

GUJARAT TECHNOLOGICAL UNIVERSITY
BE – SEMESTER – VIII EXAMINATION – WINTER 2016

Subject Code: 181901**Date: 22/10/2016****Subject Name: Refrigeration And Air-conditioning****Time: 02:30 PM to 05:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of Refrigeration Air-Conditioning charts and Steam tables is permitted

Q.1 (a) Explain the effect of subcooling and superheating on saturated vapour compression cycle with necessary diagram. **07**

(b) A heat pump uses R134_a refrigerant and operates between temperatures of 15°C and 50°C. The heat required to be pumped out is 100MJ/h. Calculate the following: 1. Dryness fraction of refrigerant of refrigerant entering the evaporator 2. Discharge temperature and 3. COP. **07**

Use following properties of refrigerant:

Specific volume of refrigerant vapour at 15°C 0.04185m³/kg

Saturation Temperature °C	Pressure bar	Enthalpy of liquid kJ/kg	Enthalpy of vapour kJ/kg	Specific entropy of liquid kJ/kg K	Specific entropy of vapour kJ/kg K
15	4.887	220.26	413.6	1.0729	1.7439
50	13.18	271.97	430.4	1.2410	1.7312

Q.2 (a) A simple air cooled system is used for an airplane having 10 TR of air conditioning system. The atmospheric pressure is 0.9 bar and temperature is 10°C. Pressure is increased to 1.013 bar due to ramming. Air is further compressed up to 3.5 bar in compressor. The temperature of air is reduced by 50°C while passing through heat exchanger. The aircraft is maintained at 1.01 bar and 25°C. Calculate power required to take load of air conditioning system and COP of the system. Assume isentropic compression and expansion process. **07**

(b) A dairy requires storage of three different commodities at different temperatures. Suggest suitable vapour compression refrigeration system with schematic and p-h diagram. **07**

OR

(b) State working principle of vapour absorption refrigeration system. Explain any one in detail. **07**

Q.3 (a) What is flash gas removal? How it is helpful in vapour compression refrigeration system? **07**

(b) Calculate power required to compress 20kg/min of Ammonia from saturated vapour at 1.4 bar to a condenser pressure of 10 bar by two stage compression with intercooling at 4 bar. Compare the power requirement with single stage compression without intercooling. **07**

OR

Q.3 (a) Sketch and explain automatic expansion valve and name other expansion devices. **07**

(b) Explain steam jet refrigeration system and mention its applications. **07**

Q.4 (a) Make a list of types of load to be considered in design of air conditioning **07**

- system. Sketch central air conditioning system.
- (b) Following readings are available from psychrometer: **07**
 Dry bulb temperature 30°C, Wet bulb temperature 20°C, Barometer reading 740 mm of Hg
 Using steam table calculate the following:
1. Dew point temperature
 2. Relative humidity
 3. Specific humidity
 4. Degree of saturation
 5. Vapour density
 6. Enthalpy of mixture per kg of dry air
- OR**
- Q.4 (a)** Define following term related to psychrometry **07**
1. Wet bulb temperature
 2. Dry bulb temperature
 3. Relative humidity
 4. Specific humidity
 5. Dew point temperature
 6. Apparatus dew point temperature
 7. Sensible heat factor
- (b) A room has sensible heat gain of 24kW and latent heat gain of 5.2 kW and it has to be maintained at 26°C DBT and 50% RH. If 180m³/min of air is supplied to the room, calculate the supply air condition. **07**
- Q.5 (a)** Define following terms for fan **07**
1. Fan total power
 2. Fan air power
 3. Fan total efficiency
- (b) A duct of 15m length passes air at the rate of 90m³/min. Assuming friction factor of 0.005, calculate pressure drop from the square duct. Size of duct is 0.3m. Name the material commonly used for making of duct. **07**
- OR**
- Q.5 (a)** Name some important thermal properties of refrigerant. **07**
 Give names of following refrigerants:
1. R12
 2. R11
 3. R717
- (b) Explain working of hermetically sealed reciprocating compressor **07**
