UCH 305 (Chemical Engineering Thermodynamics I)

Tutorial Sheet No. 1 (Basic Concepts)

Q.1 Specify whether the following systems are open or closed.

a. Boiler in steam power plant
b. Manually operated ice-cream freezer
c. Pressure cooker
d. Automobile battery
e. Reciprocating compressor
f. Gas turbine

Q.2 The turbine is supplied with steam at a pressure of 1.8 MPa guage.After expansion in the turbine, the steam passes through a condenser, which is maintained at a vacuum of 700 mm Hg by means of pumps. The barometric pressure is 770 mm Hg. What is the inlet and exhaust steam pressure in Pascal? Take the Density of Mercury as 13600 kg/m^3.

(1900 kPa, 9.3 kPa)

Q.3 A large chamber is separated into two compartments as shown in fig. 1.3 which are kept at different pressures. Pressure gauge A reads 175 kPa and pressure guage B reads 110 kPa.If the barometric pressure is 97 kPa, determine the reading of guage C ? (−65 kPa)

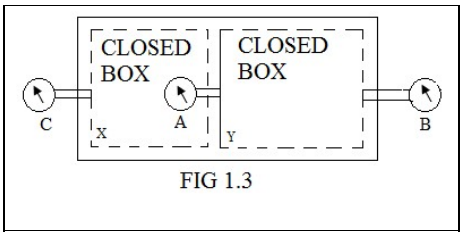

FIG 1.3

Q.4 A gas contained in two cylinders A and B connected by pistons of two different diameters as shown in fig 1.4. The mass of the piston is 10 kg and gas pressure inside the cylinder A is 200 kPa. Calculate the pressure in the cylinder B in kPa? All the dimensions are in mm. (1.91 MPa)

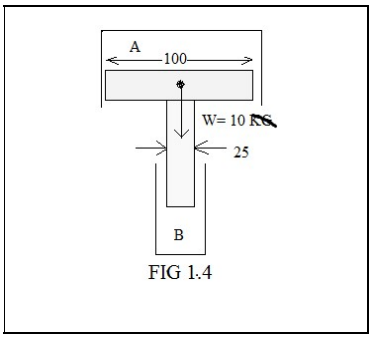

FIG 1.4

Q.5 Specify the nature of the following properties i.e. whether intensive or extensive

a) Mass
b) Pressure
c) Temperature
d) Potential Energy
e) Density
f) Volume
g) Specific Volume

Q.6 A U-tube manometer contains a fluid having a density of 800 kg/m^3. The difference in the height of the two columns is 300 mm.What pressure differences are indicated? What should be the height difference if the same pressure difference is measured using mercury?

Q.7 Consider two closed systems A and B. System A contains 3000 kJ of energy at 20°C, whereas system B contains 200 kJ of energy at 50°C. Now the systems are brought into contact with each other. Determine the direction of any heat transfer between the two systems.