**SIR ISSAC NEWTON COLLEGE OF ENGINEERING&TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**SUBJECT CODE/NAME: ME6502 HEAT AND MASS TRANSFER**

**YEAR/SEM: III/V DATE:15.09.2017**

**PART A (5\*2=10)**

**1.** what is black body?

**2.** state kirchoffs law?

**3.** define fin efficiency ?

**4,** write down the equation for heat transfer through composite pipes or cylinder and sketch?

**5,** state fourier laws of condition?

**PART – B (4\*10=40)**

**1(a).** A furnace wll emits radiation at 2000k.treating it is as black body radiation, calculate

(i)monochromatic radiant flux density at 1 µm wave length

(ii)wave length at which emission is maximum and the corresponding emissive power.

(iii)total emissive power.

(or)

**1(b).** the temperature of a black surface 0.25 m2 of area is 650˚c. calculate,

(1)the total rate of energy emission.

(ii)the intensity of normal radiation.

(iii)the wavelength of maxium monochromatic emissive power.

**2(a).** two large parallel planes at 800k and 600k have emissivities of 0.5 and 0.8 respectively. A radiation shield having an emissivity of 0.1 on one side and an emissivity of 0.05 on the other side is placed between the plates. Calculate the heat transfer rate by radiation per square meter with and without radiation shield. Comment on the results.

(or)

**2(b).** the inner sphere of liquid oxygen container is 40cm diameter and outer sphere is 50cm diameter. Both have emissivities 0.05. determine the rate at which the liquid oxygen would evaporate at -183˚c when the outer sphere at 20˚c latent heat oxygen is 210kj/kg.

**3(a).** A surface wall is made up of 3 layer one of fire brick, one of insulating brick and one of red brick. The inner and outer surface temperature are 900˚c and 30˚c respectively. The respective co-efficient of thermal conductivity of the layers are 1.2, 0.14 and 0.9 w/mk and the thickness of 20 cm, 8cm and 11 cm. assuming close bonding of the layers at the interfaces. Find the heat loss per square meter and interface temperature.

(or)

**3(b). a** composite slab is made of three layers 15 cm, 10cm and 12cm thickness respectively. The first layer is made of material with k=1.45 w/mk, for 60% of the area and the rest of material with k=2.5w/mk . the second layer is made of material with k=12.5 w/mk for 50% of area and rest of material with k=18.5 w/mk. The third layer is made of single material of k=0.76 w/mk. The composite slab is exposed on one side to warm at 26˚c and cold air at -20˚c the inside heat transfer coefficient is 15 w/m2k . the outside heat transfer is 20 w/m2k determine heat flow rate and interface temperature.

**4.** A Carbon steel (k = 55w/mk) 90 mm long rod with cross sectional area 5x10-3 m2 and permiter 0.69 m is attached to a plane wall which is maintained at a temperature of 400˚C. the surrounding environment is at 50˚C and heat transfer co-efficient is 90w/m2k. calculate the heat dissipated by the rod.