00692

Diploma in Electrical and Mechanical Engineering

Term-End Examination

December, 2011

BME-043 : RAC/UTILIZATION

Time : 2 hours *Maximum Marks : 70*

Note : ***Question No.1 is compulsory. Answer four more questions from Q.2 to Q.7. Use of calculator is permitted.***

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1. Choose the correct answer from the given alternatives : **14x1=14**

(a) The most commonly used method for the design of duct size is the :

(i) velocity reduction method

(ii) equal friction method

(iii) static regain method

(iv) dual or double method.

(b) During sensible cooling of air :

(i) its wet bulb temperature increases and dew point remains constant

(ii) its wet bulb temperature decreases and the dew point remains constant

(iii) its wet bulb temperature increases and the dew point decreases.

(iv) its wet bulb temperature decreases and dew point increases.

(c) The effective temperature is a measure of the combined effects of :

(i) dry bulb temperature and relative humidity

(ii) dry bulb temperature and air motion

(iii) wet bulb temperature and air motion

(iv) dry bulb temperature, relative humidity and air motion.

(d) The Fourier's law of heat transfer by conduction is expressed as :

(i) $Q = KA^2 \frac{dt}{dx}$

(ii) $Q = KA \frac{dt}{dx}$

(iii) $Q = K^2A \frac{dx}{dt}$

(iv) $Q = K^3A \frac{dx}{dt}$

(e) The thermal conductivity is expressed as :

(i) $W/m\text{-}K$ (ii) W/m^2K

(iii) $W/h\ mK$ (iv) $W/h^2\ m^2\ K$

(f) The conduction through flat composite wall is given by :

(i) $$Q = \frac{t_1 - t_4}{\frac{x_1}{K_1 A} + \frac{x_2}{K_2 A} + \frac{x_3}{K_3 A}}$$

(ii) $$Q = \frac{t_1 - t_4}{\frac{K_1 A}{x_1} + \frac{K_2 A}{x_2} + \frac{K_3 A}{x_3}}$$

(iii) $$Q = \frac{(t_1 - t_4)A}{\frac{K_1}{x_1} + \frac{K_2}{x_2} + \frac{K_3}{x_3}}$$

(iv) $$Q = \frac{\frac{K_1 A}{x_1} + \frac{K_2 A}{x_2} + \frac{K_3 A}{x_3}}{(t_1 - t_4)}$$

Where Q = heat transfer ; t_1, t_2, t_3, and t_4 are temperatures on surfaces of composite wall, x_1, x_2, x_3, and x_4 are thicknesses of different composite wall layers.

(g) The quantity of heat radiation is dependent on :

(i) area of the body only

(ii) shape of the body only

(iii) temperature of the body only

(iv) none of the above.

(h) In a centrifugal air compressor, the pressure ratio is increased by :

(i) increasing the speed of impeller keeping its diameter fixed

(ii) increasing the diameter of the impeller keeping its speed constant

(iii) reducing inlet temperature, keeping impeller diameter and speed fixed

(iv) all of the above

(i) for saturated air :

(i) wet bulb depression is zero

(ii) wet bulb depression is positive

(iii) wet bulb depression is negative

(iv) wet bulb depression can be either positive or negative

(j) An air washer can work as a :

(i) filter only

(ii) humidifier only

(iii) dehumidifier only

(iv) all of the above

(k) The relative humidity, during sensible heating :

(i) can increase or decrease

(ii) increases

(iii) decreases

(iv) remains constant

(l) The relative humidity, during heating and humidification :

(i) increases

(ii) decreases

(iii) may increase or decrease

(iv) remains constant.

(m) The processes of a Carnot cycle are :

(i) two adiabatic and two constant volume

(ii) two adiabatics and two isothermals

(iii) two constant volumes and two isothermals

(iv) two isothermals and two isentropics

(n) During throttling Process :

(i) internal energy does not change

(ii) pressure does not change

(iii) entropy does not change

(iv) enthalpy does not change.

2. (a) Enumerate the three modes by which heat can be transferred from one place to another. 7+7

(b) Derive an expression for heat loss in kJ/m^2 - hr. through a composite wall of layers without considering convective heat transfer co-efficients.

3. (a) Define the term 'air conditioning'. Enumerate the main parts of the equipment in the air-conditioning cycle. 7+7

(b) What is the 'aspect ratio' of a duct ? What is the recommended aspect ratio for the rectangular ducts. ?

4. (a) State the advantages of central air-conditioning system over unitary system of air-conditioning. 7+7

(b) What is the necessity for insulating cold storage ? Name the commonly used insulating materials, their advantages and disadvantages.

5. (a) Describe briefly with a neat sketch a window type air-conditioner. 7+7

(b) The discharge pressure of a refrigeration system is found to be high. How will one establish the reason for this cause and take corrective action for system with :

(i) an air-cooled condenser, and

(ii) water cooled condenser.

6. (a) What is the function of a filter ? How are air filters classified ? 7+7

(b) Why should the refrigerant temperature inside the evaporator be lower than the refrigerator cabinet temperature ? What is ton of refrigeration ?

7. Write short notes on ***any four*** of the following : **4x3½=14**

(a) Ventilation

(b) Metabolic Rate

(c) Air washer

(d) Bypass factor

(e) Water cooled condenser

(f) Float valves.