

Total No. of Questions : 10]

SEAT No. :

**P3877**

**[5561]-532**

[Total No. of Pages : 3

**B.E. (Mechanical)**

**REFRIGERATION AND AIR-CONDITIONING**  
**(2015 Course) (Semester-I) (302049)**

*Time : 2½ Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) *Answer three questions out of 6.*
- 2) *Solve Q1 or 2, Q3 or 4, Q5 or 6.*
- 3) *All the three questions should be solved in one answer book and attach extra supplements if required.*
- 4) *Draw Diagrams wherever necessary.*
- 5) *Use of steam table and scientific calculator is allowed.*
- 6) *Assume suitable data wherever necessary.*

**Q1) a)** State desirable properties of refrigerants. **[5]**

b) Write a short note on “Concept of Cold chain”. **[5]**

OR

**Q2)** An ammonia refrigeration machine operated between the temperature limits - 15°C and 30°C. The machine circulates 4.5 kg/min. There is no undercooling. The temperature after is entropic compression is 75°C. Determine **[10]**

- i) COP
- ii) ice produced in kg/hr from water at 20°C and ice at -5°C
- iii) Quality of refrigerant entering the compressor.

Assume  $C_{pv} = 2.85$  kJ/kg/K for ammonia.  $C_p$  of ice = 2.1 kJ/kgK. Also find displacement volume required for compressor in m<sup>3</sup>/min.

Ts(°C)	$h_f$ (kJ/kg)	$h_g$ (kJ/kg)	$S_f$ (kJ/kgK)	$S_g$ (kJ/kgK)	$v_f$ (m <sup>3</sup> /kg)	$v_g$ (m <sup>3</sup> /kg)
-15	112.3	1426	457	5.549	0.00152	0.509
30	323.1	1469	1.204	4.984	0.00158	0.111

**P.T.O.**

**Q3) a)** Explain the working of simple vapour absorption system. **[5]**

b) Explain the need of multipressure systems. **[5]**

OR

**Q4)** Explain single compressor with multiple evaporator and multiple expansion valves system with ph- and Ts diagram. **[10]**

**Q5) a)** Describe the process of adiabatic mixing of two streams of air. **[6]**

b) Explain the term **[10]**

i) relative humidity

ii) specific humidity,

iii) absolute humidity

iv) degree of saturation

v) dew-point temperature

OR

**Q6) a)** In a laboratory test a psychrometer recorded 36°C DBT and 30°C WBT calculate **[12]**

i) vapor pressure

ii) relative humidity

iii) specific humidity

iv) degree of saturation

v) dew point temperature

vi) enthalpy of the mixture.

b) Explain “Thermodynamics of human body” **[4]**

- Q7) a)** Explain all water air-conditioning system with neat sketch. [8]  
**b)** Explain the construction working of DX-type evaporator. [8]

OR

- Q8) a)** Discuss classification of air-conditioning. [4]  
**b)** Explain construction working of electronic expansion valve. [6]  
**c)** Explain construction working of scroll compressors. [6]

- Q9) a)** A circular duct of 250 mm is selected to carry air in an air conditioned space at a velocity of 240m/min to keep the noise at desired level. If this duct is to be replaced by rectangular duct of aspect ratio of 1.4, find the size of the duct for equal friction method when [12]

- i) Velocity of air in two ducts is same and  
ii) Discharge of air in two ducts is same if  $f = 0.015$ , find pressure loss per 100m length of duct. Take air density as  $1.15 \text{ kg/m}^3$ .

- b)** What are the desirable properties of ideal duct materials? [6]

OR

- Q10) a)** Write a note on classification of duct and explain air flow through simple duct system. [10]

- b)** Explain Equal Friction Method of Duct Design. List its advantages and disadvantages. [8]

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