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Thermal conductivity of glass and air = 1.4 W/mK and 0.025 W/mK

How the calculated parameters would be affected if the window is made of single glass 12 mm thick. 15

Section-D

8. Explain the following : 15
- (a) Temperature sensors
 - (b) Pressure sensors
 - (c) Humidity sensors
9. Describe with neat sketch, the construction and working principle of a (i) reciprocating compressor (ii) centrifugal compressor. 15

3609

B. Tech. (ME)-PEC-II 7th Semester
G-Scheme Examination, July-2022

REFRIGERATION AND AIR-CONDITIONING

Paper-PEC-ME-401-G

Time allowed : 3 hours]

[Maximum marks : 75

Note : Attempt five questions in all, selecting one question from each section. Question No. 1 is compulsory.

All questions carry equal marks.

1. Explain the following : 6×2.5=15
- (a) The COP of an ideal Bell Column cycle depends upon the ratio of upper and lower _____ Limits.
 - (b) Define coefficient of performance of refrigeration and heat pump.
 - (c) Define 1 ton of refrigeration.
 - (d) Define reversed carnot cycle.
 - (e) Define secondary refrigerants with suitable example.
 - (f) Define by-pass factor.

3609

3609-P-4-Q-9 (22)

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(2)

3609

Section-A

2. What is a refrigerant ? How can you classify the refrigerants ? And also explain the numbering system for refrigerants in details. 15
3. In an air craft refrigeration unit, the atmospheric temperature and pressure are 283 K and 0.9 bar respectively and this pressure increases to 1.013 bar due to ramming effect. The air is bled from the engine compressor at 3.5 bar and is passed through the air cooled heat exchanger where its temperature is reduced by 50°C. The air is then expanded in the cooling turbine, delivered to the aircraft cabin and subsequently leaves the aircraft at 25°C. The pressure in the cabin is 1.01 bar and the aircraft has a cooling load of 10 tons. Calculate the power required to undertake the cooling load and COP of the system.
It may be assume that both compression and expansion processes are isentropic and there is no pressure loss in the heat exchanger.
For air $C_p = 1.005 \text{ kJ/kgK}$ and $\gamma = 1.4$ 15

3609

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3609

Section-B

4. Explain the Simple Vapour Compression Refrigeration systems and also discuss the limitations of Reversed Carnot cycle with vapour as the refrigerant. 15
5. Discuss the properties of Aqua ammonia and Electrolux Refrigeration process. 15

Section-C

6. Establish the following expression for air-vapour mixture : 15
Specific humidity $\omega = 0.622 \times \frac{P_v}{P_1 - P_v}$
7. A double glazed window is made of 2 glass panes of 6 mm thick with an air gap of 6 mm between them. Assuming that the air layer, is stagnant and only conduction is involved, determine the overall heat transfer coefficient and heat flow from outside ambient to indoor. Take the following data: Ambient and inside temperatures = 40°C and 22°C
Outside and inside heat transfer coefficients = 9 W/m²K and 15 W/m²K

3609

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