Code No.: 6343

FACULTY OF ENGINEERING

B.E. (III/IV Year) (Mech / Prod) II Semester (Main) Examination, June 2010

REFRIGERATION AND AIR CONDITIONING

Time : 3 Hours] [Max. Marks : 75

Note: *Use of psychometric charts, Refrigeration Tables, steam tables permitted.*

Part A – (25 Marks)

1. Define C.O.P; State its expressions for reversed Carnot cycle for i) refrigerating machine, ii) Heat pump and iii) Heat engine?
2. Draw temperature–entropy diagram and configuration diagram for simple cooling air craft refrigeration system?
3. Why it is not possible to attain low temperatures with simple vapor compression cycle?
4. Draw configuration diagram of two stage cascade refrigeration system?
5. Draw the configuration diagram of simple vapor Ammonia absorption system?
6. What are the properties of thermo electric materials?
7. Draw psychrometric process for winter air conditioning?
8. Define Metabolism?
9. State the applications of refrigeration in food industry?
10. Mention any two different types of filters with neat sketches?

Part B – (5 × 10 = 50 Marks)

11. The upper limit of pressure is 5.2 bars. The pressure and temperature at the start of compression is 1 bar and 288°K. The compressed air cooled at constant pressure to a temperature of 314°K enters the expansion cylinder, calculate i) COP, ii) Quantity of air in circulation per minute iii) Power required to run the unit and iv) Piston displacement and bore for compressor and expander and if unit runs at 240 rpm, stroke length is 200 mm, assume double acting and n=1.4, Cp=1.003kJ/kg–K. 10

12. A simple vapor compression refrigerator uses R12 as refrigerant and operates between the temperature limits of 10°C and - 15°C respectively. At entry to the compressor, the refrigerant is dry saturated and after compression it acquires a temperature 15°C. Find C.O.P of the system if the liquid is cooled by 5°C before expansion by throttling. Use the following table for the properties of the refrigerant. 10

[P.T.O.

Temperature (°C)	Enthalpy in kJ/kg		Specific entropy in k J/kg–K	
	Liquid	Vapor	Liquid	Vapor
10	45.4	191.76	0.1750	0.6921
–15	22.3	180.88	0.0904	0.7051

13. a) Show that COP of an ideal vapor absorption refrigeration system is a function of COP of Carnot refrigerator and efficiency of Carnot engine. 5

    b) Explain the working principle of Electrolux refrigeration system with the help of configuration diagram. 5

14. a) Draw psychrometric chart for summer air conditioning process. 5

    b) State and explain the requirements of comfort air conditioning. 5

15. An air-conditioned auditorium is to be maintained at 27°C DBT and 60% RH. The ambient condition is 40°C DBT and 30°C WBT. The total sensible heat load is 100 000 kJ/h and total latent heat load is 40 000 kJ/h. 60% of the return air is re–circulated and mixed with 40% of make up air after cooling coil. The condition of air leaving the cooling coil is at 18°C. Determine i) RSHF, ii) the condition of air entering the auditorium, iii) The amount of make–up air, iv) ADP and v) BPF of cooling coil. 10

16. a) What are the applications of cryogenics? 5

    b) Write short notes on thermodynamics of human body. 5

17. a) Explain the classification of air conditioning system depending on season with neat sketches. 6

    b) State the effect of condensing pressure and evaporating pressure on the performance of refrigeration cycle. 4