01385

DIPLOMA IN ELECTRICAL AND MECHANICAL ENGINEERING (DEME)

Term-End Examination

December, 2010

BME-032 : REFRIGERATION & AIR-CONDITIONING

Time : 2 hours *Maximum Marks : 70*

Note : *All the questions are **compulsory.** Use of calculator is permitted.*

1. Select the correct answer from the given four alternatives for the following questions. **14x1=14**

   (i) The ratio between Refrigeration effect and Energy input in a refrigeration system is called as :

   (a) Efficiency.

   (b) COP.

   (c) Specific power.

   (d) None of above.

   (ii) The standard MKS unit of refrigeration is.

   (a) TR

   (b) Btu/min

   (c) Kcal/hr

   (d) kW

(iii) The driving force for refrigeration in vapour absorption refrigeration is

(a) Mechanical Energy.

(b) Thermal Energy.

(c) Electrical Energy.

(d) Chemical Energy.

(iv) In Domestic Refrigerator, the refrigeration system used is.

(a) Vapor Compression.

(b) Vapor Absorption.

(c) Vapor Condensation.

(d) Vapor Expansion.

(v) Screw Compressor is NOT suitable for which application ?

(a) Large capacity.

(b) High temperature.

(c) High pressure.

(d) High Compression efficiency.

(vi) Which one is NOT an Evaporator ?

(a) Dry expansion Evaporator.

(b) Flooded Evaporator.

(c) Finned tube evaporator.

(d) Scroll evaporator.

(vii) Conductivity of a refrigerant should be

(a) As high as possible.

(b) As small as possible.

(c) Moderate.

(d) None of the above.

(viii) Which has the designation of R 717

(a) Water

(b) Ammonia

(c) Carbon dioxide

(d) Methane

(ix) By the subcooling the refrigerant before throttling.

(a) refrigeration effect is increased.

(b) refrigeration effect is decreased.

(c) refrigeration remains same.

(d) none of the above.

(x) If T_c is the condenser temperature and T_e is the evaporator temperature, then COP of a Carnot Vapour compression cycle is given by

(a) $\frac{T_c}{T_c - T_e}$ (b) $\frac{T_e}{T_c - T_e}$

(c) $\frac{T_c - T_e}{T_c}$ (d) $\frac{T_c - T_e}{T_e}$

(xi) Absolute Humidity (ω) defined as:

(a) $\omega = \frac{M_a}{M_v}$ (b) $\omega = \frac{M_v}{M_a}$

(c) $\omega = \frac{M_v}{M_v + M_a}$ (d) $\omega = \frac{M_a}{M_v + M_a}$

Here : M_a is the mass of dry air in a given Volume of mixture and

M_v is the mass of water vapour.

(xii) In Psychrometric chart, wet Bulb temperature lines are.

(a) straight lines and uniformly spaced.

(b) inclined straight lines and non-uniformly spaced.

(c) inclined straight lines and uniformly spaced.

(d) straight lines and non-uniformly spaced.

(xiii) Which one of the following is food spoiling Agent ?

(a) Enzymes (b) Bacteria

(c) Molds (d) All of the above

(xiv) Often the fish are stored in tanks using refrigerated Sea water at

(a) 2°C (b) -1°C

(c) 0°C (d) -4°C

2. Answer *any two* of the following :

(a) (i) What is ton of refrigeration ? Express it in MKS and SI units. **4+3**

(ii) Define Refrigeration effect and COP.

(b) What are the essential parts of Simple Vapour Compression Refrigeration system ? Write their functions. **4+3**

(c) A cold storage plant is required to store 20 tonnes of fish. The fish is supplied at a temperature of 30°C. The sp.heat of fish above freezing point is 2.93 kJ/kg K. **7**

The sp.heat of fish below freezing point is 1.26 kJ/kg K. The fish is stored in cold storage which is maintained at $-8°C$. The freezing point of fish is $-4°C$. The latent heat of fish is 235 kJ/kg. If the plant requires 75 kW to drive it. Find

(a) Capacity of the plant, and

(b) Time taken to achieve cooling. Assume actual COP of the plant as 03 of the Carnot COP.

3. Answer *any two* of the following :

(a) Mention what are the components of single stage centrifugal compressors ? Write their applications. Explain the phenomenon of surge in centrifugal compressor. **4+3**

(b) What are the different types of condenser ? Explain the working of water cooled condenser. **3+4**

(c) State the function of expansion devices. What are comman types of expansion devices. Write in brief working of any one type of expansion device. **4+3**

4. Answer *any two* of the following :

(a) Define refrigerant. Differentiate between primary and secondary refrigerants. How refrigerants are designated ? **2+2+3**

(b) What are the safety and Economic criteria in selection of refrigerant. Why CFC's are phased out ? Which are the alternatives to CFC's ? **4+3**

(c) What is Cascade Refrigeration system ? Compare this system with multistage compression and evaporation. **4+3**

5. Answer any **two** of the following : 2+5

(a) Differentiate between specific and relative humidity prove $\phi = \frac{\mu}{1(1-\mu)\frac{Ps}{P}}$

(b) Differentiate between (old storage and freezers. Discuss in brief the different types of freezers. 2+5

(c) Differentiate between 3½+3½

(i) Marine and Truck Refrigeration.

(ii) Winter and summer Air conditioning.