Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth Semester B.Tech Degree Regular and Supplementary Examination December 2020

Course Code: AU309

Course Name: HEATING, VENTILATING & AIR CONDITIONING

Max. Marks: 100 Duration: 3 Hours

(Use of refrigeration table, psychrometric chart and steam table may be permitted.)

PART A

Answer any three full questions, each carries 10 marks. Marks

1 a) Explain the construction and working of forced warm air heating system with a neat sketch. (6)

b) Prepare a short note on radiant heating systems and their applications. (4)

2 a) Discuss the merits of hydronic systems for space heating. (4)

b) Describe the salient features of two pipe direct return and two pipe reverse return systems with neat sketches. (6)

3 a) Explain the effects of relative humidity on ventilation. (4)

b) Prepare short notes on the following room air distribution systems with neat sketches. (6)

i. Mixing systems

ii. Under floor systems

4 a) Classify the contaminants which affect the indoor air quality. (3)

b) What are the mechanisms of particle collection in filters? (3)

c) Discuss parallel blade damper and opposed blade damper with neat sketches. (4)

PART B

Answer any three full questions, each carries 10 marks.

5 a) Write the designation of following refrigerants. (2)

i) CF_3CHCl_2

ii) CO_2

b) Write the chemical formula of following refrigerants (2)

i) R-22

ii) R-50

c) Discuss four salient thermodynamic requirements of refrigerants. (6)

6 a) Select a suitable commercially available refrigerant with proper designation, for the following cases with due justifications. (6)

i) A cost effective halogen free refrigerant for ice plants

ii) Eco-friendly HFC refrigerant with low Ozone Depletion Potential

iii) Domestic refrigerator with hermetically sealed compressor

b) Write a short note on secondary refrigerants (4)

7 The specific humidity of atmospheric air at 28^{o}C DBT and 1 atm pressure is 0.016 kg/kg dry air. Using suitable correlations (not psychrometric chart), determine partial pressure of water vapour, relative humidity, dew point temperature, specific enthalpy and vapour density. (10)

8 Determine the load required to raise 0.5 m^3/s of air at 10^{o}C DBT and 80% RH to 30^{o}C DBT. What would be the relative humidity and WBT of air in its final condition? Represent the process in psychrometric chart, duly indicating the salient properties. (10)

PART C

Answer any four full questions, each carries 10 marks.

9 A vapour compression cycle using R-22 operates at condensing temperature of 36^{o}C and evaporating temperature of -10^{o}C. Refrigeration capacity is 15 TR. Determine the following. (10)

1. Mass flow rate of refrigerant
2. Compressor power
3. Heat rejected at the condenser
4. Actual COP

10 a) Discuss the working of a simple NH_3-H_20 vapour absorption refrigeration system (VARS) with a neat schematic. List any two advantages of VARS. (7)

b) Calculate the COP of vapour absorption refrigeration system with generator temperature=150^{o}C, Absorber temperature=30^{o}C, Condenser temperature=30^{o}C and Evaporator temperature= 10^{o}C (3)

11 a) Discuss the working of a winter air conditioning system with a neat schematic and represent the process on a typical psychrometric chart. (6)

b) Define the following air conditioning parameters and discuss their relevance. (4)

i) Apparatus Dew Point

ii) Bypass factor

12 A room has a sensible heat gain of 28 kW and latent heat gain of 7 kW. The room is maintained at 25^{o}C and 50% relative humidity. 200 m^{3}/min of air is delivered to the room. Calculate RSHF and also determine WBT and relative humidity of supply air. Indicate the process on a typical psychrometric chart. (10)

13 a) What are the modes of thermal interchange between people and environment (5)

b) Discuss the factors controlling the heat exchange between the individual and surroundings. (5)

14 a) Draw a neat schematic of typical comfort chart representing all relevant parameters. What do you mean by predicted mean vote (PMV)? (5)

b) Prepare short notes on any two types of air conditioning control systems with neat sketches. (5)

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