International Islamic University Chittagong
Department of Electrical and Electronic Engineering

Final Examination Spring-2018 | Program: B.Sc. Engg. (EEE)
Course Code: ME-2301 | Course Title: Fundamental of Mechanical Engineering
Time: 2 hours 30 minutes | Full Marks: 50

Figures in the right margin indicate full marks.

Part A
[Answer any ***two*** questions from the followings]

1(a). Show that the COP of Heat Pump is greater than Unity. **3**

1(b). What are the difference between vapour Absorption Refrigeration and vapour Compression Refrigeration System? **2**

1(c). The capacity of a refrigeration is 205 TR when between 0°C and 25°C. Determine the Mass of Ice produce per day from water at 25°C. Also Find the power required to drive the unit. Assume that the cycle operates on reversed Carnot Cycle and latent heat of ice is 335 KJ/Kg. **5**

2(a). Write short note on: **2**
i). Compressor. ii). Condenser.

2(b). Write down chemical formula and chemical name of given Refrigerant : **3**
i). R22 ii). R234 iii). R744

2(c). Temperature limits of an ammonia refrigeration system are 25°C and -10°C, if the gas is dry at the end of compression, calculate the coefficient of performance of the cycle assuming no under cooling of the liquid ammonia. Use the following table for properties of ammonia: **5**

Temperature (°C)	Liquid heat (kJ/kg)	Latent heat (kJ/kg)	Liquid entropy (kJ/kgK)
25	298.9	1166.94	1.1242
-10	135.37	1297.68	0.5443

3(a). Make a list of Applications of Refrigeration in chemical and process Industries. **3**

3(b). Show the relationship between refrigeration and air conditioning. **2**

3(c). A machine working on a Carnot Cycle operates between 300K and 255K. Determine the COP. When it is operated as 1. A Refrigerator 2. A Heat Pump 3. Heat Engine **5**

Part B

[Answer any ***three*** questions from the followings.]

4(a). Define the following: 3

i) Dry Air ii) Dew point temperature. iii) Relative humidity.

4(b). By using Psychometric Chart Show how Sensible Cooling works? 2

4(c). 6kg of air at 40^0C dry bulb temperature and 50% relative humidity is mixed with 9kg of air at 20^0C dry bulb temperature and 20^0C dew point temperature. Calculate specific humidity and the dry bulb temperature of the mixture. 5

5(a). What is Draft Tube? Briefly explain the types of Draft Tube. 3

5(b). Sketch a summer Air Conditioning system. 2

5(c). An air conditioning plant is required to supply 58 m3 of air per minute at a of 20^0C DBT and 54% R.H. The outside air is at DBT of 29^0C and 62% R.H. Determine the mass of water drained and capacity of the cooling coils. Assume the air conditioning plant first to dehumidify and then to cool the air. 5

6(a). Show that for the maximum hydraulic efficiency wheel velocity (v) should be half of the Jet velocity (V). 5

6(b). A Pelton wheel develops 2000kW under a head of 100metres, and with an overall efficiency of 85%. Find the diameter of the nozzle, if the coefficient of velocity for the nozzle is 0.98. 5

7(a). What is negative slip of the pump? What are the reasons of Negative Slip of Pump 2

7(b). What are the equipment's used in air conditioning system? Describe them. 3

7(c). A centrifugal pump is to discharge water at the rate of 110 liters/second at a speed of 1250 R.P.M against ahead of 25 meters. The impeller diameter is 250 mm and its width 50 mm. if the manometric efficiency is 74%, determine the vane angle at the outer periphery. 5