Date: 20-12-2023

Birla Institute of Technology & Science

Refrigeration and Air-conditioning, ME F461, Compre. Exam

(Closed book exam: Only Thermodynamics Tables and Calculator are allowed)

Part A

Time: 45 Minutes **Marks: 30**

Name: **ID No.:**

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1. Define Absolute humidity or Humidity ratio and provide an equation with pressures.

[4M]

2. Define Relative humidity and provide an equation in terms of absolute humidity and pressures. **[4M]**

3. An air stream at a flow rate of 1 kg/s and a DBT of 30^{o}C mixes adiabatically with another air stream flowing with a mass flow rate of 2 kg/s and at a DBT of 15^{o}C. Assuming no condensation to take place, the temperature of the mixture is approximately equal to:

[3M]

a) 20^{o}C b) 22.5^{o}C c) 25^{o}C d) Cannot be found:

4. Which of the following statements are TRUE?

[3M]

a) A refrigerant having high critical temperature yields high COP and high volumetric capacity

b) A refrigerant having high critical temperature yields low COP and high volumetric capacity
c) A refrigerant having high critical temperature yields low COP and low volumetric capacity
d) A refrigerant having high critical temperature yields high COP and low volumetric capacity

4. Which of the following statements are TRUE? **[2M]**

a) Compared to water cooled condensers, the maintenance cost is low in air cooled condensers
b) Normally, systems with water cooled condensers operate at lower condensing temperature as compared to systems with air cooled condensers
c) The initial cost of water cooled condenser is high compared to air cooled condenser
d) All of the above

5. Presence of water vapour in the refrigerant circuit of a NH3-H2O system: **[2M]**

a) Decreases evaporator temperature
b) Increases evaporator temperature
c) Increases circulation ratio
d) Leads to non-isothermal heat transfer in evaporator and condenser

6. Thermal design of evaporators is very complex due to: **[2M]**

a) Continuous variation of heat transfer coefficient along the length
b) Possibility of latent heat transfer on the external fluid side also
c) Presence of lubricating oil affects heat transfer and pressure drop
d) All of the above

7. Which of the following statements are TRUE? **[2M]**
a) The metabolic rate depends mainly on age of the human being
b) The metabolic rate depends mainly on the activity level of the human being
c) The metabolic rate depends mainly on the sex of the human being
d) All of the above

8. Which of the following statements are TRUE? [**2M]**

a) To maintain thermal comfort, the DBT of air should be increased as its moisture content increases
b) To maintain thermal comfort, the DBT of air should be decreased as air velocity increases
c) To maintain thermal comfort, the DBT of air should be increased as the temperature of the surrounding surfaces decrease
d) All of the above

9. Which of the following statements are TRUE?: **[2M]**

a) The sol-air temperature depends on indoor and outdoor temperatures
b) The sol-air temperature depends on outdoor temperature and incident solar radiation
c) The sol-air temperature depends on outdoor temperature, incident solar radiation
d) The sol-air temperature depends on outdoor temperature, incident solar radiation, surface properties of the wall and the external heat transfer efficient

10. Even though outside temperatures are very low at high altitudes cooling is required:

[2M]

a) Large internal heat gains due to occupants, equipment etc.
b) Heat generation due to skin friction caused by fast moving aircraft.
c) Solar radiation.
d) All the above

11. State which of the following statements are TRUE with respect to duct design?

[2M]

a) If not done properly, the velocity method gives rise to large sized ducts
b) In equal friction method, dampering is not required
c) In static regain method, dampering is required
d) All of the above