Sub Code: RAG503

Paper Id: 180503 Roll No: | | | | | | | | | | | | | |

B. TECH.
(SEM V) THEORY EXAMINATION 2018-19
THERMODYNAMICS, REFRIGERATION AND AIR CONDITIONING

Time: 3 Hours *Total Marks: 70*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

a. Define First law of thermodynamics?
b. What is Carnot Theorem?
c. What is vaporising process in compression cycle?
d. What is sub cooling?
e. What is the Daltons law of partial pressure?
f. What is primary and secondary refrigerant?
g. What do you mean by freezing load?

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

a. Do you agree with the statement that the conception of thermodynamics reversibility is purely hypothetical? Explain fully?
b. In an Otto cycle, air at 1 bar and 290 k is compressed isentropically until the pressure is 15 bar. The heat is added at constant volume until the pressure rises to 40 bar. Calculate the air standard efficiency and the mean effective pressure for the cycle. Take c_v = 0.717 kJ/kg k and R_u= 8.314 kJ/kg mole K.
c. Write the brief description on Cold storage plant with neat sketch.
d. Give a brief note on (i) Cooling and humidification (ii) Heating and humidification
e. Draw a neat diagram of air conditioning system required for winter season. Explain the working different component in the circuit.

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

(a) Explain briefly then Diesel cycle with the help of p-v and T-S diagram, and derive an expression for the ideal efficiency of a Diesel cycle.
(b) An engine is working on dual combustion cycle has a pressure of 1 bar and 50 ^oC before compression. The air is then compressed isentropically to $1/15^{th}$ of its original volume. The maximum pressure is twice the pressure at the end of isentropic compression. If the cut-off ratio is 2, determine the temperature at the end of each and ideal efficiency of the cycle, γ = 1.4

4. Attempt any *one* part of the following: 7 x 1 = 7

(a) 1.5 kW per tonne of refrigeration system is required to maintain the temperature of – 40^oC in the refrigerator. If the refrigeration cycle works on Carnot cycle, Determine 1. C.O.P. of the cycle; 2. Temperature of the sink; 3. Heat rejected to the sink per tone of refrigeration; and 4. Heat supplied and E.P.R. , if the cycle is used as a heat pump.
(b) What is the difference between the refrigerator and a heat pump? Drive an expression for the performance factor for both if they are running on reversed Carnot cycle.

5. Attempt any *one* part of the following: 7 x 1 = 7

(a) Sketch the *T-s* and *p-h* diagram for the vapour compression cycle when the vapour after compression is (i) dry saturated and (ii) wet
(b) An ammonia refrigerating machine fitted with an expansion valve works between the temperature limits of -10^oC and 30oC. The vapour is 95% dry at

the end of isentropic compression and the fluid leaving the condenser is at 30 ºC. Assuming actual C.O.P. as 60% of the theoretical, Calculate the kilogram of ice produced per kW hour at 0oC from 10 ºC. Latent heat of ice is 335 *kJ/kg.* Ammonia ha following properties:

Temperature ºC	Liquid heat (h_f) kJ/kg	Liquid heat (h_{fg}) kJ/kg	Liquid heat (s_f) kJ/kg	Total Entropy of dry saturated vapour
30	323.08	1145.80	1.2037	4.9842
-10	135.37	1297.68	0.5443	5.4770

6. Attempt any *one* part of the following: 7 x 1 = 7

(a) Describe, the working of two stage compression system with intercooler, liquid sub cooler and a liquid flash chamber with the help of schematic diagram.

(b) The following date refers to a two stage compression ammonia refrigerating system with water intercooler.
Condenser pressure = 14 bar
Evaporator pressure = 2 bar;
Intercooler pressure 5 bar ;
Load on the evaporator = 2TR
If the temperature of the de-superheated vapour and sub-cooled liquid refrigerant are limited to 30 ºC, Find (i) the power required to drive the system; and (ii) C.O.P. of the system

7. Attempt any *one* part of the following: 7 x 1 = 7

(a) Give Brief not on (i) Short term and long term Storage (ii) Bacteria (iii) Yeast

(b) The amount of air supplied to an air conditioned hall is 300 m^3 /min. The atmospheric conditions are 35ºC DBT and 55 % RH. The required condition are 20 ºC DBT and 60 % RH. Find out the sensible heat and latent heat removed from the air minute. Also find sensible heat factor for the system.