

Total No. of Questions : 12]

SEAT No. :

**P813**

[Total No. of Pages : 6

**[4659]-56**

**B.E. (Mechanical) (Sandwich)**

**a-REFRIGERATION AND AIR CONDITIONING**

**(2008 Pattern) (Semester-I) (Elective-II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer 3 questions from Section-I and 3 questions from Section-II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) Write a note on vortex refrigeration. [4]
- b) What is the necessity of air craft refrigeration? [4]
- c) Explain Boot strap system with a neat sketch and T-S diagram. [8]

OR

- Q2)** a) Write a note on evaporative refrigeration. [4]
- b) Explain the concept of 'DART'. [4]
- c) Explain Reduced Ambient System with a neat sketch and T-S diagram. [8]

- Q3)** a) How refrigerants are classified? [4]
- b) Explain GWP and ODP of a refrigerant. [6]
- c) Write a note on desirable properties of refrigerants. [6]

OR

**P.T.O.**

- Q4)** a) Write a note on 'Nomenclature of Refrigerants'. How organic substances used as refrigerants are designated? [4]
- b) What are selection criteria of a refrigerant? [6]
- c) Discuss Montreal protocol and Kyoto protocol. [6]
- Q5)** a) Explain cascade system with a neat sketch. [6]
- b) Derive an expression for cop of an ideal vapour absorption cycle. [4]
- c) Calculate power required by two compressors in an ammonia system which serves a 250 kW evaporator at  $-25^{\circ}\text{C}$  and uses flash intercooler in between two compression stages. The condenser pressure is 14 bar. Find cop of the system. [8]

OR

- Q6)** a) Explain with neat sketch and p-h diagram 'two stage compression with flash gas removal'. [8]
- b) Write a note on 'Electrolux Refrigeration System'. [6]
- c) An aqua ammonia absorption cycle has a generator temperature of  $120^{\circ}\text{C}$  and evaporator temperature of  $-20^{\circ}\text{C}$ . The ambient temperature is  $30^{\circ}\text{C}$ . Estimate the maximum possible cop. Also find the capacity in TR per kW of heat supplied. [4]

### SECTION-II

- Q7)** a) What are the factors that one has to keep in mind while selecting an air-conditioning system? Explain unitary or central air-conditioning system. [8]
- b) A building has the following calculated cooling loads:

$$\text{RSH gain} = 310 \text{ kW}$$

$$\text{RLH gain} = 100 \text{ kW}$$

The space is maintained at the following conditions:

$$\text{Room DBT} = 25^{\circ}\text{C}$$

$$\text{Room RH} = 50\%$$

Outdoor air is at  $28^{\circ}\text{C}$  and 50% RH. And 10% by mass of air supplied to the building is outdoor air. If the air supplied to the space is not to be at a temperature lower than  $18^{\circ}\text{C}$ , find:

- i) Minimum amount of air supplied to the space in  $\text{m}^3/\text{s}$ .
- ii) Capacity, ADP, BPF and SHF of the cooling coil. [8]

OR

**Q8)** Write short notes on the following: [16]

- a) Automobile air conditioning system.
- b) All air system.
- c) All water system.
- d) Room Sensible Heat Factor.

**Q9)** a) List the various controls necessary for a modern air conditioning system. Describe the working of any one type of control used for-

- i) flow of air,
  - ii) bacteria. [6]
- b) Write short note on duct design methods. [6]
  - c) Write a short note on humidistat. [6]

OR

- Q10)a)** What are the desirable properties of an ideal duct material? Name some commonly used duct materials. [6]
- b) Explain the meaning of (i) throw (ii) drop (iii) spread. [6]
- c) What is basic refrigeration control? Explain any one controlling element with a neat sketch. [6]

- Q11)a)** Explain briefly the following
- i) Bacteria ii) Molds & iii) Yeast
- with reference to the food preservation. [6]
- b) Why do you require to preserve food and vegetable products? [4]
- c) Explain the ideal liquefaction cycle for a gas. [6]

OR

- Q12)a)** What are the limitations of vapour compression systems for the production of low temperature? [6]
- b) Write a short note on cold storage. [6]
- c) Explain various applications of cryogenics. [4]



