

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE - SEMESTER-VIII • EXAMINATION – WINTER • 2014**

**Subject Code: 181901****Date: 04-12-2014****Subject Name: Refrigeration and Air conditioning****Time: 02:30 pm - 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Define Refrigeration. State types of refrigeration systems. Explain Bell-Coleman air refrigeration cycle. **07**
- (b) An air refrigeration open system operating between 100 KPa and 1 MPa is required to produce a cooling effect of 2000 kJ/min. Temperature of the air leaving the cold chamber is  $-5^{\circ}\text{C}$  and at leaving the cooler is  $30^{\circ}\text{C}$ . Neglect losses and clearance in the compressor and expander. Determine : **07**
- (i) Mass of air circulated per min,
  - (ii) Compressor work, expander work, cycle work ,
  - (iii) COP and power in kW required.

- Q.2** (a) A 5 tonne R-12 refrigeration plant has saturated suction temperature of  $-5^{\circ}\text{C}$ . The condensation takes place at  $32^{\circ}\text{C}$  and there is no undercooling of refrigerant liquid. Assuming isentropic compression, find **07**
- (i) COP of the plant,
  - (ii) Mass flow rate of refrigerant
  - (iii) Power required to run the compressor in KW.

Take the following properties of R-12.

P (bar)	Sat. Temp.( $^{\circ}\text{C}$ )	$h_f$ (KJ/Kg)	$h_g$ (KJ/Kg)	$S_g$ (KJ/Kg-K)
7.85	$32^{\circ}\text{C}$	130.5	264.5	1.542
2.61	$-5^{\circ}\text{C}$	95.4	249.3	1.557

- (b) State limitations of air refrigeration system. Explain construction and working of simple vapour compression refrigeration system with P-V,T-S and P-H diagram. **07**

OR

- (b) Write brief note on human comfort chart. **07**

- Q.3** (a) How subcooling improves performance of vapour compression refrigeration cycle? **07**
- (b) What is basic principle of Vapour absorption refrigeration system? Write brief note on Electrolux( $\text{NH}_3\text{-H}_2$ ) refrigerator. **07**

OR

- Q.3** (a) Explain multistage refrigeration system with intercooling between stages. **07**
- (b) Write brief note on Hermetically sealed compressor. **07**

- Q.4** (a) Explain working of steam jet refrigeration system. Also state applications, advantages and limitations of steam jet refrigeration system. **07**
- (b) Write brief note on natural refrigerants. **07**

**OR**

- Q.4 (a)** Define following terms: **07**
- (i) Saturated air
  - (ii) Specific humidity
  - (iii) Relative humidity
  - (iv) Absolute humidity
  - (v) Dry bulb temperature
  - (vi) Dew point temperature
  - (vii) Wet bulb depression

- (b)** The sling- psychrometer reads 35°C DBT and 25°C WBT calculate **07**  
followings:  
(i) Specific humidity (ii) Relative humidity (iii) Absolute humidity in air (iv)  
Dew point temperature (v) Enthalpy of the mixture per kg of dry air.  
Assume atmospheric pressure to be 1.01 bar.

- Q.5 (a)** Classify air conditioning systems and enlist factors affecting comfort air conditioning. **07**
- (b)** 40 m<sup>3</sup> of air at 35°C DBT and 50% R.H. is cooled to 25°C DBT maintaining **07**  
its specific humidity constant. Determine :  
(i) Relative humidity (R.H.) of cooled air ;  
(ii) Heat removed from air.

**OR**

- Q.5 (a)** State important applications of refrigeration system. Explain construction and **07**  
working of an Ice plant.
- (b)** Describe different methods of duct design. **07**

\*\*\*\*\*