DETAILED SYLLABUS FOR THE POST OF

TRADESMAN- REFRIGERATION AND AIR CONDITIONING

TECHNICAL EDUCATION DEPARTMENT

(CATEGORY NO: 135/2024)

(TOTAL MARKS ±100)

MODULES	SUB-HEADINGS	TOPICS	
Module-1 Fitting, Sheet metal & Welding	Safety	Safety precautions	2
		First Aids	
		Personal Protective Equipments (PPE)	
		Fire fittings equipments	
		Electrical safety	
	Fitting	Different types of fitting hand tools, power tools	3
		Functions, constructions, specifications & application of hand tools and power tools	
		Care and maintenance of hand tool & power tools	
		Machineries and equipments like drilling machines, grinding machines etc	
		Function, construction, specification, application, care & maintenance of machineries & equipments	
		Precision measuring instruments like verniercalliper, micrometers, vernier height gauge etc	
		Functions, constructions, specifications & application of precision instruments	
		Care and maintenance of precision instruments	
	Sheet metal	Sheet metal tools, instruments, equipments	2
		Construction, working, use, application and specification	
		Care and maintenance of sheet metal tools, instruments& equipments	
		Types of sheet metal joints	
		Rivets & riveting, their types and uses	
	Welding	Welding tools and equipments, types specifications and use	2
		Oxy-Acetylene welding equipments & accessories	
		Gas welding hand tools and safety apparels	
		Arc welding accessories	
		Classification of welding process	

		Methods of gas welding	
		Use of Oxy Acetylene, Oxy LPG, Air LPG and two stage regulator	
		Types of weld	
Module-2 Electrical	Electrical	Electrical terms such as AC and DC supply, voltage, current, capacitors, resistors, power, energy, frequency etc	3
		Conductors and insulators	
		Series circuits, parallel circuits, open circuits, short circuits	
		Material used as conductors	
		Joints in conductors	
		Measuring instruments such as voltmeter, ammeter, ohmmeter, energy meter, frequency meter etc	
		Earthing and its importance	
		Earth resistance, insulation, and continuity testing	
	AC Motors	Single phase and three phase motors	3
		Construction and working principle of Capacitor start Capacitor run induction motor (CSR), Split phase induction motor (RSIR), Capacitor start induction motor (CSIR),Permanent Capacitor or capacitor run induction motor (PSC), Resistance start capacitor run induction motor (RSCR), Shaded pole motor etc	
		Centrifugal switch	
		Methods of changing the direction of rotation	
		Construction and working principle of squirrel cage induction motor, slip ring induction motor	
		Common faults, causes and remedies in single phase and three phase motors	
	Motor starters	Construction and working of Single phase and three phase motor starters such as DOL starter, Star delta starter, Auto transformer starter, Rotor resistance starter	2
		Common faults, causes and remedies in single phase and three phase motor starters	
Module-3 Electronics	Electronic components	Active and passive components	2
		Resistor, Capacitors, Semiconductors, Diodes, Transistors etc	
		Rectifiers (Half wave, Full wave, Bridge rectifier etc)	
		Zener diodes, voltage regulator, Amplification	
		Transistors-CB,CE,CC Configuration	
		Photo diodes, Photo transistors, Multi vibrator, SCRs, UJTs, ICs etc	

