

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous) Dundigal, Hyderabad -500 043 MECHANICAL ENGINEERING

ASSIGNMENT QUESTIONS

Course Name	:	REFRIGERATION AND AIR CONDITIONING	
Course Code	:	A60334	
Class	•••	III B. Tech II Semester	
Branch		Mechanical Engineering	
Year	:	2017 – 2018	
Course Co-ordinator	o-ordinator : Dr. CH V K N S N Moorthy, Professor, Department of Mechanical Engineering		
Team of Instructors	:	Dr. CH V K N S N Moorthy, Professor	
		Mr. A. Somaiah, Assistant Professor	

COURSE OVERVIEW:

Refrigeration and air conditioning continues to grow in importance in every segment of our day-to-day living. The course covers various conventional refrigeration systems like air, vapour compression, vapour absorption and steam jet refrigeration systems, also describes some unconventional refrigeration systems; thermoelectric refrigeration, Hilsch tube, etc.. The course introduces the psychrometry, various air conditioning systems and heat pump circuits.

S. No	Question	Blooms Taxonomy Level	Course Outcome
	ASSIGNMENT-I	Lever	
1	a) Explain how you would detect whether a refrigerant is uncharged or over charged. b) A R12 refrigerating machine works on a vapor compression cy The temperature of refrigerant in the evaporator is -20° C. vapor is dry saturated when it enters the compressor and leave in a superheated condition. The condenser temperature is 30 Assuming Cp for R12 in the superheated condition as 1.884 KJ K, determine: i) Condition of vapor at the entrance to condenser, ii) Condition of vapor at the entrance to the evapor and iii) COP _{th} of the machine. Properties of R12 Temp ^o C h _f , KJ/Kg h _g , KJ/Kg S _f , KJ/Kg K S _g , KJ/Kg K -20 17.82 178.73 0.0731 0.7087 30 64.59 199.62 0.2400 0.6843	nder vcle. The es it D ^o C. //Kg the ator C	1, 3
2	a) Explain the effect of sub cooling of liquid and super heating vapor on the COP of Ideal vapor compression cycle with neat graphs.b) Explain with neat P-h graph the deviations of practical cycle frideal vapor compression cycle.	g of P-h Trom	1, 3
3	a) Classify the evaporators; explain the working of flooded t evaporator with neat diagram.b) Classify the expansion valves and explain the working principle an automatic expansion valve with a neat sketch.	Understand e of	4

S. No	Question	Blooms Taxonomy Level	Course Outcome
4	a) Classify the compressors; explain their working principles, advantages and disadvantages of rotory type and screw type compressors with neat diagrams.b) Classify the condensers; explain their working principles of evaporative condenser with neat diagram.	Understand	4
5	 a) Derive an expression for the COP of vapor absorption refrigeration system. b) In an absorption refrigeration system heating, cooling and refrigeration takes place at the temperature of 150°C, 30°C and -20°C. Find the theoretical COP of the system; if the heating temperature is increased to 200°C and refrigeration temperature is decreased to -40°C. Calculate the percentage of change in theoretical COP. 	Understand	3
	ASSIGNMENT-II		
1	In a Steam jet refrigeration system dry saturated steam at 7 bar abs. pressure is supplied. The flash chamber temperature is 5°C, the condenser temperature is 40°C, make up water is supplied at 20°C. Assuming that quality of motive steam and flash vapour at the beginning of compression as 93% dry and efficiency of the nozzle, efficiency of entertainment and the efficiency of the thermo- compressor as 90%, 65% and 91% respectively. Determine: (a) Weight of steam required per hour per ton of refrigeration. (b) The volume of vapour removed from the flash chamber per hour per ton of refrigeration.	Understand	1
2	 (a) Describe briefly the differences between open and dense air systems. (b) A Bell - Coleman cycle works between 1 and 6 bar pressure limits. The compression and expansion indices are 1.25 and 1.3 respectively. Obtain COP and tonnage of the unit for an airflow rate of 0.5 kg/s. Neglect clearance volume and take temperature at the beginning of compression and expansion to be 7°C and 37°C, respectively. 	Remember	3
3	 (a) Represent the following process in a skeleton psychrometric chart. i. Sensible cooling ii. Cooling and humidification iii. Adiabatic mixing of air streams. (b) Ten grams of moisture per kg of dry air is removed from atmospheric air when it is passed through an air conditioning system and its temperature becomes 20°C. The atmospheric conditions are 40°C DBT and 60% RH. Calculate the following for the conditioned air. i. Relative humidity, ii. Wet-bulb temperature, iii. Dew point temperature, iv. Enthalpy change for the air. Assume standard atmospheric pressure. 	Understand	2
4	An air conditioned auditorium is to be maintained at 27° C DBT and 60% RH. The ambient condition is 40° C DBT and 30° C WBT. The total sensible heat load is 100000 KJ/h and total latent heat load is 40000 KJ/h. 60% of the return air is recirculated and mixed with 40% of make-up air after the cooling coil. The condition of air leaving the cooling coil is at 18° C. Determine: i. Room Sensible Heat Factor, ii. The condition of air entering the auditorium; iii. The amount of make-up air; Show the process on psychrometric chart.	Remember	2
5	The air in a room is to be maintained at 19° C and 54 % R.H. by air supplied at a temperature of 14° C. The design out-door conditions are as follows:	Understand	2

S. No	Question	Blooms	Course
		Taxonomy	Outcome
		Level	
	Sensible heat gain: 20000 kJ/hr, Latent heat gain: 4000 kJ/hr, Out-		
	door conditions: 30 ^o C DBT and 42% R.H. The ratio of recirculated		
	air to fresh air is fixed at 2.8: 1 by weight .The plant consists of direct		
	expansion cooling coil and after-heater and a constant speed fan.		
	Calculate:		
	(a) The quantity of air supplied per minute in cubic meters		
	(b) The load on refrigerating plant in tons of refrigeration assuming		
	the bypass factor of the cooling coil 0.15		
	(c) The load on after - heater in kW.		

Prepared by:

Dr. CH V K N S N Moorthy, Professor Mr. A. Somaiah, Assistant Professor.

HOD, MECHANICAL ENGINEERING

