

Reg. No:

--	--	--	--	--	--	--	--	--

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)

B.Tech IV Year I Semester Regular Examinations Nov/Dec 2019

REFRIGERATION & AIR CONDITIONING
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

UNIT-I

- 1 a Describe the Bell-Coleman cycle with neat sketch. Derive an expression for COP assuming compression and expansion to be isentropic. **4M**
- b A cold storage is supplied with 4500kg of fish at 25°C. The fish has to be cooled to -12°C. Freezing point of fish is - 3°C. If the capacity of plant is 12 tons, how long it will take to cool the fish. Specific heat of fish above and below freezing point are 3kJ/kg.K and 1.25kJ/kg.K respectively latent heat of freezing= 230kJ/kg.K **8M**

OR

- 2 The atmospheric air at pressure 1bar and temperature -5°C is drawn in the cylinder of the compressor of a Bell-Coleman refrigerating machine. It is compressed isentropically to a pressure of 5 bar. In the cooler, the compressed air is cooled to 15°C, pressure remaining the same. It is then expanded to a pressure of 1bar in an expansion cylinder, from where it is passed to the cold chamber. **12M**
- Find (a) The work done/kg of air (b) C.O.P of the plant.
- For air assume law for expansion $PV^{1.2} = C$, law for compression $PV^{1.4} = C$, $C_p = 1 \text{ K.J/K.g-K}$

UNIT-II

- 3 a With a neat sketch, explain the working principle of vapour compression refrigeration system. **4M**
- b A vapour compression refrigerator works between the pressure limits of 60 bar and 25 bar. The working fluid is just dry at the end of the compression and there is no under cooling of the liquid before the expansion valve. Determine: C O P of the cycle and capacity of refrigerant if the fluid flow is at the rate of 5kg/min. **8M**

Pressure (bar)	Saturation Temp (K)	Enthalpy (kJ/kg)		Entropy (kJ/kg.K)	
		Liquid	Vapour	Liquid	Vapour
60	295	151.9	293.29	0.554	1.0332
25	261	266	322.58	0.226	1.2464

OR

- 4 a State secondary refrigerants and selection of refrigerants. **4M**
- b A refrigerating machine R-12 as refrigerant operates between the pressure 2.6 bar and 9 bar, the compression is isentropic and there is no under cooling in the condenser. The vapour is in dry-saturated condition at the beginning of the compression. Estimate the theoretical COP, if the actual COP is 0.68 of theoretical valve, calculate the net cooling produced/hr. the refrigerant flow is 5kg/min. properties of refrigerant are **8M**

Pressure(bar)	Temperature ⁰ C	Enthalpy kJ/kg		Entropy of vapour kJ/kg-k
		Liquid	Vapour	
9	36	71	202	0.6836
2.6	-7	30	185	0.7001

UNIT-III

- 5 **a** What is an absorption system? How does it differ from vapour compression system? **6M**
b Discuss desirable properties of refrigerant and absorbent used in vapour absorption system. **6M**

OR

- 6 **a** Explain the working principle of pulse tube refrigeration system with a neat sketch its applications. **6M**
b (i) Differentiate thermoelectric system with vapour compression system. **6M**
(ii) What are the applications of Thermo electric refrigeration system?

UNIT-IV

- 7 **a** Define relative humidity, specific humidity, and Adiabatic saturation temperature and describe any one method for determining their values with an example **6M**
b The pressure and temperature of mixture of dry air and water vapour are 736 mm of Hg and 21°C. The dew point temperature of the mixture is 15°C. Find the following: **6M**
(i) Partial pressure of water vapour in the mixture (ii) Relative Humidity
(iii) Enthalpy of mixture (iv) Specific Volume of mixture per Kg of dry air

OR

- 8 **a** Explain the working principle of thermostat expansion device with a neat sketch. **6M**
b Write short notes on condensers and evaporators used for refrigeration industry. **6M**

UNIT-V

- 9 **a** Explain summer air conditioning system for hot and humid outdoor condition system with sketch and also represent the conditions on P-H chart. **6M**
b Explain year round air conditioning system with sketch. **6M**

OR

- 10 The following data related at an air-conditioned space are outdoor condition of 38°C DBT, 50% RH, sensible heat of 24kW, 50% RH, latent heat of 6kW, by-pass factor of the cooling coil of 0.16, if the ventilation requirement is such that on mass flow rate basis 20% of fresh air is introduced and 80% of supplied air is recirculated. Determine (i) supply air flow rate (ii) outside air sensible heat (iii) outside air latent heat (iv) ground total heat (v) effective room sensible heat factor. **12M**

*** END ***