Module-4 Basic refrigeration	Refrigeration tools, instruments ,and equipments	Refrigeration tools, instruments, and equipments	4
		Construction, working, use, application and specification	
		Care and maintenance of refrigeration tools, instruments& equipments	
	Fundamentals of refrigeration	Fundamentals of refrigeration	
		Science related to refrigeration such as units, mass, weight, work, power, energy, force, pressure, heat, temperature, sensible heat, latent heat, super heating, sub cooling, saturation temperature, boiling point , freezing point, etc	5
		Laws of thermodynamic, Laws of perfect gases	
	Different types of refrigeration system	Construction and working of ice refrigeration	3
		Construction and working of Dry ice refrigeration	
		Construction and working of Water vapour refrigeration	
		Construction and working of Liquid gas refrigeration	
		Construction and working of Evaporative refrigeration	
		Construction and working of Steam jet refrigeration	
		Construction and working of Thermo electronic refrigeration	
		Construction and working of Vapour absorption refrigeration cycle	
		Construction and working of Vapour compression cycle, fundamental operations, Sub cooling and super heating	
		Application of vapour compression cycle	
		COP, Ton of Refrigeration	
		Study of Ph, Ts, Pv diagram	
	Compressor	Construction, working, types and application of different compressors such as Reciprocating, Rotary, Scroll, Screw, Centrifugal, Swash plate etc	5
		Volumetric efficiency, capacity control, factors influencing volumetric efficiency, piston displacement, compression ratio etc	
		Compressor lubrication oil, properties, types and lubrication methods	
		oil separator	
		Advantage and disadvantage of different types of compressors	
		Common faults, care and remedies in compressor	
		Construction, working, types and application of condensers such as air cooled, Water cooled, evaporative	

Module-5 Refrigeration equipments	Condenser	Capacity of condensers, factors affecting the condenser capacity	3
		Advantage and disadvantage of different types of condensers	
		De-scaling, methods of descaling, fouling factor etc	
		Liquid receiver	
		Drier, types and application	
		Description of desiccants	
	Cooling tower	Construction and working principles of different types of cooling towers	3
		Types of cooling towers	
		Capacity of cooling towers, factors affecting the cooling tower capacity	
		Advantage and disadvantage of different types of cooling towers	
		Cooling tower approach, range, efficiency etc	
		Water treatment, water softening plant	
	Expansion valve	Construction and working principles of different types of expansion valves such as Thermostatic expansion valves (TXV), Automatic expansion valves (AXV), Float valve, Electronic expansion valves, Level master control (LMC),Capillary tubes etc	3
		Selection of expansion valves	
	Evaporator	Construction and working principles of different types of evaporators	2
		Capacity of an evaporator, factors affecting the capacity of an evaporator	
		Types of evaporators such as Natural convention, forced convention, flooded evaporator, Dry expansion evaporator, Bare tube coil evaporator, Finned tube evaporator, Plate evaporator, Shell and tube, Shell and coil, Tube in tube evaporator, frosting evaporator, non frosting evaporator etc	
		Methods of defrosting such as Manual defrosting, Pressure control defrosting, Temperature control defrosting, Water defrosting, Reverse cycle defrosting, Simple hot gas defrosting, Automatic defrosting, Electric defrosting etc	
		Accumulator	
		Heat exchanger, their function, construction, application & advantage	
		Properties of refrigerant	
		Classification of refrigerants	

Module-6 Refrigerant	Refrigerant	Alternative refrigerants	5
		Climatic impact of refrigerants	
		Ozone depletion potential (ODP)	
		Green house effect- global warming (GWP)	
		ODP & GWP of various Refrigerants	
		Numbering of refrigerants	
		Refrigerant cylinders, Cylinder colour coding	
		Handling of refrigerant cylinders & Flammable refrigerant	
		Refrigerant leak detection methods	
		Flushing, leak testing, Evacuation, Gas charging in different system	
		Retrofitting	
Module-7 Refrigeration system	Refrigerator (direct cool)	Construction and working principles of single door direct cool refrigerator	3
		Study the electrical and mechanical components	
		Testing of electrical and mechanical components	
		Door gasket	
		Heat insulation materials, types & properties	
		Trouble shooting of refrigerator	
		Installation method	
		Care and maintenance of refrigerator	
		Leak testing, Evacuation, Gas charging	
		Electrical circuit diagram	
	Frost free refrigerator	Construction and working principles of frost free refrigerator (2 or 3 door)	2
		Study the electrical and mechanical components	
		Testing of electrical and mechanical components	
		Trouble shooting of frost free refrigerator	
		Care and maintenance of frost free refrigerator	
		Installation method	
		Leak testing, Evacuation, Gas charging	
		Electrical circuit diagram	1
	Refrigerator (inverter technology)	Construction and working principles of refrigerator	
		Refrigeration cycle & Air cycle	
		Study the electrical and mechanical components	
		Testing of electrical and mechanical components	
		Trouble shooting of refrigerator	
		Care and maintenance of refrigerator	
		Leak testing, Evacuation, Gas charging	
		Electrical circuit diagram	

