A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 59A01

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

Elective

Agriculture Engineering

15UAG901- REFRIGERATION AND AIR CONDITIONING

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. If there is no heat transfer between system and surrounding, it is called as __ CO1- R

   (a) Adiabatic process (b) Isentropic process

   (c) Isothermal process (d) Reversible process

2. Amount of energy required to change 1 ton of water into ice at $0^{o}C$ temperature is said to be _____ CO1- R

   (a) Ton of refrigeration (b) Refrigerating capacity

   (c) Latent heat of freezing (d) Latent heat of fusion

3. 1 TR is equal to _____ kW. CO2- R

   (a) 3.52 (b) 4.0 (c) 5.50 (d) 7.46

4. Q_e/W_c is called as _____ CO2- R

   (a) COP (b) Power input (c) Power output (d) Efficiency

5. Ratio between humidity ratio of air and the same as that of saturated mixture is called as _____ CO3- R

   (a) Saturation (b) Degree of saturation

   (c) Humid specific heat (d) Specific enthalpy

6. During sensible heating, moisture content of the air remains _____ CO3- R

(a) Zero (b) Low (c) High (d) Constant

7. In all water system, the external medium is _____. CO4-R

(a) Air (b) Water (c) Air-Water (d) Brine

8. The purpose of the humidifier in all air A.C system is to maintain the _____ CO4- R

(a) Air moisture (b) Temperature (c) Air volume (d) Cleanliness

9. VARS is also called as _____ driven system. CO5- R

(a) Heat energy (b) Cold (c) Humid (d) Wet system

10. For a completely reversible system the total entropy change (system+surroundings) is _____ CO5- R

(a) Zero (b) Maximum (c) Constant (d) Negligible

PART – B (5 x 2= 10 Marks)

11. What is Triple point ? CO1 R

12. What is volumetric efficiency? CO2 R

13. What is wet bulb depression? CO3 R

14. What is the role of duct in A.C system? CO4 R

15. What is regeneration in VARS? CO5 R

PART – C (5 x 16= 80Marks)

16. (a) Explain first and second law of thermodynamics with illustrations. CO1- U (16)

Or

(b) Explain basic vapour compression refrigeration system with a schematic. CO1- U (16)

17. (a) A single stage air compressor running at 80 RPM, compress air from a pressure of 1 bar and temperature of 15 to a pressure of 5 bar .The clearance volume is 5 % of swept volume which is 0.42 Assuming that the compression and expansion to follow the law $pV^{1.3}$=constant , Determine the power required to drive the compressor. CO2- App (16)

Or

	(b)	A reciprocating air compressor has cylinder with 24 cm bore and 36 cm stroke. Compressor admits air at 1 bar, 17°C and compresses it up to 6 bar. Compressor runs at 120 rpm. Considering compressor to be single acting and single stage determine mean effective pressure and the horse power required to run compressor when it compresses following the isothermal process and polytropic process with index of 1.3. Also find isothermal efficiency when compression is of polytropic and adiabatic type.	CO2- App	(16)
18.	(a)	(i) A cooling tower is used for cooling the condenser water of a refrigeration system having a heat rejection rate of 100 kW. In the cooling tower air enters at 35^{o}C (DBT) and 24^{o}C (WBT) and leaves the cooling tower at a DBT of 26^{o}C relative humidity of 95%. What is the required flow rate of air at the inlet to the cooling tower in m3/s. What is the amount of make-up water to be supplied? The temperature of make-up water is at 30^{o}C, at which its enthalpy (hw) may be taken as 125.4 kJ/kg. Assume the barometric pressure to be 1 atm.	CO3- App	(8)
		(ii) Explain different properties of psychrometry.	CO3- U	(8)
		Or		
	(b)	(i) In an air conditioning system air at a flow rate of 2 kg/s enters the cooling coil at 25oC and 50% RH and leaves the cooling coil at 11oC and 90% RH. The apparatus dew point of the cooling coil is 7oC. Find a) The required cooling capacity of the coil, b) Sensible Heat Factor for the process, and c) By-pass factor of the cooling coil. Assume the barometric pressure to be 1 atm. Assume the condensate water to leave the coil at ADP (hw = 29.26 kJ/kg)	CO3- App	(8)
		(ii) Explain any one air standard cycle.	CO3- U	(8)
19.	(a)	(i) Explain the advantages and disadvantages of unitary refrigerant based system of A.C.	CO4- U	(8)
		(ii) Explain dual duct constant volume system of air condition.	CO4- U	(8)
		Or		
	(b)	(i) Explain single duct varible volume system of air condition..	CO4- U	(8)
		(ii) Explain all water system of air conditioning.	CO4- U	(8)

20.	(a)	Explain the vapour absorption refrigeration system with neat illustrations and determine the COP of VARS.	CO5- U	(16)
		Or		
	(b)	Explain different refrigerant absorbent mixtures.	CO5- U	(16)