DEPARTMENT OF MECHANICAL ENGINEERING

CLASS:- M E 2	SEM:- V
SUBJECT:- HEAT TRANSFER	DATE:- **xx / 09 / 2016**
DURATION:- **60 min.**	MARKS:- **20**

CLASS TEST 01

Q.01 Attempt any two: (08 Marks)

a)	A pipe with a diameter of 2 cm is kept at a surface temperature of 40 degree C. Find the heat transfer rate per meter length of this pipe if it is (a) placed in an air flow in which the temperature is 50 degree C and (b) placed in a tank of water kept at a temperature of 30 degree C. The heat transfer coefficients in these two situations, which involve forced convection in air and (b) free convection in water, are estimated to be 20 W/m2K and 70 W/m2k respectively. Comment on the results in both the cases.	04
b)	A gas filled tube has 2mm inside diameter and 25 cm length. The gas is heated by an electrical wire of diameter 50 microns(0.05mm) located along the axis of the tube. Current and voltage drop across the heating element are 0.5 amps and 4 volts, respectively. If the measured wire and inside tube wall temperatures are 175 degree C and 150 degree C respectively, find the thermal conductivity of the gas filling the tube.	04
c)	A refrigerant suction line having outer diameter 30 mm is required to be thermally insulated. The outside air film coefficient of heat transfer is 12 W/m2degree C. The thermal conductivity of insulation is 0.3 W/m degree C. (i) Determine whether the insulation will be effective, (ii) Estimate the maximum value of thermal conductivity of insulating material to reduce heat transfer.	04

Q.02 Attempt any two: (12 Marks)

a)	An egg with mean diameter of 40 mm and initially at 20 degree C is placed in a boiling water pan for 4 minutes and found to be boiled to the consumer's taste. For how long should a similar egg for same consumer be boiled when taken from a refrigerator at 5 degree C. Take the following properties for egg, K = 10W/m degree C, Density = 1200 Kg/m3, c = 2 kJ/Kg degree C and h(heat transfer coefficient) = 100 W/m2 degree C. Use lump theory..	O6
b)	A Steel ball 50 mm in diameter and at 900 degree C is placed in still atmosphere at 30 degree C. Calculate the initial rate of cooling of the ball in degree C/min. Take Density = 7800 Kg/m3, c = 2kJ/Kg degree C (for steel), h = 30 W/m2 degree C. Neglect internal thermal resistance.	06
c)	Two long rods of the same diameter, one made of brass(k = 85 W/m degree C) and other made of copper(K = 375 W/m degree C) have one of their ends inserted into the furnace.Both of the rods are exposed to the same environment. At a distance 105 mm away from the furnace end, the temperature of the brass rod is 120 degree C.At what distance from furnace end the same temperature would be reached in the copper rod?	06