Module-7 Refrigeration system	Water cooler & Water dispenser	Construction and working principles of water cooler & water dispenser	2
		Types of water cooler & water dispenser	
		Refrigeration cycle of water cooler & water dispenser	
		Study the electrical and mechanical components	
		Testing of electrical and mechanical components	
		Trouble shooting of water cooler & water dispenser	
		Care and maintenance of Water cooler & Water dispenser	
		Leak testing, Evacuation, Gas charging	
		Electrical circuit diagram	
		Insulation materials	
	Visible cooler & Bottle cooler	Description, Construction and working principles	1
		Study the electrical and mechanical components	
		Testing of electrical and mechanical components	
		Trouble shooting of visible cooler & bottle cooler	
		Care and maintenance of visible cooler & bottle cooler	
		Leak testing, Evacuation, Gas charging	
		Electrical circuit diagram	
	Deep freezer/Display carbine	Description, Construction and working principles	2
		Study the electrical and mechanical components	
		Testing of electrical and mechanical components	
		Trouble shooting	
		Care and maintenance	
		Leak testing, Evacuation, Gas charging	
		Electrical circuit diagram	
		Installation method	1
	Ice cube machine/Softy machine	Description, construction, working	
		Study the electrical and mechanical components	
		Testing of electrical and mechanical components	
		Trouble shooting	
		Care and maintenance	
		Leak testing, Evacuation, Gas charging	
		Electrical circuit diagram	
		installation method	
	Window Air Conditioner	Construction and working principles	5
		Study the electrical and mechanical components	
		Testing of electrical and mechanical components	
		Trouble shooting and servicing	
		Installation method	
		Care and maintenance of refrigerator	
		Leak testing, Evacuation, Gas charging	
		Electrical circuit diagram	
		Energy Efficiency Ratio(EER)	
		Energy Efficiency labeling on Air-Conditioning system	
		Construction and working principles	
		Study the electrical and mechanical components	

Module-8 Air conditioning system	Split Air-Conditioner (Wall Mounted, Floor, Ceiling/Cassette mounted, Duct able)	Testing of electrical and mechanical components	2
		Trouble shooting and servicing	
		Installation method	
		Care and maintenance of refrigerator	
		Leak testing, Evacuation, Gas charging	
		Electrical circuit diagram	
		Energy Efficiency Ratio(EER)	
		Energy Efficiency labeling on Air-Conditioning system	
	Multi split Air-Conditioner	Construction and working principles	2
		Study the electrical and mechanical components	
		Testing of electrical and mechanical components	
		Trouble shooting and servicing	
		Installation method	
		Care and maintenance of refrigerator	
		Leak testing, Evacuation, Gas charging	
		Electrical circuit diagram	
	Inverter Split Air-Conditioner	Construction and working principles	1
		Study the electrical and mechanical components	
		Testing of electrical and mechanical components	
		Trouble shooting and servicing	
		Installation method	
		Care and maintenance of refrigerator	
		Leak testing, Evacuation, Gas charging	
		Electrical circuit diagram	
Module-9 Commercial	Ice candy plant	Function, construction, Working principle	1
		Circuit diagram	
		Capacity & types of compressor used	
		Brine solution types, properties	
		Testing of electrical and mechanical components	
		Trouble shooting and servicing	
		Installation method	
		Care and maintenance of refrigerator	
		Leak testing, Evacuation, Gas charging, Retrofit	
	Ice plant	Function, construction, Working principle	2
		Circuit diagram	
		Capacity & types of compressor used, agitator	
		Brine solution types, properties	
		Testing of electrical and mechanical components	
		Trouble shooting and servicing	
		Installation method	
		Care and maintenance of refrigerator	
		Leak testing, Evacuation, Gas charging	
		Function, construction, Working principle	
		Circuit diagram	

