Code No: R1632033 **R16** SET - 1

III B. Tech II Semester Supplementary Examinations, November - 2019

REFRIGERATION AND AIR CONDITIONING

(Mechanical Engineering)

Time: 3 hours **Max. Marks: 70**

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
3. Answer any **FOUR** Questions from **Part-B**

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PART – A (14 Marks)

1	a)	What is refrigeration? Define one ton of refrigeration.	[2M]
	b)	Mention the advantages of vapour compression refrigeration system over air refrigeration system.	[2M]
	c)	What are essential properties of a good refrigerant?	[3M]
	d)	Define and write the expression for entrainment efficiency in steam jet refrigeration system.	[2M]
	e)	Explain in brief, an adiabatic saturation process. Represent the same on a psychrometric chart.	[3M]
	f)	Explain the features required for the proper selection of a fan for a given application.	[2M]

PART – B (56 Marks)

2	a)	An air refrigeration system operating on Bell Coleman cycle takes in air from cold room at 260 K and compresses it from 1.0 bar to 5.5 bar. The index of compression being 1.25. The compressed air is cooled to 300 K. The ambient temperature is 20^0C. Air expands in an expander where the index of expansion is 1.35. Calculate: (i) C.O.P. of the system (ii) Quantity of air circulated per minute for production of 1500 kg of ice per day at 0^0C from water at 20^0C. (iii) Capacity of the plant in terms of kJ/s. Take cp = 4.18 kJ/kg K for water, cp = 1.005 kJ/kg K for air, Latent heat of ice = 335 kJ/kg.	[7M]
	b)	Explain Bootstrap aircraft refrigeration system.	[7M]
3	a)	What is the effect of sub cooling and super heating in vapor compression process and show it in T-S and h-s diagram?	[7M]
	b)	An ammonia ice plant operates between a condenser temperature of 30^0C and an evaporator temperature of -20^0C. It produces 10 tons of ice per day from water at 25^0C to ice at -10^0C. Assuming simple saturation cycle, determine: i) the capacity of refrigerating plant ii) mass flow rate of refrigerant and iii) COP of the cycle.	[7M]
4	a)	How condensers and evaporators are classified? Explain any one of the condenser and evaporators with the help of neat sketch.	[7M]
	b)	How water, Freon-11, Freon-12 and CCl4 are designated as refrigerants? Explain.	[7M]
5	a)	What are the merits and demerits of steam jet refrigeration system and name few applications?	[7M]
	b)	With a neat sketch explain the working of Vortex tube refrigerator.	[7M]

6 a) The following data apply to an air conditioning system: [9M]
Room sensible heat = 41778 kJ/hr; room latent heat = 41778 kJ/hr; inside design condition= 28^0C, 50% RH, outside design condition=35^0C, DBT, 27.6 WBT. Return air from the room is mixed with the outside air before entering the cooling coil in the ratio of 4:1. Return air from the room is mixed with the cooling air, i.e. after the cooling coil in the ratio of 1:4. Cooling coil by pass factor is 0.1. The air may be reheated if necessary before supplying to the conditioned space. Assume ADP as 12^0C and determine:
i) Supply air conditions into the room
ii) Refrigeration load due to the reheat
iii) Total refrigeration capacity
iv) The quantity of fresh air supplied.

b) What is an effective temperature? State and explain the factors which govern optimum effective temperature? [5M]

7 a) What is the function of a filter and how are filters classified? [7M]

b) An air-conditioned auditorium is to be maintained at 27^0C DBT and 60% RH. The ambient condition is 40^0C DBT and 30^0C WBT. The total sensible heat load is 100 000 kJ/h and total latent heat load is 40000 kJ/h. 60% of the return air is re-circulated and mixed with 40% of makeup air after cooling coil. The condition of air leaving the cooling coil is at 18^0C. Determine i) RSHF, ii) The condition of air entering the auditorium, iii) The amount of make-up air, iv) ADP and v) BPF of cooling coil. [7M]

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