Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem Examination May-2023

ME3CO16 Refrigeration & Air Conditioning

Programme: B.Tech. Branch/Specialisation: ME

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. Find the COP of a refrigeration system, if the work input is 40 kJ/kg and refrigerating effect is 130 kJ/kg of refrigerant flowing: **1**

(a) 3.00 (b) 2.25 (c) 3.75 (d) 3.25

ii. Bootstrap cycle is based on which refrigerant? **1**

(a) Air (b) Ammonia (c) Water (d) Freon

iii. The phases observed by refrigerant in VCRS are- **1**

(a) Solid and liquid (b) Solid and gaseous

(c) Liquid and gaseous (d) Solid, liquid and gas

iv. If dry compression is happening in compressor, the leaving refrigerant from compressor will definitely be- **1**

(a) Super-heated (b) Saturated gas

(c) Wet steam (d) None of these

v. In VARS, _____ is missing. **1**

(a) Compressor (b) Condenser

(c) Evaporation (d) Expansion device

vi. Which of the following is not a part of actual VARS system? **1**

(a) Generator (b) Rectifier

(c) Analyzer (d) All are parts of a VARS

vii. As warm air cools, its relative humidity **1**

(a) Increases (b) Decreases

(c) Remains unaffected (d) Increases then decreases

viii. During heating and humidification, the WBT **1**

(a) Increases (b) Decreases

(c) Remains unaffected (d) Increases then decreases

P.T.O.

ix. When the heat stored in the body is _____ the human body feels comfortable. **1**
(a) Zero (b) Infinite (c) Positive (d) Negative

x. Which of the following process is used in summer air conditioning? **1**
(a) Humidification
(b) Dehumidification
(c) Heating and humidification
(d) Cooling and dehumidification

Q.2 i. Draw Carnot cycle on p-v and T-s diagram. **2**

ii. Explain the working of Bootstrap refrigeration cycle, with diagram. **8**

OR iii. A simple air-cooled system is used for an aeroplane having a load of 9 tonnes. The atmospheric pressure and temperature are 0.9 bar and 10°C. During ramming the pressure increases to 1.013 bar. The heat exchanger reduces the temperature of air by 55 °C. The pressure of the cabin is 1.01 bar and the air leaving the cabin is 25 °C. Determine power required to cool the cabin and COP of the system. **8**

Q.3 i. What is the role of condenser in VCRS? **2**

ii. Show a simple VCRS on- **8**
(a) p-v diagram (b) T-s Diagram
(c) p-h diagram
Also write the merits of VCRS over air refrigeration system.

OR iii. Discuss the effect of following on performance of VCRS: **8**
(a) Sub-cooling (b) Superheating
Support you answer with diagrams.

Q.4 i. Define cryogenics. **2**

ii. Explain the system of multiple expansion & compression with flash inter cooling, with diagrams. **8**

OR iii. Explain vapour absorption practical system, with diagram. **8**

Q.5 i. Define the following terms: **4**
(a) DBT (b) DPT
(c) WBT (d) RH

ii. In a heating application moist air enters a steam heating coil at 10 °C, 50% RH and leaves at 30 °C. Determine the sensible heat transfer if the mass flow rate of the air is 100 kg/s. **6**

OR iii. Air at 30 °C and 50% RH enters an air washer has humidifying efficiency of 80 %. Determine the final DBT and RH of air washed with recirculated spray water. **6**

Q.6 Write short notes on any two:

i. Winter air conditioning **5**

ii. Air-conditioning loads **5**

iii. Human comfort conditions **5**

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MAY - 2023.

Q.1. (10) (10×1)

i) (d) (3.25)
ii) (a) air
(iii) (c) Liquid & gaseous
(iv) (a) Super-heated
(v) (a) Compressor
(vi) (d) All are parts of a VARS
(vii) (a) Increases.
(viii) (a) Increases.
(ix) (a) Zero
(x) (d) Cooling & dehumidification.

Q.2 (i) P-V. diagram of carnot cycle — 1
T-s diagram of carnot cycle — 1
(02)

(ii) Blockdiagram of bootstrap Refri. cycle —— (03)
T-s diagram —— (02)

(iii) As given ——— (1) 01

T-S diagram ——— 02

Power required ——— 03

COP of the system ——— 02

(08)

Q.3

(i) Role of condenser ——— (02)

(ii) P-v diagram ——— 02

T-S diagram ——— 03

P-h diagram ——— 02

(08)

Merits of VCRS ——— 02

(08)

(iv)

Effect of Subcooling with diagram ——— 04

Effect of Superheating with diagram ——— 04

(08)

Q.4 (i) Defination of cryogenics ——— 02

(ii) Diagram ——— 02

T-S diagram ——— 02

4 (iii) diagram of System — 03
Components of System — 01
working of System — 04
(08)

Q.5 (i) DBT ——— 01
DPT ——— 01
WBT ——— 01
RH ——— 01
(04)

(ii) Ploting of Process on Psychrometric plot ——— 02
Sensible heat factor Calculation ——— 04
(06)

(iii) Ploting of Procss on Psy. Chart — 02
Calculation for DBT & RH — 04
(06)

Q.5 (i) Diagram of Winter A/c — 02
Working of winter A/c — 03
05

(ii) Brief discussion of A/c loads — 05 (1×5)

(iii) Brief discussion of different

human comfort — 05 (1x5)