(4 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.
(2) Answer any **four** questions out of remaining **six** questions.
(3) Answers to **all** parts of a question should be written **together** one below the **other**.
(4) Assume any **suitable** data wherever **required** but justify the **same**.
(5) Use of **refrigeration** tables and charts are **permitted**.

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1. (a) An air conditioner of 1·5 TR capacity has a power input of 1·2 kW. Find EER (1TR = 12,000 Btu/h). 4
(b) A compressor operating with an SST of 15°C and a SDT of 40°C delivers 100 TR when system is charged with refrigerant R 12. What will be the system capacity if the refrigerant is changed to R 22 ? 6
(c) A refrigeration plant using ammonia is provide 150 kW of refrigeration at –15°C and 50 kW at –30°C. Condensation is at + 40°C The system uses 2-stage compression with intercooling. The discharge pressure of the low stage compressor and suction pressure of high stage compressor is equal to pressure in –15°C evaporator. Draw a neat sktech of the system and determine the power required and COP. Assume dry saturated compression and sub cooling of 5°C. 10

2. (a) What is meant by 'superheat horn' in a vapor compression cycle ? 4
(b) For a compressor with fixed displacement and condensing temperature, discuss the variation of mass flow rate and power input with change in evaporating temperature. 6
(c) What is the need for purging in a refrigerant system ? Give a schematic of the system used for the same. 10

3. (a) What is the need for capacity control of a compressor ? Describe any one method in detail. 10
(b) With a neat sketch explain the working of a thermostatic expansion valve. List the main advantages and disadvantages. 10

4. (a) The power input to a compressor used in a refrigeration system with an air cooled condenser is more than that if the system had water cooled condenser. State if this statement is true or false and justify your answer. 6
(b) Discuss the effect of fouling factor on the performance of a refrigeration system. 4
(c) Discuss the essential components of a cooling tower. What is meant by NTU of the tower ? What is its significance ? 10

5. (a) What are ecofriendly refrigerants ? 6
(b) What materials are used to insulate cold storages ? Explain what is optimum economic insulation ? 8
(c) What do you understand by pull down condition and normal condition of a refrigeration plant ? 6

6. (a) Compare Li Br–water and aqua ammonia absorption refrigeration systems. 8
(b) Explain the phenomena of crystallization in a Li Br-water system. Which is the location most susceptible to crystallization ? 6
(c) Discuss the different types of evaporators used in refrigeration practice. 6

7. Write notes on the following :– 20
(a) Balancing of a refrigeration system
(b) Comparison of scroll and reciprocating compressors
(c) Safety controls incorporated into a refrigeration system
(d) Refrigeration applications in a milk processing plant.