Hall Ticket No | | | | | | | | | | | Question Paper Code: AME017

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER

B.Tech VII Semester End Examinations (Regular), December - 2019

Regulations: IARE - R16

REFRIGERATION AND AIR CONDITIONING

(MECHANICAL ENGINEERING)

Time: 3 hours **Max. Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. a) What are the important types of vapour compression cycles? Explain with the help of P-h diagram. [7M]

   b) The capacity of a refrigerator is 200 TR when working between -6^{0}C and 25^{0}C. determine the mass of ice produced per day from water at 25^{0}C. Also find the power required to drive the unit. Assume that the cycle operates on reversed Carnot cycle and latent heat of ice is 335 KJ/Kg.J [7M]

2. a) Distinguish between dry and wet compression. What are the advantages of one over the other? [7M]

   b) A refrigerator using CO_2 as refrigerant works between the temperatures 17.5^{0}C and -17.5^{0}C. The CO_2 leaves the compressor at 30^{0}C. The gas is completely condensed but there is no under cooling. Calculate theoretical COP. [7M]

UNIT – II

3. a) Explain with neat sketch Domestic Electrolux Refrigerator, with the functions of hydrogen, ammonia and water in the three fluid refrigeration system. [7M]

   b) Calculate the COP of vapour absorption refrigeration system has the generator temperature of 80^{0}C, condenser temperature of 25^{0}C and an evaporator temperature of -10^{0}C. [7M]

4. a) Explain the function of liquid-vapour heat exchanger between the generator and absorber and how it can improve the performance of the vapour absorption system. [7M]

   b) A In an absorption refrigeration system heating, cooling and refrigeration takes place at the temperature of 150^{0}C, 30^{0}C and -20^{0}C. Find the theoretical COP of the system; if the heating temperature is increased to 200^{0}C and refrigeration temperature is decreased to - 40^{0}C. Calculate the percentage of change in theoretical COP. [7M]

UNIT – III

5. a) Which component of the vapor compression refrigeration system produces the refrigeration effect? [7M]

   b) Describe the hermetically and semi hermetically sealed compressors, also give their merits and demerits. [7M]

6. a) Describe the working principle of bare tube coil, finned tube coil and plate type evaporators with neat sketches. [7M]

   b) Explain the working of natural convection and forced convection type evaporator, also discuss their merits and demerits. [7M]

UNIT – IV

7. a) Represent the following process in a skeleton psychometric chart. [7M]
   I. Sensible cooling
   II. Cooling and humidification
   III. Adiabatic mixing of air streams.

   b) The sensible heat factor of an air-conditioned room is 0.67. The condition of the air leaving the air-conditioned room is 270C DBT and 52% RH. The maximum permissible temperature difference between the inlet air and outlet air is 110C. If the quantity of air flow at the inlet of the room is 180m3/min, then determine the sensible and latent heat load of air conditioned room. [7M]

8. a) Write any two major requirements of human comfort. Also sketch the process of heating and dehumidification on psychometric chart. [7M]

   b) The atmospheric air at 18^0C DBT and 70% RH is supplied to the heating chamber at the rate of 120 m^3/min. The leaving air has a temperature of 24^0C without change in its moisture contents. Determine the heat added to the air per minute and final RH of the air. [7M]

UNIT – V

9. a) Discuss about the performance of Heat pump when used with the different sources of heat. State the advantages and disadvantages in each case. [7M]

   b) Describe any two methods of humidification of air by atomizing the water into air, with simple line sketches. [7M]

10. a) Explain the following heat pump circuits with a neat sketch Fixed refrigerant circuit design. [7M]

    b) Describe the working of the heat pump by drawing the circuit for Air to water design. [7M]

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COURSE OBJECTIVES:

The course should enable the students to:

I	Understand vapour compression, vapour absorption and air refrigeration systems.
II	Analyze the refrigeration cycles and methods for improving the performance using standard data hand book with p-h charts.
III	Familiarize the components of refrigeration system.
IV	Identify various psychometric properties and processes.

