B.TECH SEM – VI (2007 COURSE) (MECHANICAL ENGG.) :
WINTER - 2017

SUBJECT: REFRIGERATION & AIR- CONDITIONING

Day: **Monday** Time: **10.00 AM TO 01.00 PM**
Date: **20/11/2017** **W-2017-2524** Max Marks: 80

N.B:

1) **Q. No. 1** and **Q. No 5** are **COMPULSORY.** Out of remaining questions Attempt **ANY TWO** questions from each section.
2) Answers to both the sections should be written in the **SEPARATE** Answer books.
3) Use of non- programmable **CALCULATOR** is allowed.
4) Use of psychometric chart and steam table is allowed.
5) Figures to the right indicate **FULL** marks.
6) Assume suitable data if necessary.

SECTION-I

Q.1 a) Differentiate between Heat pump, refrigeration I.C. Engine. **(04)**

b) Explain secondary refrigerant. **(05)**

c) Explain with neat sketch thermoelectric refrigeration system. **(05)**

Q.2 a) Explain effects of following parameters on COP of refrigeration cycle. **(06)**

- **i)** Superheating
- **ii)** Undercooling
- **iii)** Suction pressure
- **iv)** Discharge pressure

b) Find the theoretical COP for a CO_2 machine working between the temperature range of 25^0 c & 5^0 c. The dryness fraction of CO_2 gas during the suction stroke is 0.6 following properties of CO_2 are given: **(07)**

Temp 0C	Liquid		Vapour		Latent Heat
	Enthalpy KJ/kg	Entropy KJ/kgK	Enthalpy KJ/kg	Entropy KJ/kgK	KJ/kg
25	164	0.59	282.2	0.99	117
-5	72	0.28	321.1	1.21	248

Q.3 a) Explain Bell- coleman cycle with neat sketch. **(07)**

b) A cold storage is to be maintained at 6^0c., while the surroundings are at 36^0 c. The heat leakage from the surroundings into the cold storage is estimated to be 30kw.The actual COP of the refrigeration plant is one- fourth of an ideal plant working between the same temperatures. Find the power required to drive the plant. **(06)**

Q.4 a) Explain Li- Br vapor absorption system with neat sketch.

b) Draw the block diagrams & p-h diagrams of the followings.

- **i)** Cascade system
- **ii)** Three stage compression with flash chamber
- **iii)** Multiple evaporate , at the different temperatures with single compressor individual expansion value & back pressure valves

P.T.O

SECTION-II

Q.5 Write short notes on **ANY THREE** of the following: **(14)**

a) Mobile refrigeration
b) Duct design methods
c) Mixing of two air streams
d) Humidification & Dehumidification
e) Central air conditioning plant

Q.6 **a)** Explain with neat sketch thermostatic expression valve. **(05)**

b) Give the classification of compressors& explain any one with neat sketch. **(04)**

c) Explain & define SHF, RSHF, and ERSHF. **(04)**

Q.7 **a)** Explain sensible cooling, heating process and chemical dehumidification with neat sketch. **(07)**

b) The atmospheric air at 760 mm of Hg, dry bulb temperature 15^0c & wet bulb temperature 11^0c enter's a heating coil, whose temperature is 40^0c. Assuming by-pass factor of heating coil as 0.5, determine dry bulb temperature, wet bulb temperature & relative humidity of the air leaving the coil. Also determine the sensible heat added to the per kg of dry air. **(06)**

Q.8 **a)** Derive the expression for equivalent diameter of a duct for a rectangular duct. **(06)**

b) Explain friction losses in ducts. **(04)**

c) Explain the applications of air conditioning in different industries. **(03)**

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