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)	Draw the p-h, T-S diagrams for the processes of sub cooling with dry compression and sub cooling with dry compression.	[7M]
	b)	An ammonia refrigerator works between - 6.70C and 260C. The vapour leaves the compressor in dry and saturated condition. Assuming there is no under cooling; calculate the theoretical COP of the system.	[7M]
2.	a)	Explain the procedure to detect whether a refrigerant is charged, under charged or over charged.	[7M]
	b)	A refrigeration system works on ammonia between pressure limits, 2.36 bar and 15.54 bar. If the refrigerant is sub cooled by 10k before throttling, determine the improvement in COP over simple vapor compression cycle.	[7M]

UNIT – II

3.	a)	What are the different refrigerant - absorbent working pairs and what is the effect of evaporator temperature on performance of absorption systems.	[7M]
	b)	A Bell - Coleman cycle works between 1 and 6 bar pressure limits. The compression and expansion indices are 1.25 and 1.3 respectively. Obtain COP and tonnage of the unit for an airflow rate of 0.5 kg/s. Neglect clearance volume and take temperature at the beginning of compression and expansion to be 70C and 370C, respectively.	[7M]
4.	a)	Explain the principle and working of steam jet refrigeration system and the function of steam ejector with a neat sketch.	[7M]
	b)	A In an absorption refrigeration system heating, cooling and refrigeration takes place at the temperature of 12^0C, 40^0C and -10^0C. Find the theoretical COP of the system; if the heating temperature is increased to 200^0C and refrigeration temperature is decreased to - 30^0C. Calculate the percentage of change in theoretical COP.	[7M]

UNIT – III

5. a) During which component of the VCR system, the enthalpy of the refrigerant remains constant? [7M]
   b) Discuss the advantages and disadvantages of centrifugal compressors over reciprocating compressors. [7M]

6. a) A capillary tube is used in a small refrigerator to serve the purpose of which component of the refrigerating system? [7M]
   b) Discuss the advantages and disadvantages of centrifugal compressors over reciprocating compressors. [7M]

UNIT – IV

7. a) Represent the following process in a skeleton psychometric chart. [7M]
      I. Sensible heating
      II. Heating and dehumidification
      III. Fog region.
   b) Ten grams of moisture per kg of dry air is removed from atmospheric air when it is passed through an air conditioning system and its temperature becomes 200C. The atmospheric conditions are 400C DBT and 60% RH. Calculate the following for the conditioned air. i. Relative humidity, ii. Wet-bulb temperature, iii. Dew point temperature, iv. Enthalpy change for the air. Assume standard atmospheric pressure. [7M]

8. a) Derive the expression for the following: i. Specific humidity, ii.Relative humidity and iii. Vapor density [7M]
   b) 800 m3/min. of recirculated air at 220C DBT and 100C DPT is to be mixed with 300 m3/min. of fresh air at 300C DBT and 50% RH. Determine the enthalpy, specific volume, humidity ratio and DPT of the mixture. [7M]

UNIT – V

9. a) Describe any two methods of humidification of air by atomizing the water into air, with simple line sketches. [7M]
   b) Which type of air cleaner would be selected for removing very small dirt particles and smoke from the air? Explain its working principle. [7M]

10. a) What are the advantages and disadvantages of spray type dehumidifier over coil type dehumidifier? [7M]
    b) With the help of a diagram, explain the Air washer humidifier and state the advantages of this type. [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**