

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (NEW) EXAMINATION – WINTER 2021****Subject Code:3171918****Date:15/12/2021****Subject Name:Refrigeration and Air conditioning****Time:10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.
5. Use of Gas, Steam and Refrigerant table is permitted

- Q.1** (a) Distinguish between primary and secondary refrigerants. Give example of each category. **03**
- (b) What is cascade refrigeration system? **04**
- (c) Differentiate between simple and boot-strap air refrigeration system. **07**
- Q.2** (a) What is meant by compound or multi-stage vapour compression system? List the advantages of this system over single-stage vapour compression system. **03**
- (b) An ice plant has been set up for producing 2000 kg of ice per hour at -10°C from water available at room temperature of 25°C . Determine the (i) refrigeration effect and the tonnage required (ii) power rating of the compressor if COP of the plant is 3.2 and the overall electro-mechanical efficiency is 85%. Take specific heat of water as 4.18 kJ/kg K, enthalpy of solidification of ice as 335 kJ/kg and specific heat of ice below 0°C as 2.1 kJ/kg K. **04**
- (c) Draw the schematic arrangement of the various components comprising lithium bromide – water absorption system and explain its working. **07**
- OR**
- (c) Sketch a thermostatic expansion valve. Name its different parts and explain how it operates. **07**
- Q.3** (a) Define human comfort and explain the factors which affect it. **03**
- (b) What is meant by the term infiltration? How an estimate can be made of air leakage through window and door cracks? **04**
- (c) Calculate the cooling load of your own bedroom. Mention size and location of your room. What capacity air conditioner will you purchase for it? **07**
- OR**
- Q.3** (a) Define effective temperature and state the factors which affect it. **03**
- (b) A refrigeration system working on reversed Brayton cycle operates between pressure limits of 1 bar and 5 bar. The temperature at inlet to compressor and expander are 30°C and 40°C respectively. The isentropic efficiency for compression is 0.8 and the same for expansion is 0.9. if the capacity of the system is 5 tons of refrigeration, determine (a) mass flow rate of air and (b) power input to the compressor. **04**
- (c) Explain with a neat line diagram sketch of a summer air conditioning system. **07**
- Q.4** (a) List the different sources of heat gain in the enclosed space. **03**

- (b) What are the advantages of split air conditioner with comparison to window air conditioner? **04**
- (c) The main air supply duct of an air conditioning system is 800 mm x 600 mm in cross section, and carries 300 m³/min of standard air. It branches into two ducts of cross section 600 mm x 500 mm and 600 mm x 400 mm. If the mean velocity in the larger branch is 480 m/s, find (1) mean velocity in the main duct and the smaller branch (2) mean velocity in each duct. **07**

OR

- Q.4** (a) State the importance of indoor air quality in a building. **03**
- (b) Mention desirable properties of refrigerants. Enlist some modern ecofriendly refrigerants. **04**
- (c) With proper line diagram and p-h diagram, explain two-stage compression with water intercooler, liquid sub-cooler and liquid flash chamber. **07**
- Q.5** (a) What is hermitically sealed compressor? Point out its salient features. **03**
- (b) List out the characteristics if a good air distribution system. **04**
- (c) A standard VCR cycle developing 50 kW of refrigeration using refrigerant R-22, operates with a condensing temperature of 35 °C and an evaporating temperature of -10 °C. Calculate: (1) the refrigeration effect (2) the circulation rate of refrigerant (3) power required by compressor (4) COP (5) volume flow rate measured at the compressor suction (6) power per kW of refrigeration (7) the compressor discharge temperature. **07**

OR

- Q.5** (a) State the purpose of refrigerant flow control device and name the different types of flow control devices. **03**
- (b) Write a short note on Electrolux Refrigerator. **04**
- (c) Explain central air conditioning system with a neat sketch. Where such system is more advantageous? **07**
