

Seat No.	
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B.E. (Mechanical) (Part-IV) (Semester-VII) (Revised) (New)

Examination, November - 2016

REFRIGERATION AND AIR CONDITIONING

Sub. Code :67501

Day and Date : Tuesday, 15- 11 - 2016

Total Marks : 100

Time : 2.30 p.m. to 5.30 p.m.

- Instructions :
- 1) Attempt all questions.
 - 2) Figures to the right indicate full marks.
 - 3) Use same answer book.
 - 4) Neat diagram must be drawn.
 - 5) Use of steam table, refrigerant property table/ chart & psychrometric charts are allowed.
 - 6) Make Suitable assumptions if required.

Q1) Attempt any two.

- a) Explain Bell-Coleman Air cycle with help of block diagram. Derive the expression for COP and represent the cycle on T-S plot. [8]
- b) Discuss the main differences between Reversed Carnot cycle operating on perfect gas and wet vapour with help of T-S plot. [8]
- c) i) A Carnot refrigerator requires 1.25kW per ton of refrigeration to maintain a region at low temperature of -40°C . Determine C.O.P. and heat rejected in kJ/min. [4]
- ii) Give the comparison between Heat Engine, Heat pump and Refrigerator. [4]

Q2) Attempt any two.

- a) Discuss the effects of operating conditions on the performance of vapour compression refrigeration system. [8]
- b) Write a note on
 - i) Applications of cryogenics. [4]
 - ii) Actual vapour compression refrigeration. [4]

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- c) An ammonia refrigerating machine works between condenser temperature of 40°C and evaporator temperature of -10°C . Determine theoretical piston displacement per ton of refrigeration and C.O.P for following cases.
- Dry and saturated refrigerant vapour at the beginning of the compression
 - Super heated vapour by 5°C at the beginning of the compression.
- Assume isentropic compression and no subcooling for both cases. C_p of NH_3 vapour = $2.8 \text{ kJ/kg-}^{\circ}\text{C}$. [8]

Q3) Attempt any two.

- ASHRAE classification of refrigerants. Suggest alternative refrigerants for environmental protection and justify your suggestion. [9]
- Explain in detail safety devices used in refrigeration system and sketch any one of them. [9]
- Explain how following equipment are selected for a system. [9]
 - Compressor
 - Condenser
 - Evaporator

Q4) Solve any two.

- With standard notation derive the relation between specific humidity and partial pressures of dry air and water vapour. [5]
 - Show Enthalpy deviation curves on psychrometric chart. [3]
- Moist air at 1.013 bar has DBT = 25°C , WBT = 20°C , $P_v = 2.01 \text{ kN/m}^2$. Use equations and calculate specific humidity, Relative humidity, specific enthalpy of moist air and dew point temperature from steam table. Use psychrometric table only. [8]
- With neat sketch, briefly explain adiabatic mixing of two air streams. Write only governing equations for enthalpy, mass of air, mass of water vapour. [8]

Q5) Solve any two.

- Write only governing equations and represent on hand drawn psychrometric chart for B.F, contact factor, A.D.P and coil capacity. Also draw RSHE, GSHF and ESHF lines. [9]

- b) Air at 15.9°C DBT and 95% RH is heated and humidified to 30.5°C DBT and 55% RH. The processes are sensible heating, air washer with recirculated water spray till R.H rises to 95% and then sensible heating. Find makeup water quantity, heating required and humidifying efficiency of air washer. [9]
- c) Draw only neat sketch of comfort chart giving numerical values. Show all year round zone .Write the factors affecting effective temperature.[9]

Q6) Solve any two.

- a) Write a note on sources of heat load for air conditioning unit briefly, suitable for all seasons. [8]
- b) Write a note on duct sizing using friction loss chart, Conversion chart for circular to rectangular ducts and aspect ratio. [8]
- c) Write short notes on- types and use of grilles and diffusers. Also give their locations and factors governing selection. [8]

