

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC- SEMESTER VII- • EXAMINATION – SUMMER - 2016

Subject Code: X71901**Date: 23/11/2016****Subject Name: Refrigeration and Air-Conditioning****Time: 10:30 AM to 1:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of psychrometric chart is permitted.

- Q.1 (a)** Draw a neat named schematic of a Boot strap air refrigeration system without evaporative cooling. Represent it on t-s diagram. Explain its working. Name any four advantages of air cycle being used for air-craft applications. **07**
- (b)** Compare vapour compression refrigeration system and vapour absorption refrigeration system with reference to the following points. **07**
- (i) Type of energy used (ii) control of evaporator pressure (iii) Quality of evaporator vapour (iv) capacity
- Q.2 (a)** Develop an expression for theoretical COP of an absorption system. Also show that it is a combination of cyclic heat engine and a cyclic refrigerator. **07**
- (b)** Draw the schematic of steam jet refrigeration system. Write appropriate value of temperature in the flash chamber and condenser. Explain its working. Name the refrigerant used. State the purpose of make up water supplied. **07**
- OR**
- (b)** (i) Draw the neat named schematic of an Automatic expansion valve. Explain why such a valve is suitable for small equipment having relatively constant loads. **04**
- (ii) Discuss the following thermodynamic properties of ideal refrigerants. **03**
- Critical temperature and pressure, enthalpy of evaporation, specific heat
- Q.3 (a)** (i) Draw a schematic having two evaporators, individual compressor, multiple expansion valve arrangement and flash chamber. Represent it on p-h diagram. Develop an expression for power required to drive the system and COP. **05**
- (ii) Explain why Flash gas removal is always desirable in a vapour compression refrigeration System. **02**
- (b)** 50 m³ of air per minute at 30°C dbt and 20°C wbt is passed over the cooling coil whose surface temperature is 5°C. The coil cooling capacity is 3.5 TR under the given condition of air. Determine dbt and wbt of air leaving the cooling coil, the bypass factor and water condensation rate. **07**
- OR**
- Q.3 (a)** Define the following terms: **07**
- Specific humidity, degree of saturation, relative humidity, dry bulb temperature, Wet bulb depression, dew point temperature, sensible heat factor
- (b)** Write short note on flywheel effect of building material and its use in design. **07**
- Q.4 (a)** A duct of 14 m length passes air at the rate of 80 m³/min. Assuming the friction factor as 0.006, calculate the pressure drop in the duct in mm of water when (i) The duct is circular of diameter 0.25 m and (ii) the duct is of 0.25 m square cross section. **07**
- (b)** Explain with neat sketch window air conditioner. Name the psychrometric process taking place across the cooling coil. What are the advantages of split air conditioner in comparison with window air conditioner? **07**

OR

- Q.4** (a) Draw all water central air conditioning system. Enumerate its advantages and disadvantages. **07**
- (b) Explain air conditioning of residential and commercial building. **07**
- Q.5** (a) Explain with neat sketch steam injection humidifier **07**
- (b) Explain with neat sketch flooded type and dry expansion type evaporators. **07**
- OR**
- Q.5** (a) Explain with neat sketch absorption type dehumidifier. **07**
- (b) Define term effective temperature. Explain the factors affecting it. **07**
