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SUBJECT CODE NO:- E-79
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(Mech) Examination Nov/Dec 2017
Refrigeration and Air Conditioning
(REVISED)

[Time: 3:00 Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

- 1) Solve three questions from each section.
- 2) Figure to the right indicate full marks.
- 3) Use of refrigerant table, steam tables & psychometric chart is allowed.

Section A

- Q.1 a) Explain simple vapour compression refrigeration system. 06
- b) Explain effect of suction pressure and discharge pressure on simple vapour compression cycle. 07
- Q.2 a) Two refrigerators A and B operate in series. The refrigerator A absorbs energy at the rate of 1KJ/S from a body at temperature 300K and rejects energy as heat to a body at temperature T. The refrigerator B absorbs the same quantity of energy which is rejected by the refrigerator A from the body at temperature T, and rejects energy as heat to a body at temperature 1000K. If both the refrigerators have the same c.o.p calculate. 07
- i) The temperature T of the body.
 - ii) The c.o.p of the refrigerators
 - iii) The rate at which energy is rejected as heat to the body at 1000k.
- b) 500kgs of fruits are supplied to a cold storage at 20⁰c. The cold storage is maintained at -5⁰c and the fruits get cooled to the storage temperature in 10hr. The latent heat of freezing is 105 KJ/ kg & specific heat of fruit is 1.256 kJ/ kg. k . find the refrigeration capacity of the plant. 06

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Q.3 In a 15 TR ammonia plant, compression is carried out in two stages with water & flash intercooling & water subcooling. The particulars of the plant are as follows: 13

Condenser pressure =12 bar,

Evaporator pressure =3 bar,

Flash intercooler pressure=6 bar

Limiting temperature for intercooler and sub-cooling =20⁰c.

Draw p-h chart & estimate,

- i) The c.o.p of the plant
- ii) The power required to drive the compressor.
- iii) The swept volume for each compressor if the volumetric efficiency of both the compressor is 80%.

Q.4 An aircraft refrigeration plant has to handle a cabin load of 30 tonnes. The atmospheric temperature is 17⁰c. The atmospheric air is compressed to a pressure of 0.95 bar & temperature of 30⁰c due to ram action. This air is then further compressed in a compressor to 4.75 bar, cooled in a heat exchanger to 67⁰ c, expanded in turbine to 1 bar pressure & supplied to the cabin. The air leaves the cabin at a temperature of 27⁰ c. The isentropic efficiencies of both compressor & turbine are 0.9 . calculate the mass of air circulated per minute & the c.o.p. 13

For air $c_p = 1.004 \text{ KJ/Kg. k}$

$C_p/c_v = 1.4$

Q.5 Short note on the following (any three) 14

- i) Bell-coleman cycle
- ii) DART
- iii) Cascade refrigeration system
- iv) Two stage compression with water intercooler & liquid sub-cooler.
- v) Two-stage compression with liquid intercooler.

Section :B

Q.6 a) Explain lithium Bromide vapour absorption refrigeration system. 07

b) Practical vapour absorption refrigeration system. 06

- Q.7 a) What is refrigerant? Describe classification of refrigerant. 06
b) Explain the procedure for designations of refrigerant? With some examples. 07

- Q.8 a) Atmosphere air was found to have a dry bulb temp. of 30°C & a WBT = 18°C . The barometric pressure was observed to be 856 mm of Hg. Using steam table. Determine the relative humidity, the specific humidity, the dew point temp, enthalpy & volume. 07
b) Explain By-pass factor of Heating coil. 06

- Q.9 A conference room of 60 seating capacity is to be air –conditioned for comfort conditions of 22°C dry bulb temperature & 55% relative humidity. The out door condⁿ are 32°C dry bulb temp. And 22°C wet bulb temperature The quantity of air supplied is $0.5\text{ m}^3/\text{min}$ per person. The comfort conditions are achieved first by chemical dehumidification & by cooling coil. 13

Determine:

- i) Dry bulb temp. of air at exit of dehumidifier.
- ii) Capacity of dehumidifier,
- iii) Capacity & surface temp. of cooling coil, if the by-pass factor is 0.30.

- Q.10 Write short note on the following. (Any three) 14
- i) Ice plant
 - ii) Stem jet air conditioning system.
 - iii) Human comfort
 - iv) Domestic refrigerator
 - v) GWP & ODP