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B.E SEMESTER 7th EXAMINATION (NOVEMBER / 2015)

SUBJECT CODE: ME-702
SUBJECT NAME: REFRIGERATION AND AIR-CONDITIONING
DATE: 24/11/2015 **TIME: 10:30 am to 1:30 pm** **TOTAL MARKS: 70**

Instruction:

1. Answer each section in separate Answer Sheet.
2. Use of calculator, Psychrometric chart and p-h chart is permissible.
3. All questions are compulsory.
4. Indicate **clearly**, the options you attempted along with its respective question number.
5. Use the last page of main supplementary for rough work.

SECTION-I

Que:1 (A) Explain the working of vapour compression refrigeration system with the help of T-S and P-H diagram. **[5]**

(B) Compare vapour compression refrigeration system with vapour absorption refrigeration. **[5]**

(C) Mention the limitations of Simple vapour compression refrigeration cycle. Briefly explain the working of Two stage compression with water intercooler and liquid sub-cooler employed for vapour compression system. **[5]**

OR

(C) What are desirable characteristics of ideal refrigerant? Explain how refrigerants are designated. **[5]**

Que:2 (A) Explain with neat sketch "Li – Br refrigeration system". **[5]**

(B) A Derive equation of COP for Bell-Coleman Air-refrigerator show different processes on P-V and T-S Diagram. **[5]**

OR

(A) State main applications of Refrigeration. Explain Ice making plant with a suitable diagram. **[5]**

(B) Describe Boot-strap cycle of air refrigeration system with neat schematic sketch and show it on T-S diagram. **[5]**

Que:3 (A) Give detail classification of condensers used in refrigeration and air conditioning system. **[5]**

(B) Explain multiple evaporators at different temperature with individual expansion valve with neat sketch and P-H diagram. **[5]**

OR

(A) A dense air refrigeration machine operating on Bell-Coleman cycle works between 3.4 bar and 17 bar. The temperature of air after the cooler is 15oC and after refrigeration is 6° C, for a refrigeration capacity of 6 tons calculate **[5]**

1. Temperature after compression and expansion
2. Air circulation required in cycle per minute
3. Work of compression and expansion
4. Theoretical COP
5. Rate of water circulation required in the cooler in Kg/min if rate of temperature rise is limited to 30° C

(B) A vapour compression refrigeration system uses R-12 as refrigerant and the liquid evaporates in the evaporator at -15° C. The temperature of this refrigerant at the delivery from the compressor is 15° C when vapour is condensed at 10° C. find out the COP if [5]

1. There is no under cooling,
2. The liquid is cooled by 5° C before expansion by throttling.

TEMP	Enthalpy in kJ/kg		Sp. Entropy in kJ/kg K	
	Hf	Hg	Sf	Sg
- 15	22.3	180.88	0.0904	0.7051
+ 10	45.4	191.76	0.1750	0.6921

SECTION-II

Que:4 (A) Explain the following terms briefly : [5]

i. Wet bulb temperature
ii. Dew point temperature
iii. Relative humidity
iv. Cooling and Dehumidification
v. Absolute humidity

(B) Explain "Sources of Heat load". [5]

(C) The sling-psychrometer reads 40^0C DBT and 28^0C WBT calculate followings using psychrometric chart: [5]
(i) Specific humidity (ii) Relative humidity (iii) Vapor density in air
(iv) Dew point temperature (v) Enthalpy of the mixture per kg of dry air.

OR

(C) Write brief note on human comfort chart [5]

Que:5 (A) Describe different methods of duct design. [5]

(B) Define Air-conditioning. Classify air-conditioning system. [5]

OR

(A) A duct of 15m length passes air at the rate of 90 m^3/min. Assuming the friction factor as 0.005, calculate the pressure drop in the duct in mm of water when the duct is circular of diameter 0.3 m. [5]

(B) Explain Central air conditioning system with a neat sketch. [5]

Que:6 (A) Explain important applications of refrigeration system. [5]

(B) Explain in brief the Humidifiers used in air conditioning systems. [5]

OR

(A) Classify Fan used in air-conditioning system. Explain selection of the Fan using fan characteristic curve. [5]

(B) An air conditioned space is maintained at 27° C DBT and 50% RH, the ambient conditions are 40° C DBT and 27° C WBT. The space has sensible heat gain of 14 kW the air is supplied to the space at 7° C saturated. Calculate: [5]

i. Mass of moist air supplied to the space in kg/hr
ii. Latent heat gain of space in kW

ALL THE BEST... ☺