Refrigeration and air conditioning system	Walk in cooler & reach in cabinet	Capacity & types	1
		Trouble shooting and servicing	
		Installation method	
		Care and maintenance of refrigerator	
		Leak testing, Evacuation, Gas charging	
	Cold storage	Function, construction, Working principle	3
		Controls & Circuit diagram	
		Capacity & types of cold storage and its details	
		Trouble shooting and servicing	
		Installation method	
		Care and maintenance of refrigerator	
		Methods of Leak testing, Evacuation, Gas charging	
		Food preservation	
		Maintaining temperature in different places	
		Properties of commonly used refrigerants like ammonia and its safe handling	
		use of vibration eliminator and shock absorber	
		Mobile refrigeration in transport vehicle	
		Deep freezing, Freezing tunnel, Blast freezing	
		Requirement of comfort Air-Conditioning	

Module-9 Commercial Refrigeration and air conditioning system	Psychrometry		
		Study of psychrometric terms-DBI, WBT, RH, enthalpy, dew point, specific humidity etc	4
		Study of psychrometric chart-Dry bulb temperature line, Wet bulb temperature line, Specific humidity or moisture content line, Dew point temperature line, Enthalpy (total heat) line, Vapour pressure line, Relative humidity line etc	
		Study of psychrometric process-Sensible heating, Sensible cooling, Humidification & Dehumidification, Cooling and adiabatic humidification, Cooling and humidification by water injunction, Heating and humidification, Humidification by steam injection, Adiabatic chemical dehumidification etc	
		Heat load calculation for commercial and industrial buildings	
	Central Air-Conditioning system/HVAC plant	Introduction to HVAC	3
		Fundamentals of central Air-Conditioning/ HVAC plant	
		Types of central Air-Conditioning (direct & indirect)	
		Construction & Working	
		Components, Fault, Care & Maintenance	
		Temperature & pressure control used in AC plant	
		Construction and working of safety devices in AC plant	
		Cooling tower, Pipe lines	
		Preventive maintenance schedule of central Air-Conditioning plant	
		Maintain log book for daily operation	
		Modulating valve for temperature control	
		Package chiller, Screw chiller, Reciprocating chiller	
		Humidity control	
		Humidifier	
		Dehumidifier	
		Air washer	
		AHU, FCU	
		Chilled water system	
	Package Air-Conditioner (Air cooled, Water cooled condenser)	Construction & working principles	1
		Types, application	
		Installation methods	
		Trouble shooting	
		Care and maintenance	
		Temperature & pressure control	
		Construction and working of safety devices	

Module-9 Commercial Refrigeration and air conditioning system	Split package	Construction & working principles	1
		Types, application	
		Study of various electrical & mechanical components	
		Installation methods	
		Trouble shooting	
		Care and maintenance	
		Temperature & pressure control	
		Construction and working of safety devices	
		VRV/VRF system	
		Details of piping	
		Common reason for error code	
		Types of ODU & IDU	
	Duct	Function, types	4
		Classification of ducts	
		Materials used for ducting	
		Duct designing	
		Pressure in ducts	
		Duct insulations	
		Properties of insulation materials	
		K-factors	
		Acoustic insulation	
		Air distribution methods	
		Air flow	
		Fan and blower	
		Function, types, classification of fan & blower	
		Static & Velocity pressure measurements	
	Air Filter	Construction, Function of air filters	3
		Types of air filters	
		Care & maintenance of air filter	
		Effect of chocked air filter	
		Clean room	

Module-10 Automobile air-Conditioning	Car Air-Conditioner	Construction, working	2
		Study various electrical & mechanical components	
		Testing components	
		Electrical circuit diagram	
		Fault detection	
		Leak testing, evacuation, gas charging	
		Installation	
		Trouble shooting	
		Magnetic clutch operation	
		Free wheeling	
		Care and maintenance	
	Mobile Air-Conditioner (Bus, Train)	Study the refrigeration cycle in automobile AC	1
		Construction and working of bus AC	
		Magnetic clutch operation, free wheeling	
		Refrigerant used HCFC-22, HFC_134a, HFOs, Blends of HFCs, and HFOs	
		Construction and working of train AC	
		Trouble shooting of Bus AC & Train AC	
		Planning for Preventive maintenance and scheduling	
		Maintenance actives in large AC and Refrigeration plant	

NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper