

R15

Code No: 126ZM

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, March - 2024

REFRIGERATION AND AIR CONDITIONING

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 75

Note: i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART- A

(25 Marks)

- 1.a) Explain the term "Ton of Refrigeration". [2]
- b) Why refrigeration is required in air crafts? [3]
- c) What are the types of expansion devices? [2]
- d) What are the advantages and disadvantages of compressor? [3]
- e) Name principle components of vapor compression refrigeration cycle. [2]
- f) Represent ideal vapor compression cycle on T-S and P-H diagram. [3]
- g) What is the meaning of sensible heat and latent heat? [2]
- h) What is the difference between wet bulb temperature and thermodynamic wet bulb temperature? [3]
- i) What is a heat pump? [2]
- j) What are the features required for the proper selection of a fan? [3]

PART- B

(50 Marks)

2.a) Explain Boot strap evaporative cooling air refrigeration system. Draw its schematic and represent the processes on T-S diagram.

b) What are the differences between ideal and actual cycle? [5+5]

OR

3.a) Explain Carnot refrigerator.

b) What is the effect of sub cooling of liquid in refrigeration system? [5+5]

4.a) What is an evaporator?

b) Explain the working of a compressor. [4+6]

OR

5.a) What are condensers? How are they used in refrigeration? Classify them.

b) What is the working principle of an evaporator? [5+5]

6.a) Derive an equation of COP for Bell-Coleman Air-refrigerator show different processes on P-V and T-S Diagram

b) What is a Li Br Water system? [6+4]

OR

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- 7.a) An air refrigerator working on the principle of Bell-Coleman cycle. The air into the compressor is at 1 atm at -10°C . It is compressed to 10 atm and cooled to 40°C at the same pressure. It is then expanded to 1 atm and discharged to take cooling load. The air circulation is 1 kg/s. The isentropic efficiency of the compressor = 80%. The isentropic efficiency of the expander = 90%. Find the following: i) Refrigeration capacity of the system ii) C.O.P of the system Take $\gamma = 1.4$, $C_p = 1.00 \text{ kJ/kg } ^{\circ}\text{C}$ (solution)
- b) Explain steam jet refrigeration system. [5+5]

- 8.a) Explain the terms ASHF and ESHF.
b) Explain the concept of human comfort and effective temperature? [5+5]

OR

- 9.a) What are the psychometric properties and processes?
b) A simple saturation cycle using F12 is designed for taking a load of 10 tons. The refrigerator and ambient temperatures are -10°C and 300°C respectively. A minimum temperature difference of 50°C is required in evaporator and condenser for heat transfer. Find: i) mass flow rate through the system ii) power required in kw. iii) Cylinder dimensions assuming $L/D = 1.2$ for single cylinder, single acting compressor if it runs at 300 r.p.m. with volumetric efficiency = 0.9. [5+5]

- 10.a) What are the design considerations for an ideal blower and fan?
b) Draw different heat pump circuits and explain. [5+5]

OR

- 11.a) What is the equipment used for humidification and dehumidification in air conditioning systems.
b) Explain about heat source in air conditioning system? [5+5]

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