Total No. of Questions : 10]

SEAT No. :

P3881

[Total No. of Pages : 3

[5561]-537
B.E.(Mechanical)
HEATING, VENTILATION, AIR-CONDITIONING AND REFRIGERATION
(2015 Course) (Semester - I) (Elective - I) (402044C)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.***
2) ***Assume suitable data wherever necessary.***
3) ***Use of non-programmable pocket calculator is allowed.***
4) ***Draw neat diagrams wherever necessary.***
5) ***Figures to the right indicate full marks.***

Q1) a) Explain ejector expansion trans-critical refrigeration cycle. **[3]**

b) A Freon 12 vapor compression system at a condenser temperature of 40ºC an evaporative temperature of 0ºC develops 15 tons of refrigeration. Determine - **[7]**

i) The discharge temperature and mass flow rate of the refrigerant circulated

ii) The theoretical piston displacement of the compressor and displacement per ton of refrigeration.

iii) The theoretical horse power of the compressor and horse power per ton of refrigeration.

iv) The heat rejected in the condenser

v) The Carnot COP and actual COP of the cycle

Use the following values with standard notations

$h_1 = 187.5$ kJ/kg. $h_2 = 213.96$ kJ/kg, $h_3 = 74.6$ kJ/kg = h_4

$v_1 = 0.055$ m^3/kg, $s_1 = s_2 = 0.6966$ kJ/kg.K

OR

Q2) a) Explain the performance characteristic curves of centrifugal compressor. **[4]**

b) Discuss the classification of cooling tower. **[6]**

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Q3) A two-cylinder single acting reciprocating compressor with 5% clearance is used in a R22 refrigeration cycle to take refrigeration capacity of 7.2 TR at 5°C (3.6 bar) refrigeration temperature and 40°C (9.6 bar) condensing temperature. The compressor index is 1,15. The speed of piston is limited to 3 m/s. Take L/D 0.8. specific volume as 0.0525 m^3/kg. Determine - **[10]**

a) Power

b) Volumetric efficiency

c) Bore and stroke

d) RPM

Temp. (°C)	Pressure (Bar)	h_f(kJ/kg)	h_g(kj/kg)
5	3.6	40.69	189.65
40	9.6	74.59	203.2

OR

Q4) a) Discuss the advantages and disadvantages of centrifugal compressor over reciprocating compressor. **[6]**

b) Discuss the Capacity and safety controls and their types of reciprocating refrigeration system. **[4]**

Q5) a) Which are the factors affecting thermal comfort of human being? Explain in detail. **[8]**

b) What is CLTD method? How it connects with Time lag and Decrement factor? **[8]**

OR

Q6) a) Discuss types of air distribution devices. **[4]**

b) What is Wind effect and Stack effect? Explain in detail. **[12]**

Q7) a) Explainin detail: **[8]**

i) Air Spaces and

ii) Sol Air temperature

b) A building has U-value of 0.5 W/m^2K and total exposed surface area of 384 m^2. The building is subjected to an external load (only sensible) of 2 kW and an internal load of 1.2 kW(sensible). If the required internal temperature is 25°C, state whether a cooling system is required or heating system is required when the external temperature is 3°C. How the result will change, if the U-value of the building is reduced to 0.36 W/m K?**[10]**

OR

Q8) a) Explain the energy conservation building code. **[10]**

b) How do one achieve energy conservation in the air conditioning in the building? Explain in detail. **[8]**

Q9) a) Explain the Rotary Desiccant Dehumidifier with diagram. **[8]**

b) Write a note on Liquid Spray Tower. **[8]**

OR

Q10)a) Explain the use of "Heat Pump" for heating and cooling cycle. **[8]**

b) Explain thermal storage air conditioning system. **[8]**

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