heater and timer switch/ damaged Door gasket. Remedy of the above problem.	
10	Electrical concept	10.1 Concept of current, voltage, resistance, electrical power, electrical energy. 10.2 Measurement of current, voltage, resistance, electrical power, electrical energy. 10.3 Use of Multimeter, Watt meter and Energy Meter.	6
11	Application of Refrigeration system	11.1 Cold storage-Flow diagram 11.2 Milk processing plant- Flow diagram 11.3 Ice making plant- Flow diagram 11.4 Ice cream plant- Flow diagram 11.5 Water cooler- Flow diagram	10
		TOTAL DURATION OF THEORY CLASS	72

Detail of Practical Syllabus

SL NO	CONTENT	DETAILS	Hours
1	Refrigerator Servicing tolls	1.1 Identification of various service Tools and their uses	6
2	Domestic Refrigerator	2.1 Identification of various components of Domestic Refrigerator such as compressor, condenser, expansion device, evaporator, Current relay, PTC relay, OLP, Thermostat, Running Capacitor, Bimetal Thermal, Timer Switch, Heater, Thermal Fuse, Door Lamp, Door Switch etc. 2.1 Diagnosis of fault of the above components. 2.2 Servicing.	16
3.	Compressor	3.1 Dismantling of Reciprocating Compressor (open type) and identification. 3.2 Overhauling, oiling and servicing of components like Cylinder, Piston, piston Ring, Crankshaft, Cylinder head valve plate assembly, Shaft seal, connecting rod etc. and assemble them. 3.3 Charging of compressor oil	12
4.	Condenser	4.1 Testing for leakage through condenser. 4.2 Repairing for leakage	8
5.	Expansion Device	5.1 Checking the capillary tube. 5.2 Detection of choking in the capillary tube by flushing. 5.3 Repair or replacement of the above part.	2
6.	Evaporator	6.1 Removal of oil from evaporator 6.2 Checking for leakage 6.3 Removal of oil from evaporator 6.4 Repair	4

7.	Copper tube	7.1 Cutting, bending and joining of copper tube 7.2 Flaring 7.3 Swaging 7.4 Silver Soldering.	6
8.	Gas charging in Refrigerator	8.1 Gas Charging 8.2 Vacuumising 8.3 Drying of the system	6
9.	Refrigerator cabinet	9.1 Servicing of refrigerator cabinet 9.2 Checking of door liner and body inside liner 9.3 Replacement of door liners and door gasket 9.4 Adjustment of door alignment	8
10.	Overload protector and starting relay	10.1 Checking of thermal overload protector, Motor starting relays and capacitors 10.2 Servicing of the above components.	4
11	Project		24
Total Practical and Project			96

Details of Project (Any Two)

Sl. No.	Content	Details	Hours
1.	Project I	Disassembly and assembly of different components of a domestic refrigerator.	12
2.	Project II	Preparation of report based on Industrial visit to a cold storage	12
3.	Project III	Preparation of report based on Industrial visit to an Ice Plant	12
4.	Project IV	Preparation of report based on Industrial visit to a Ice Cream Plant	12

OUTCOMES

Outcomes to be assessed	Assessment criteria for the outcome
1. Apply safe working practices.	<p>1.1 Assessor will note whether the trainee is able to achieve a safe working environment in line with occupational health and safety regulations and requirements according to site policy.</p> <p>1.2 Assessor can judge the trainee on his ability to recognize any unsafe situations according to site policy, and assess his report accordingly.</p> <p>1.3 Assessor will ask the trainee to demonstrate use of different bandages and medicines commonly present in a first aid box.</p> <p>1.4 Trainee will be asked to demonstrate basic first aid & CPR and use them under different circumstances.</p> <p>1.5 Assessor will ask the trainee to demonstrate Safety sign for Danger, Warning, caution and personal safety message accurately.</p> <p>1.6 Assessor will assess the report/record submitted by trainee to supervisor/ Competent of authority in the event of accident or sickness of any staff, including accident details according to site accident/injury procedures</p> <p>1.7 Trainee will be asked to identify different fire extinguishers and to use the same as per requirement in a mock drill</p> <p>1.8 Assessor can judge the trainee on his ability to take precautionary measures in case of leakage of refrigerant.</p> <p>1.9 Assessor will ask the Trainee to describe safety precaution to be taken during the use of different tools and equipment required for servicing Refrigerator such as hammers, saw, screw drivers, wrenches, pliers, clamps, metal snips, files, torque wrench, flaring tool set, swaging tool, bending spring external type for copper tube, pipe cutter for copper tube, pinch of tool for copper tube, pipe cutter with built in reamer and space cutter for copper tube, pipe/tube bender lever type, puller 3 legged with flexible arm, multimeter, gas leak detector for halogen gas, electronic leak detector, compressor tester for hermetic compressor, evacuating and charging station, two stage rotary vacuum pump etc.</p> <p>1.10 Assessor will judge the trainee on his/her ability to use PPE's during servicing of the Refrigerator.</p>

