University of Mumbai

Examination June 2021 under cluster 9 (FAMT)

Examinations Commencing from 1st June 2021

Program: Mechanical Engineering

Curriculum Scheme: Rev2016

Examination: TE Semester VI

Course Code: MEC604 and Course Name: Refrigeration and Air Conditioning

Time: 2 hourMax. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	For a space to be air conditioned, Room Sensible heat is 400 kW and Room Latent heat is 200 kW. The room sensible heat factor will be_____.
Option A:	2
Option B:	4/7
Option C:	2/3
Option D:	3/5
2.	One Ton of refrigeration is equal to _____
Option A:	1 kW
Option B:	10000 kW
Option C:	3.52 kW.
Option D:	7.2 kW
3.	If a Refrigerator and heat pump are operating between two temperature limits of 300K and 600K. COP of Heat Pump and Refrigerator will be _____respectively.
Option A:	3 and 4
Option B:	2.24 and 3.24
Option C:	3.24 and 2.24
Option D:	2 and 1
4.	In steam jet refrigeration system, the refrigerant used is_____
Option A:	R 718
Option B:	R 12
Option C:	R 717
Option D:	R 134a
5.	Nozzle Diffuser section is used in _____
Option A:	Heat exchanger
Option B:	Ram compression
Option C:	Jet Compression
Option D:	Reciprocating compressor
6.	In which of the following refrigeration methods there is no phase change of the refrigerant?
Option A:	Steam Jet Refrigeration
Option B:	Vapour Compression Refrigeration
Option C:	Vapour Absorption Refrigeration

Option D:	Air Refrigeration
7.	Star ratings for electricity consumption of equipment are assigned by_____.
Option A:	Bureau of Energy Efficiency
Option B:	Best Efficiency of Engine
Option C:	Bureau of Electrical Engineering
Option D:	Best Effectiveness of Energy
8.	In a VCR, which one of the following process is assumed to be constant enthalpy process?
Option A:	Evaporation
Option B:	Compression
Option C:	Throttling
Option D:	Condensation
9.	Intercooling is done to achieve_____.
Option A:	More refrigeration effect.
Option B:	Less work input
Option C:	Lower evaporator temperature
Option D:	Higher condenser temperature
10.	R717 is the designation of _____.
Option A:	Ammonia
Option B:	Air
Option C:	CO_2
Option D:	Water
11.	Air washer is used to cool_____.
Option A:	Refrigerant
Option B:	Air
Option C:	Water
Option D:	Oil
12.	Which one of the following is a primary refrigerant?
Option A:	R12
Option B:	R717+Water
Option C:	NaCl+Water
Option D:	LiBr + Water
13.	Which type of compressor is used in a domestic refrigerator?
Option A:	Hermetically sealed compressor
Option B:	Centrifugal compressor
Option C:	Screw compressor
Option D:	Axial compressor
14.	Receiver is used to _____.
Option A:	Allow entry of liquid refrigerant in throttle valve
Option B:	Store the liquid refrigerant
Option C:	Avoid entry of liquid refrigerant in evaporator
Option D:	Allow entry of liquid refrigerant in condenser

15.	As compared to VCR, in a VAR system which one of the following components is absent?
Option A:	Pump
Option B:	Evaporator
Option C:	Condenser
Option D:	Compressor
16.	Electrolux cycle is called as ____ fluid system.
Option A:	2
Option B:	3
Option C:	4
Option D:	1
17.	_____refrigeration uses sound waves.
Option A:	Thermoelectric
Option B:	Thermoacoustic
Option C:	Vortex tube
Option D:	Vapour absorption
18.	Which one of the following psychrometric process is not achieved in an air washer?
Option A:	Cooling and Dehumidification
Option B:	Heating and Dehumidification
Option C:	Heating and Humidification
Option D:	Cooling and Humidification
19.	In adiabatic humidification, _____ remains constant.
Option A:	Enthalpy
Option B:	Relative Humidity
Option C:	Dry Bulb Temperature
Option D:	Dew Point Temperature
20.	Infiltration load occurs due to_____.
Option A:	Electronic equipment
Option B:	Sun
Option C:	Human
Option D:	Leakage

Q2 **(20 Marks Each)**	
A	**Solve any Two . (5 marks each)**
i.	Define a) Coolingtower range b) Cooling tower approach c) Cooling tower efficiency
ii.	Explain the effect of condenser pressure on COP of VCRS with P-h plot.
iii.	Explain bootstrapair refrigeration systems with neat sketch.
B	**Solve any One** **10marks each**
i.	An aircraft refrigeration plant has to handle a cabin load of 25 TR. The atmospheric temperature is 16^{o}C. The atmospheric air is compressed to a pressure of 0.96 bar and temperature of 29^{o}C due to ram action. This air is then further compressed in a compressor to 4.8 bar, cooled in a heat

	exchanger to 66^{o}C, expanded in a turbine to 1 bar pressure and supplied to the cabin. The air leaves the cabin at a temperature of 26^{o}C. The isentropic efficiencies of both compressor and turbine are 0.85 Calculate: (i) The Mass of air circulated per minute (ii) COP.
ii.	A vapour compression system using R12 is works between-15 ^{o}C and 35^{o}Cas evaporator and condenser temperature respectively. Use p-h chart determine: 1) COP 2) mass flow of refrigerant per TR3) Piston displacement per TR using volumetric efficiency=85% iv) Heat rejected in the condenser per TR and v) Ideal COP.

Q3. **(20 Marks Each)**	
A	**Solve any Two. (5 marks each)**
i.	Define 1) Bypass factor 2)Room Sensible Heat Factor
ii.	Represent the psychrometric process: a) Cooling with dehumidification b) Heating with dehumidification.
iii.	Explain with neat sketch deep sea water air-conditioning?
B	**Solve any One** **10marks each**
i.	A duct of rectangular cross section 600 mm × 400mm, 100m length carries 90 m^{3}/min of air having density1.2 kg/m^{3}. Determine equivalent diameter of a circular duct if 1) The quantity of air passing through both the ducts is same 2) The Velocity of air passing through both the ducts is same. (Take f = 0.011)
ii.	The humidity ratio of atmospheric air at 1.013 bar and 25^{o}C dry bulb temperature and specific humidity is 0.011 Kg/Kg of dry air. Find using psychrometry chart: 1) Partial Pressure of Water Vapor, 2) Relative Humidity, 3) Dew Point Temperature, 4) Specific Enthalpy, & 5) Vapor Density.