

Code No: 07A72405

R07**Set No. 2**

IV B.Tech I Semester Examinations, May 2011
AUTO AIR CONDITIONING
Automobile Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
 All Questions carry equal marks

1. Write short notes on psychrometric process:
 - (a) Sensible cooling.
 - (b) Sensible heating.
 - (c) Cooling and Dehumidification. [16]
2. (a) What are the various elements required in the air - heating system ?
 (b) Explain about "Blow or throw" and spread in the air - distribution. [8+8]
3. What are the various tools and instrument required to find the leakage of air and fluids in aircraft system ? [16]
4. (a) Explain about humidifying and De - humidifying processes as applied to air conditioning.
 (b) Describe the purpose of automatic control used in air conditioning unit. [8+8]
5. Saturated R_{134a} vapour is compressed isotropic ally from -18 degree C ($P_{sat} = 144.6$ KPa) to a pressure of 433.8 KPa in a single stage centrifugal compressor. Calculate the speed of the compressor at the tip of the impeller assuming that the vapor enters the impeller radially. [16]
6. Although Ammonia Refrigerant is toxic, but it is the most widely used refrigerant, explain the reasons for not phasing out? [16]
7. Describe the sequence of operations involved in charging the aircraft system ? [16]
8. A Freon 12 vapor compression system operating at a condenser temperature of 40°C and evaporator temperature of -5°C develops 15 tons of refrigeration . Using the p-h diagram for Freon 12, Determine:
 - (a) The mass flow rate of the refrigerant circulated.
 - (b) The theoretical piston displacement of the compressor and piston displacement per ton of refrigeration.
 - (c) The theoretical horse power of compressor and horse power per ton.
 - (d) The heat rejected in the condenser Of refrigeration. [4+4+4+4]

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1. What are the reasons for evacuating the aircraft system and mention various methods to evaluation ? [16]
2. (a) On a particular day the weather forecast states that the dry bulb temperature is 37°C , while the relative humidity is 50% and the barometric pressure is 101.325 kPa. Find the humidity ratio, dew point temperature and enthalpy of moist air on this day.
 (b) Will the moisture in the above air condense when it comes in contact with a cold surface whose surface temperature is 24°C ? [8+8]
3. Write a short note on:
 - (a) A single vapour compression system.
 - (b) Multistage compression system.
 - (c) Flash inter cooling. [4+8+4]
4. (a) What are the various advantages of laminar flow clean room aircraft system ?
 (b) Differentiate between down flow and cross flow laminar movement clean room aircraft system. [8+8]
5. (a) Derive an expression for cooling load calculations.
 (b) Explain the heating load calculations. [8+8]
6. If heat transfer losses in the automobile are high, how the walls and window panels and floor is protected so that the losses be minimized. [16]
7. (a) What are the effects of ventilation on the air conditioning equipment loads ?
 (b) What are the minimum mechanical ventilation requirements in different automobiles? [8+8]

8. The followings are the values measured on a shell-and tube ammonia condenser:

Velocity Of Water flowing through the tubes, V(m/s)	1.22	0.61
Overall heat transfer coefficient, U_0 (W/m ² . K)	2300	1570

Water flows inside the tubes while refrigerant condensed outside the tubes. The tubes were 51mm OD and 46mm ID and had a conductivity of 60W/m-K. Using the concept of Wilson's plot, determine the condensing heat transfer coefficient. What is the value of overall heat coefficient when the velocity of water is 0.224m/s? [16]

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1. For moist air at 303 K obtain the relative humidity and degree of saturation. If Dew-point is given to be 288 K. The Total pressure is 1 bar calculate the Results? [16]
2. (a) Explain the working principle of an electronic expansion valve ?
 (b) Write briefly some of the practical problems with expansion devices? [8+8]
3. What is the need of compressor and mention the various problems occurred in the compressor ? [16]
4. (a) Differentiate between multi - zone system and dual duct system of air conditioning units.
 (b) How the satisfactory temperature and humidity control is obtained in air conditioning system? [8+8]
5. (a) Derive the equation of transmission by heat conduction.
 (b) Explain about cooling load. [8+8]
6. The evaporating and condensing temperatures of 258K and 313K respectively, calculate:
 - (a) Tonnage.
 - (b) Volume handled by compressor.
 - (c) COP and heat transfer to condenser. The compressor power input is 10KW m. The refrigerant used is R-22 and enthalpy at the end of isentropic compression is $h_2 = 287.07$ kJ/kg. [4+8+4]
7. What are the situations at which, the pressure regulating, valves, relief valves be serviced or replaced ? [16]
8. (a) How the blowers are selected in air craft system ?
 (b) Distinguish type of blowers and their characteristics. [8+8]

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1. What is hermetically sealed compressor and how can it be repaired, when there are problems ? [16]
2. (a) What are the various factors responsible for the losses in ducts ?
 (b) Derive an equation to find the loss due to sudden contraction in a duct. [8+8]
3. A ton cooling unit is used per dehumidify $0.2 \text{ m}^3/\text{s}$ from $T_{db} = 28^\circ\text{C}$ and $T_{wb} = 25^\circ\text{C}$ to specific humidity level of $w_2 = 0.08 \text{ kgw/kg}$ of da. Determine T_{db2} and T_{dp2} of air at exit condition and Take $C_{pam} = 1.026 \text{ KJ/kg}$ of da. [16]
4. Describe the properties of thermodynamics and thermo-physical properties of Refrigerants. [16]
5. Estimate the required length of capillary tube using analytical method? [16]
6. Sketch a functional block control diagram for an open - loop and for closed - loop system. Label and describe basic elements of air conditioning unit. [16]
7. A simple saturation cycle using Freon 22 is designed for a load of 100 TR. The saturation suction and discharge temperatures are 5°C and 40°C respectively. Calculate:
 - (a) The mass flow rate of refrigerant.
 - (b) The COP and isentropic horse power.
 - (c) The heat rejected in the condenser.

t $^\circ\text{C}$	p bar	h_f kJ/kg	h_g kJ/kg	s_f kJ/(kg.K)	s_g kJ/(kg.K)	v_g m^3/kg
5	5.836	205.9	407.1	1.02115	1.7447	0.0404
40	15.331	249.53	416.4	1.16659	1.69953	0.0404

Specific heat of vapor is $0.65 \text{ kJ}/(\text{kg.K})$. [16]

8. What are the various instruments and methods used to detect the leakages and mention the method of rectification ? [16]
