SUBJECT: REPAIR & MAINTENANCE OF CENTRAL AIR-CONDITIONING SYSTEM (RMCA)

CLASS XII
SEMESTER - III

THEORY

FULL MARKS – 20

(MCQ Type Question)

UNIT	Topic	No of periods assigned	Marks
1	**Introduction to Central Air Conditioning Systems**	09	3
2	**Principles and Applications of Key Components**	15	07
3	**Fundamentals of HVAC and Psychrometry**	12	5
4	**Split and Package AC Systems**	09	5

DETAIL SYLLABUS: THEORY

UNIT	Topics / Sub Topics	No of periods assigned
1	**Introduction to Central Air Conditioning Systems:** 1.1 Definition and purpose of central air conditioning 1.2 Components: Thermostat, Evaporator coil, Air handler, Condenser coil, Compressor, Refrigerant lines, Ductwork, Blower fan, Air filters, Vents Expansion valve, Condenser fan, and Condensate drain line 1.3 Applications: Industrial, commercial, and residential uses	09
2	**Principles and Applications of Key Components:** 2.1 Working principles of Compressor, Condenser, Evaporator Coil, Air Handler, Refrigerant Lines, and Electrical Components 2.2 Description and function of VRF/VRV systems	15
3.	**Fundamentals of HVAC and Psychrometry:** 3.1 Introduction to HVAC 3.2 Fundamentals of HVAC plant 3.3 Requirements of comfort A.C 3.4 Psychrometric Properties: DBT, WBT, RH, enthalpy, dew point, and specific humidity.	12
4	**Split and Package AC Systems:** 4.1 Types of split and package systems 4.2 Components, construction and their functions 4.3 Mechanical and electrical fault diagnosis	09
	Total	**45**

SUBJECT: REPAIR AND MAINTENANCE OF CENTRAL AIR-CONDITIONING SYSTEM

CLASS XII
SEMESTER IV

THEORY

FULL MARKS – 30

(SAQ AND LAQ Type Question)

UNIT	Topic	No of periods assigned	Marks
1	**Refrigeration Systems and Refrigerants**	12	2(SAQ) & 5(LAQ)
2	**Air Distribution and Duct Design**	15	3(SAQ) & 5(LAQ)
3	**Types and Installation of Central Air Conditioning Systems**	21	3(SAQ) & 5(LAQ)
4	**Maintenance Practices**	15	2(SAQ) & 5(LAQ)

DETAIL SYLLABUS

UNIT	Topics / Sub Topics	No of periods assigned
1	**Refrigeration Systems and Refrigerants:** 1.1 Brine composition for temperature control: Agitator functioning 1.2 Ice Plants: ▪ Components, working principles, and circuit diagrams ▪ Capacity & types of compressors used ▪ Operation, maintenance, retrofit 1.3 Refrigerants: Properties, types, and safe handling of ammonia and low-GWP refrigerants.	12
2	**Air Distribution and Duct Design:** 2.1 Ductwork: ▪ Function, types, and materials ▪ Insulation properties: Thermal ('K' factors) and acoustic insulation 2.2 Air Distribution: ▪ Airflow methods, AHU, FCU, fan, and blower mechanisms	15
3	**Types and Installation of Central Air Conditioning Systems:** 3.1 System Types: ▪ Direct and indirect systems ▪ Components, Construction and working principles of each system 3.2 Operation of industrial air conditioning systems 3.2 Installation Procedures: ▪ Selection of components based on suitability ▪ Installation steps for central air conditioning systems	21
4	**Maintenance Practices:** 4.1 Maintenance of industrial air conditioning systems 4.2 Humidification and dehumidification methods 4.3 Fault detection and troubleshooting 4.4 Annual and routine maintenance schedules	15
	Total	**63**

Practical – 40marks
Project – 10marks

Practical

SL NO	DETAILS	Hours
1	Identification and uses different tools and equipment required for servicing Air conditioner such as hammers, saw, screw drivers, wrenches, pliers, clamps, metal snips, files, 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, torque wrench, multi meter, gas leak detector for halogen gas, electronic leak detector, Sling Psychrometer, Anemometer ,compressor tester for hermetic compressor, evacuating and charging station, two stage rotary vacuum pump etc	18
2	Package AC, types, construction and working principle, trouble shooting, and various applications. Duct system, AHU. Care and maintenance, installation method. Construction and working principle, types, maintenance of Industrial Air-conditioning plant. Humidification and dehumidification methods. AHU, description of FCU Electrical circuit of split package AC	18
3.	Planning for Preventive maintenance and scheduling of maintenance activities in large AC and Refrigeration plant	18

	Types of Central air conditioning (Direct and indirect system) Construction, working, components, faults, care and maintenance	
4.	Construction and working principle, types, troubleshooting& care and maintenance. Energy Efficiency Ratio (EER) - Energy-efficiency labelling on ACs. Advantages of proper installation with emphasis on proper functioning and avoidance of leakage of refrigerant. Selection of location of indoor and outdoor units ensuring minimum distance between the units, away from flammable materials, if any, good air flow within the cooling space as well as over the condenser.	24
5.	deep freezer, ice candy machine and ice plant. Maintenance by OEM. Study of Cold storage-Flow diagram Milk processing plant- Flow diagram Ice making plant- Flow diagram Ice cream plant- Flow diagram	18
6.	Direct expansion system. Operation & Preventive Maintenance Schedule of central AC plant. Maintain log book for daily operation. Planning for Preventive maintenance and scheduling of maintenance activities in large AC and Refrigeration plant.	18
7	Project	30
	Total Practical and Project	144

Project (Any two)

Sl. No.	Content	Details	Classes
1.	Project I	Disassembly and assembly of Window type Room Air-conditioner.	15
2.	Project II	Disassembly and assembly of Split type Air-conditioner.	15
3.	Project III	Identification of different components of Car A.C. form model.	15
4.	Project IV	Preparation of a report based on industrial tour to a Central Air-Conditioning Plant.	15