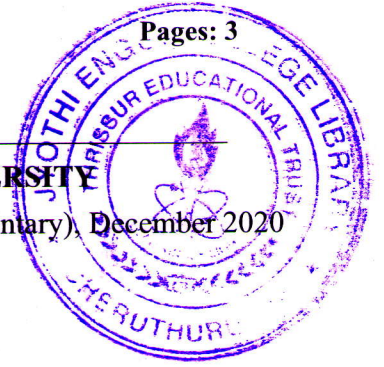C

Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Examination (Regular and Supplementary), December 2020

Course Code: ME405

Course Name: Refrigeration and Air Conditioning

Max. Marks: 100   Duration: 3 Hours

Use of Refrigeration and Air Conditioning data book is permitted

PART A

Answer any three full questions, each carries 10 marks.   Marks

1	a)	Define the terms: (i) Refrigeration (ii) Coefficient of Performance and (iii) Ton of Refrigeration. State the major applications of refrigeration	(5)
	b)	A Carnot refrigerator works between temperature limits of 37°C and -13°C. Find the Carnot COP. Also determine the amount of ice that will be produced per kWh at -13°C from water at 27°C using this refrigerator.	(5)
2	a)	Explain with the support of schematic and T-S diagrams the working of regenerative aircraft refrigeration system.	(5)
	b)	An air refrigerator working on reversed Brayton cycle gets compressor inlet air at 1.2 bar and the pressure ratio is 3.75. Determine the theoretical Brayton COP and Carnot COP, if the compression and expansion processes are reversible adiabatic. Assume that the cold chamber temperature is 10°C and ambient temperature is 30°C.	(5)
3	a)	Describe any one refrigeration technique for the production of very low temperature using a neat diagram.	(5)
	b)	A R12 refrigerator operates between temperatures of 35°C and -15°C, for the condenser and evaporator, respectively. The system is provided with a liquid-vapour regenerative heat exchanger with the temperature of refrigerant vapour leaving the heat exchanger is at 15°C. Determine the COP of the system. Also, determine the COP of the system without the liquid-vapour regenerative heat exchanger. Assume that the cycle is simple saturated without the regenerative heat exchanger.	(5)

4 a) Draw the T-s and p-h plots of actual vapour compression refrigeration cycle and highlight its differences from a simple vapour compression refrigeration cycle. (5)

   b) With a neat sketch, describe the principle of working of vortex tube refrigeration. (5)

PART B
Answer any three full questions, each carries 10 marks.

5 a) With schematic and T-S diagrams explain the working of cascade vapour compression refrigeration system. (5)

   b) Explain the selection criteria of refrigerants for different applications. (5)

6 a) With the help of schematic and p-h diagrams explain the working of a two stage compression vapour compression refrigeration system with flash inter-cooling. (5)

   b) With the support of a schematic diagram, describe the working of a simple Ammonia-Water vapour absorption refrigeration system. (5)

7 a) How frost formation affects the working of a domestic refrigerator. Describe the working of any frost free refrigerator? (5)

   b) Describe the working of any two types of compressors used in refrigeration systems using neat diagrams. (5)

8 a) With a neat sketch explain the construction and working of an automatic expansion valve. (5)

   b) Explain the principle, working and application of a cooling tower. (5)

PART C
Answer any four full questions, each carries 10 marks.

9 a) Find out the relative humidity, dew point temperature, density and enthalpy of atmospheric air when dry bulb temperature is 35°C and wet bulb temperature is 23°C. Show the properties on a representative psychrometric chart. (5)

   b) What you meant by adiabatic dehumidification process? Show the process on a representative psychrometric chart. (5)

10 a) What is an air washer; show in a representative psychrometric chart the various psychrometric processes that can be performed using an air washer. (5)

   b) An air conditioner is handling 2.5 m³/s of air at 40°C with specific volume of 0.862 m³/kg d.a. Find out the rate at which sensible heat must be added or removed to cool the air to 13°C? (5)

11 a) What are the major factors that influence human comfort? What is the difference between ventilation load and infiltration load in air conditioning? (5)

b) Define the terms (i) room sensible heat factor (RSHF) (ii) room apparatus dew point (Room ADP) and (iii) grand sensible heat factor (GSHF) (iv) Coil apparatus dew point (Coil ADP). Show them on a representative psychrometric chart. (5)

12 a) With a schematic diagram, explain the working of a split air conditioner. (5)

b) Describe the working of any two control devices used in air conditioning systems. (5)

13 a) Give the classification of air conditioning systems. With a schematic diagram describe a winter air conditioning system. (5)

b) What are the various industrial applications of air conditioning? (5)

14 a) Propose an air conditioning system for a small restaurant building. Give schematic illustration of the system. (5)

b) Compare the velocity reduction and equal pressure drop methods for duct designing in air conditioning. (5)

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