Question bank (G scheme)

Name of Subject: Heat Transfer Operation

Subject code: 17560

Semester: Fifth **Course: CH**

Unit test I

Chapter 1 – Conduction (18 marks)

3 marks question

1. Explain convection as a mode of heat transfer

2. Explain conduction with example

3. Fourier's law with mathematical expression and explain the terms involved

4. Give the unit of thermal conductivity in S.I and MKS

5. What is the effect of temperature on Thermal conductivity?

6. Explain optimum thickness of insulation

8 marks question

1. Derive an expression to calculate rate of heat flow through a cylinder

2. Derive an expression to calculate rate of heat flow through a sphere

3. Derive an expression to calculate rate of heat transfer through furnace wall made of three different materials.

4. A steam pipe line 150/160mm in diameter carries steam. The pipe line is lagged with a layer of heat insulating material(k=0.08W/mK) of thickness 100 mm. The temperature drops from 392.8K to 313K across the insulating surface. Determine the rate of heat loss per 1m length of pipe line.

5. A wall of 0.5 m thickness is constructed using a material having k= 1.4 W/mK. The wall is insulated with a material having k of 0.35 W/mK so that heat loss per m^2 is 1500W. The inner and outer temperatures are 1273K and 373 K respectively. Calculate the thickness of insulation required

and
temperature of at the interface between the two layers.

Chapter 2 – Convection (36 marks)

3 marks question

1. Counter current heat exchangers are more common than co current heat exchangers. Why?

2. Define film wise condensation and drop wise condensation.

3. What is nucleate boiling and film boiling

4. Write down the following equations

a) Sider Tate equation b) Dittus Bolter equation

5. What is the difference between natural convection and forced convection?

6. Vertical condensers give lower heat transfer coefficient than horizontal condensers. Why?

7. Why heat transfer coefficients are low in case of film wise condensation?

8. Write down the unit of U in SI and MKS system

9. Write down the expression for LMTD for co current and counter current flow

8 marks question

1. Derive the relationship Q=U.A.LMTD

2. Differentiate between co current and counter current flow

3. Derive an expression to calculate the relation between individual and overall heat transfer coefficients

4. Cold water is flowing through heat exchanger at a rate of $15m^3$ /hr. It enters the heat exchanger at
303K and leaves at 328K. The hot thermic fluid enters the heat exchanger at the rate of $21m^3$/hr at a
temperature of 388K . Find out the area of heat transfer required assuming the flow is counter current
and U= 3490W/ m^2K

Density of cold fluid= $1000Kg/m^3$

Density of thermic fluid= $950Kg/m^3$

Sp.ht of cold fluid = 4.187KJ/KgK

Sp.ht of cold fluid = 2.93KJ/KgK

5. Calculate U from the following data

h_i =5800W/m^2K h_o=1750W/m^2K

d_o=30 mm d_i=20 mm