Sub Code:NAG503

Paper Id: 910151 Roll No: | | | | | | | | | | | | | |

B. TECH
(SEM-V) THEORY EXAMINATION 2019-20
REFRIGERATION AND AIR CONDITIONING

Time: 3 Hours *Total Marks: 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

a.	Define refrigeration effect?
b.	Define refrigerator and heat pump?
c.	What are the systems by which mechanical refrigeration can be accomplished?
d.	What is the importance of refrigeration?
e.	Give the classification of Aircraft Refrigeration Systems.
f.	Define the role of humidity and air motion for storage conditions.
g.	Define the role of flash chamber in vapour compression refrigeration system.
h.	Define the following terms: DBT,WBT, DPT.
i.	Describe the three major ways of classifying Air conditioning systems.
j.	In absorption system, which components replace the compressor of the compression system?

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

a.	Describe a cold storage in brief. What is the importance of storage period and preservation conditions in the design of a cold storage?
b.	Explain the vortex tube refrigeration systems.
c.	On a particular day, the atmospheric air at a pressure of 1.0132 bar, was found to have a DBT of 35®C and relative humidity of 65%. Using steam table only , calculate : The partial pressure of water vapor and air in the moist air , specific humidity , degree of saturation , and the dew point temperature
d.	The condenser and evaporator temperature of a 20 T capacity, simple saturated vapour compression refrigeration system, are 40^0C and -20^0C respectively. The refrigerant used in the system is R-22. Draw the cycle on P-h diagram (assuming isentropic expansion) and calculate (i) the mass of refrigerant to be circulated. (ii) Power required in the compressor and (iii) the COP of the cycle. If the system employees 5^0C sub cooling of refrigerant liquid and a superheating of 10^0C of refrigerant vapour, what will be the new COP of the cycle? Whether it will increase or decrease?
e.	What do you understand by food preservation? State the factors which contribute to food spoilage. How is pasteurization achieved?

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

(a)	Air at 10^0 C DBT and 90% RH is to be brought to 35 ^{0} C DBT and 22.5^0 C WBT with the help of winter air conditioner. If the humidified air comes out of the humidifier at 90% RH, draw the various processes involved on a skeleton psychrometric chart and find: 1. The temperature to which the air should be preheated and, 2. The efficiency of the air washer.
(b)	What is multi-stage vapour compression refrigeration system? Compare it with cascade refrigeration system. Explain advantages and disadvantages over simple vapour compression system

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4. Attempt any *one* part of the following: 10x 1 = 10

(a)	What is the importance of refrigeration and what are the different methods of producing refrigeration? Also define COP and unit of refrigeration.
(b)	Enlist the desirable properties of refrigerant. Name some common refrigerant generally used in refrigeration system.

5. Attempt any *one* part of the following: 10 x 1 = 10

(a)	What is a required secondary refrigerant? Where is it used? Discuss the substitute for chlorofluorocarbon.
(b)	Explain the reverse Carnot cycle.

6. Attempt any *one* part of the following: 10 x 1 = 10

(a)	Draw a neat labeled sketch of a Practical Vapour Absorption refrigeration cycle and explain its working in brief.
(b)	Define the terms: i. Dew point temperature ii. Specific humidity iii. Relative humidity iv. Degree of saturation

7. Attempt any *one* part of the following: 10 x 1 = 10

(a)	Explain the dynamic losses in ducts and how it's different from pressure loss due to friction.
(b)	Define enthalpy concentration diagram for adiabatic mixing. One kg per min of saturated ammonia vapor with concentration equal to 1 i.e. c=1 at 2 bar is mixed with 10 kg per min of saturated liquid ammonia at 2 bar and 40^0 C. The final desired mixture is to be saturated liquid at 2 bar, Determine: i. The concentration, enthalpy of the mixture state ii. The removal of heat during mixing process in kJ/min.