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**Reg. No. :**

**Question Paper Code: 49077**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Elective

Mechanical Engineering

14UME913 - REFRIGERATION AND AIR CONDITIONING

(Approved Refrigeration table and Steam table are allowed)

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 1 = 10 Marks)

1. The vapour compression refrigeration cycle operates on reversed

(a) Rankine cycle (b) Joules cycle (c) Atkinson cycle (d) Ericsson cycle

2. The super heated vapour state of refrigerant in a vapour compression cycle occurs

(a) Before entering the expansion wall (b) After leaving the compressor

(c) At exist from the compressor (d) After passing through the condenser

3. An intercooler is used with multi stage reciprocating compressor to cool the

(a) A refigerant gas before it is sucked inside the compressor cylinder

(b) Refrigerant gas before it is discharged to the receiver

(c) Refrigerant gas after one stage of compression before it is sent to the next stage

(d) Compressor cylinder

4. Fouling or scaling factor is the term used with

(a) Evaporators (b) Compressor (c) Condenser (d) Expansion valve

5. The wet bulb depression is zero when relative humidity equals

(a) Zero (b) 0.5 (c) 0.75 (d) 1

6. A sling psychometer can measure of

(a) Absolute humidity(b) Specific humidity

(c) Wet bulb temperature (d) Dry as well as wet bulb temperature

7. In winter air conditioning the air is

(a) Heated and dehumidified (b) Heated and humidified

(c) Cooled and dehumidified (d) Cooled and humidified

8. If the bypass factor of each depth in a coil is 0.8, then the combined bypass factor of a four

depth coil would be

(a) 0.4 (b) 0.62 (c) 0.8 (d) 0.95

9. Aqua ammonia solution used in vapour absorption refrigeration system is a solution of

ammonia in

(a) Water (b) Hydrogen (c) Lithium bromide (d) Carbon tetra chloride

10. Which of the following machines can be used to obtain refrigeration at places where is no

electric power

(a) Air refrigeration (b) Steam jet refrigeration

(c) Vapour compression (d) Vapour absorption

PART - B (5 x 2 = 10 Marks)

11. What is meant by Refrigerant?

12. What is commonly used unit of refrigeration?

13. What is degree of saturation of moist air?

14. What is the effect of subcooling a refrigerant in a vapour compression system?

15. Define Bypass factor of a heating coil.

PART - C (5 x 16 = 80 Marks)

16. (a) Sketch and explain vapour compression refrigeration cycle and draw pressure – volume

and temperature – entropy diagrams. (16)

Or

(b) A standard vapour compression refrigerator using F-12 as the refrigerant operates

between the condenser pressure of 10 bar and the evaporator pressure of 15 bar. The

evaporator absorbs 75KJ/min of energy as heat and the vapour is dry saturated at the exit

from the compressor. Represent the cycle on T-S plane and calculate (16)

(a)Flow rate of refrigerant

(b) power consumed and

(c) cop of the cycle. Also calculate cop of the carnot refrigeration

operating between the same temperature limits.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Pressure  Bar | Saturation  Temp  (0c) | Enthalpy  KJ/Kg | | Entropy  KJ/Kg k. | |
|  |  | Liquid | vapour | Liquid | vapour |
| 10 | 41.7 | 76.8 | 203.65 |  | 0.682 |
| 1.5 | -20.1 | 17.82 | 178.84 | 0.073 | 0.709 |

17. (a) Explain with neat sketches, the construction and working of (16)

1. Shell and coil condenser
2. Shell and tube condenser
3. Double pipe condenser

Or

(b) State the difference between: (16)

(i) Natural draft cooling tower and mechanical draft cooling tower.

(ii) Induced cooling tower and forced draft cooling tower.

18. (a) A mixture of air and water – vapour occupies a volume of 650 m3 at 1 bar pressure and

350c temperature. If its relative humidity is 78 percent. Calculate the specific humidity,

the dew point and the masses of air and vapour in the mixture. (16)

Or

(b) With the help of psychrometric chart, explain the following process: (16)

(i) Sensible heating and sensible cooling process

(ii) Cooling and dehumidification process

(iii) Heating and humidification process.

19. (a) Explain with a neat line diagram sketch, the working of the following air conditioning

systems: (16)

(i) Summer air- conditioning system.

(ii) Winter air- conditioning system.

(iii)Year – round air- conditioning system.

Or

(b) An air conditioned auditorium is to be maintained at 270c dbt and 55%RH. The ambient condition is 390c dbt and 280c wbt. The total sensible heat load is 120000KJ/hr, the total latent air is recirculated and mixed with 40% of the make up air leaving the cooling coil at 170c. Determine heat load is 45000KJ/hr and 60% of the return. (16)

(i) Room sensible heat factor.

(ii) Condition of air entering the anditortium

(iii)Amount of make- up air

(iv) Apparatus dew point and,

(v) By-pass factor of the cooling coil.

20. (a) Explain with the help of a neat sketch, the working of a vapour absorption system. (16)

Or

(b)Explain with the help of a neat sketch, the working of a steam jet refrigeration system.

(16)