

Ambient and inside temperatures = 40°C and 22°C
Outside and inside heat transfer co-efficient =
 $9\text{W}/\text{m}^2\text{K}$ and $15\text{W}/\text{m}^2\text{K}$
Thermal conductivity of glass and air = $1.4\text{W}/\text{m K}$
and $0.025\text{W}/\text{mK}$

SECTION - D

8. A single acting single stage reciprocating compressor of 20cm bore and 20cm stroke is so constructed that its clearance volume is 5% of active stroke. The compressor receives refrigerant at 1 bar, turns 500 rev/min and delivers the compressed refrigerant at 5 bar. Presuming that the compression and expansion curves follow the polytropic law $p v^{1.3} = \text{constant}$, make calculations for the volumetric efficiency of the compressor and the power required to run it. 20
9. Explain regenerative air refrigeration system for aircraft with neat sketch. 20

Roll No.

24477

B. Tech. 7th Semester (ME)
(Common with Special Chance)
Examination – December, 2019
REFRIGERATION & AIR-CONDITIONING

Paper : ME-403-F

Time : Three Hours] [Maximum Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any five questions in all. Question No. 1 is compulsory. Attempt other four questions by selecting any one question from each Section. All questions carry equal marks.

1. (a) What is meant by COP ? What value of COP is desirable large or small and why ?
(b) Define 1 ton of refrigeration.
(c) The bell coleman cycle uses as the working fluid.
(d) What is the prime consideration in the design of refrigeration system of an aircraft ?
(e) Which part of the vapour compression refrigeration cycle produces the refrigerating effect ?

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- (f) Discuss the desirable properties of a refrigerant.
- (g) Name 3 components of vapour absorption system, which are used to replace compressor of vapour compression system.
- (h) Write the merits of water cooled condenser over air cooled condenser.
- (i) Define "Dalton's law of partial pressure".
- (j) What are the necessary conditions of air for human comfort?
 $2 \times 10 = 20$

SECTION - A

2. (a) Define cryogenics and enumerate it's applications.
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- (b) Write down the chemical formula and name of the following refrigerants:
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R-11, R-12, R-22 & R-717

3. An air refrigeration system used for food storage provides 25 tons of refrigeration. The temp of air entering the compressor is 7°C and temp. at exit from the cooler is 27°C. The quantity of air circulated in the cooler is 3000 Kg/hr. both the compression and expansion follow the polytropic law $p v^{1.3} = \text{constant}$.
 Compute.
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(a) COP of the cycle.

(b) power required by the compressor per ton of refrigeration.

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SECTION - B

4. A standard vapour compression cycle developing 50 KW of refrigeration using refrigerant R-22 operates with a condensing temp. of 35°C and an evaporating temp. of -10°C. Calculate:
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- (a) the refrigerating effect in KJ/Kg.
- (b) the circulation rate of refrigerant in KG/sec.
- (c) the power required by the compressor in KW
- (d) the COP
- (e) the volume flow rate measured at the compressor suction
- (f) the power per KW of refrigeration

5. Explain two-stage compression with liquid intercooler with the help of neat sketch. Also draw p-h diagram.
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SECTION - C

6. An air-water vapour mixture at 20°C and 760 mm mercury has a relative humidity of 70%. Determine (a) partial pressure of vapour and air (b) humidity ratio (c) saturation ratio (d) dew point (e) density of mixture.
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7. A double glazed window is made of 2 glass panes of 6mm thick with an air gap of 6mm between them. Assuming that the air layer is stagnant and only conduction is involved, determine the overall heat transfer co-efficient and heat flow from outside ambient to indoor. Take the following data :
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