C 41682

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Name .....

Reg. No .....

EIGHTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, APRIL 2013

ME 09 801—REFRIGERATION AND AIR CONDITIONING

(2009 Admissions)

Time : Three Hours

Maximum : 70 Marks

Part A

Short Answer Questions. (One / two sentence)
All questions are compulsory.

1. Define a ton of refrigeration.
2. Why is it necessary to pressurize the cabin in case of air refrigeration system ?
3. What are the parts of a simple vapour compression refrigeration system ?
4. What is dew point temperature ?
5. What is the function of a shaft seal in a refrigerant compressor ?

(5 × 2 = 10 marks)

Part B

Analytical / Problem solving questions.
Answer **four** *out of six.*

6. "The COP of an air refrigeration cycle is very low, but still air refrigeration system is most common in aircraft", discuss the statement.
7. With a neat sketch, explain the working of vortex tube refrigeration system.
8. With the help of a Psychrometric chart explain adiabatic heating and dehumidification process.
9. What is Bypass factor ? Explain its usefulness.
10. What are the factor to be considered while selecting the condenser for a refrigeration system ?
11. Explain why a reciprocating compressor cannot be used as a vacuum pump for producing high vacuum.

(4 × 5 = 20 marks)

Part C

Descriptive / Analytical / Problem Solving Questions.
All questions are compulsory.

MODULE I

12. (a) The cockpit of a jet plane flying at a speed of 1200 km/hr. is to be cooled by a simple air cooling system. The cockpit is to be maintained at 25°C and pressure in the cockpit is 1 bar. The ambient air pressure and temperature are 0.85 bar and 35°C respectively. The other data available is as follows :

Cockpit cooling load = 10 TR.

Main Compressor pressure ratio = 4.

Temperature of air leaving heat exchanger and entering cooling turbine = 60°C.

Pressure drop in heat exchanger = 0.5 bar.

Pressure loss between cockpit and cooling turbine = 0.2 bar.

Assuming isentropic efficiencies of main air compressor and cooler turbine as 80 %, find quantity of air passing through the cooling turbine and COP of the system.

Or

12. (a) With neat sketch, explain the working of steam jet refrigeration system.

MODULE II

13. (a) Briefly explain Lithium Bromide absorption system.

Or

(b) An ammonia vapour compression refrigerating machine works between 25°C and – 20°C. The ammonia leaves the compressor in dry and saturated condition. Liquid ammonia is under cooled to 21.5°C, before passing through throttle valve. The average specific heat of liquid ammonia is 4.75 kJ/kg-°C.

Find the theoretical COP of the machine. The following properties of NH_3 are given.

Temperatures °C	*Liquid*		*Vapour*	
	h_f (kJ/kg.)	s_f (kJ/kg-k)	h_f (kJ/kg.)	s_f (kJ/kg-k)
25	537.6	4.612	1708.5	8.534
– 20	328.4	3.854	1661.0	9.118

If the net refrigeration required is 400×10^3 kJ/hr. find the mass of ammonia circulated/min. Assume relative COP is 75 % of theoretical COP.

MODULE III

14. (a) One kg. of air at 40°C DBT and 50 % R.H. is mixed with two kg. of air at 20°C DBT and 12°C dew-point temperature. Calculate the temperature and specific humidity of the mixture.

Or

(b) With neat sketch explain summer air conditioning system.

MODULE IV

15. (a) Explain the construction and working of thermostatic expansion valve.

Or

(b) Briefly explain different types of rotary compressors.

(4 × 10 = 40 marks)