COURSE OUTCOMES (COs):

CO 1	Describe the concept of vapour compression refrigeration, effect of subcooling, super heating, construction of P-H charts.
CO 2	Understand the working of vapor absorption refrigeration, it's components and air refrigeration systems.
CO 3	Understand the functions of various refrigeration components like, compressor, condenser, expansion valve and evaporator.
CO 4	Explore the concept Psychometry, it's properties, RSHF, ESHF, GSHF and concept of human comfort and temperature.
CO 5	Classification of air conditioning equipment and description of heat pumps.

COURSE LEARNING OUTCOMES (CLOs):

Students, who complete the course, will have demonstrated the asking to do the following:

AME017.01	Derive COP of HP, R & HE
AME017.02	Describe the working of Carnot refrigerator and its applications.
AME017.03	Describe the working of vapor compression refrigeration cycle.
AME017.04	Construction of PH charts & Solve the problems.
AME017.05	Classifying and Demonstration of compressors.
AME017.06	Demonstration of working of condensers.
AME017.07	Demonstration of working of evaporators.
AME017.08	Demonstration of Aqua-Ammonia VARS.
AME017.09	Classifying and Demonstration of expansion devices.
AME017.10	Illustration of Li-Br VARS.
AME017.11	Explanation of principle & Demonstration of Electrolux.
AME017.12	Discuss the air refrigeration cycles and its applications.
AME017.13	Discuss the various properties of air.
AME017.14	Draw and Calculate Various sensible heat factors.
AME017.15	Draw & Describe comfort and industrial air conditioning.
AME017.16	Calculate the air conditioning loads.
AME017.17	Classify the equipment of air conditioning.
AME017.18	Describe the importance of filters, grills, registers & Explain the working of fans and blowers.
AME017.19	Discuss the various heat pump sources.
AME017.20	Draw heat pump circuits and Discuss their applications.

MAPPING OF SEMESTER END EXAMINATION (SEE) TO COURSE LEARNING OUTCOMES (CLOs):

SEE Question No		Course Learning Outcomes (CLOs)		Course Outcomes	Bloom's Taxonomy Level
1	a	AME017.04	Construction of PH charts & Solve the problems.	CO 1	Remember
	b	AME017.03	Describe the working of vapor compression refrigeration cycle.	CO 1	Remember
2	a	AME017.04	Construction of PH charts & Solve the problems.	CO 1	Remember
	b	AME017.03	Describe the working of vapor compression refrigeration cycle.	CO 1	Remember
3	a	AME017.05	Classifying and Demonstration of compressors.	CO 2	Remember
	b	AME017.06	Demonstration of working of condensers.	CO 2	Remember
4	a	AME017.06	Demonstration of working of condensers.	CO 2	Understand
	b	AME017.08	Demonstration of Aqua-Ammonia VARS.	CO 2	Understand
5	a	AME017.09	Classifying and Demonstration of expansion devices.	CO 3	Remember
	b	AME017.09	Classifying and Demonstration of expansion devices.	CO 3	Remember
6	a	AME017.10	Illustration of Li-Br VARS.	CO 3	Understand
	b	AME017.11	Explanation of principle & Demonstration of Electrolux.	CO 3	Understand
7	a	AME017.13	Discuss the various properties of air.	CO 4	Understand
	b	AME017.14	Draw and Calculate Various sensible heat factors.	CO 4	Understand
8	a	AME017.15	Draw & Describe comfort and industrial air conditioning.	CO 4	Understand
	b	AME017.16	Calculate the air conditioning loads.	CO 4	Understand
9	a	AME017.17	Classify the equipment of air conditioning.	CO 5	Understand
	b	AME017.18	Describe the importance of filters, grills, registers & Explain the working of fans and blowers.	CO 5	Understand
10	a	AME017.17	Classify the equipment of air conditioning.	CO 5	Remember
	b	AME017.18	Describe the importance of filters, grills, registers & Explain the working of fans and blowers.	CO 5	Remember

Signature of Course Coordinator **HOD, MECHANICAL ENGINEERING**