

Total No. of Questions : 10]

SEAT No. :

P3881

[5561]-537

[Total No. of Pages : 3

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 40°C an evaporative temperature of 0°C 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

$$h_1 = 187.5 \text{ kJ/kg}, h_2 = 213.96 \text{ kJ/kg}, h_3 = 74.6 \text{ kJ/kg} = h_4$$

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

OR

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

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

P.T.O.

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 m³/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)** Explain in detail: [8]
- i) Air Spaces and
 - ii) Sol Air temperature
- b) A building has U-value of 0.5 W/m²K and total exposed surface area of 384 m². 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]**