<p>2. Demonstrate the use of different servicing tools & equipment and electrical instrument for refrigerator.</p>	<p>2.1 Trainee will be asked to identify different tools and equipment required for servicing Refrigerator such as hammers, saw, screw drivers, wrenches, pliers, clamps, metal snips, files, torque wrench, flaring tool set, swaging tool, bending spring external type for copper tube, pipe cutter for copper tube, pinch of tool for copper tube, pipe cutter with built in reamer and space cutter for copper tube, pipe/tube bender lever type, puller 3 legged with flexible arm, multimeter, gas leak detector, compressor tester for hermetic compressor , evacuating and charging station, two stage rotary vacuum pump. etc.</p> <p>2.2 Assessor will ask the trainee to demonstrate the use of above tools and equipment required for servicing.</p> <p>2.3 Assessor will ask the trainee to demonstrate the use of a Multimeter to take readings of voltage, current and resistance.</p> <p>2.4 Assessor will ask trainee to take reading of power and energy from watt meter and energy meter respectively.</p>
<p>3. Explain different refrigeration system, Refrigerant and terms related to refrigeration.</p>	<p>3.1 Assessor will ask the trainee to define –Refrigeration, Refrigerating effect, COP of Refrigerator.</p> <p>3.2 Assessor will ask the trainee to describe the major area of application of refrigeration.</p> <p>3.3 Assessor can judge the trainee on his ability to draw flow diagram of Vapour Compression Refrigeration system (VCRS)</p> <p>3.4 Assessor can judge the trainee on his ability to draw flow diagram of Vapour Compression Refrigeration system (VCRS)</p> <p>3.5 Trainees will be asked to describe the function of each component of VCRS.</p> <p>3.6 Assessor can judge the trainee on his ability to draw flow diagram of Vapour Absorption Refrigeration system (VARs)</p> <p>3.7 Trainees will be asked to describe the function of each component of VARs.</p> <p>3.8 Trainees will be asked to classify refrigerants.</p> <p>3.9 Trainees will be asked to describe refrigerants.</p> <p>3.10 Assessor will judge the trainee on his ability to state the nomenclature and symbols of refrigerant.</p> <p>3.11 Assessor will judge the trainee whether the trainee is acquainted with ODP and GWP or regarding eco friendly Refrigerant.</p> <p>3.12 Assessor will ask the trainee to describe types, working principle and construction of following components of Vapour Compression Refrigeration System (VCRS)</p> <ul style="list-style-type: none"> ● Compressor ● Condenser ● Expansion device ● Evaporator

	<p>3.13 Assessor will judge the trainee on ability to read basic Electrical Circuit for refrigeration.</p>
<p>4. Perform Overhauling, servicing and troubleshooting of Refrigerator</p>	<p>4.1 Trainee will be asked to identify different component of refrigerator such as compressor, condenser, expansion device, evaporator, Current relay, PTC relay, OLP, Thermostat, Running Capacitor, Bimetal Thermal, Timer Switch, Heater, Thermal Fuse, Door Lamp, Door Switch etc.</p> <p>4.2 Assessor will judge trainee on ability to diagnose common problem of refrigerator such as-</p> <p>Common problems in direct cool refrigerator and possible causes such as-</p> <ul style="list-style-type: none"> ➤ No cooling due to leakage of gas/ compressor not started. ➤ Leakage of water ➤ Poor cooling due to improper setting of controls/ compressor trips frequently/ moisture in the system. <p>Remedy of the above problems</p> <p>Common problems in Frost Free Refrigerator and possible causes such as</p> <ul style="list-style-type: none"> ➤ No cooling due to Filter drier choked / Compressor no started. ➤ Poor cooling due to partially choked capillary tube/malfunctioning of Bimetal thermo, Defrost heater and timer switch/ damaged Door gasket. <p>Remedy of the above problem.</p> <p>4.3 Assessor will judge the trainee on ability to solve the problem by overhauling and oiling/repair/replacement of the concerned part(s) of the refrigerator.</p> <p>4.4 Trainee will be asked to disassemble the compressor.</p> <p>4.5 Assessor will judge the trainee on the ability of overhauling, oiling, servicing of different components of compressor like cylinder, piston, piston ring, crankshaft, cylinder head valve plate assembly, shaft seal, connecting rod etc.</p> <p>4.6 Trainees will be asked to charge compressor oil.</p> <p>4.7 Trainees will be asked to assemble after servicing.</p> <p>4.8 Trainee will be asked to descale condenser</p> <p>4.9 Trainees will be asked to flush condensers and evaporators.</p> <p>4.10 Trainees will be asked to perform leak tests, evacuation, drying with drying agents and gas charging.</p> <p>4.11 Assessor will judge trainees on the ability to perform</p>

	<p>cutting, bending, flaring, swaging and silver soldering of copper tubes.</p> <p>4.12 Assessor will judge the trainee on the ability to check the liner of the cabinet and door of the refrigerator and replace if necessary.</p> <p>4.13 Assessor will judge the trainee on the ability to check the door gasket and replace if necessary.</p> <p>4.14 The trainee will be asked to identify different control devices used in refrigerator such as Thermostat, Solenoid Valve, Pressure Switch (High Pressure & Low Pressure), Pressure relief valve, Oil-safety switch, Anti-freeze thermostat, Flows witch, Time delay relay (TDR), Electrical overloads protectors (Bimetal type) and Motor winding protection thermostat.</p> <p>4.15 The trainee will also be asked to state the location and purpose of the above control devices.</p> <p>4.16 Trainee will be to repair/ replace electrical/ electronic control devices in presence of supervisor following electrical safety rules</p>
5. Name components of different refrigeration plant.	<p>5.1 Assessor will judge trainee whether on ability of labeling the different components of following refrigeration plant-</p> <ul style="list-style-type: none"> ● Cold storage ● Milk processing plant ● Ice making plant ● Water cooler