RCT – 3
HT

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Date……April, 2015
Time…….....30 Min.
Each Question……1 Mark
(No Negative Marking)

Q1. A solid copper ball of mass 500 grams, when quenched in a water bath at 30^0C, cools from 530^0C to 430^0C in 10 seconds. The temperature of the ball after the next 10 seconds is _____ K

Q2. A copper sphere weighing 3 kg is heated in a furnace to a temperature of 300^0C and is suddenly taken out and allowed to cool in ambient air at 25^0C. If it takes 60 min for the copper sphere to cool down to 35^0C, what is the average surface heat transfer coefficient. $\rho_{copper} = 8950 kg/m^3$, $C_p = 383 kJ/kg^0C$ .Also assume biot no. to be less than 0.1

(a) $0.045 w/m^2K$ (b) $45.33 w/m^2K$

(c) $4.53 w/m^2K$ (d) $453 w/m^2K$

Q3. A finned surface consists of root or base area of 1 m^2 and fin surface area of 2 m^2. The average heat transfer coefficient for finned surface is 20 w/m^2K. Efficiency of fins provided is 0.75. if finned surface with root or base temperature of 50^0C is transferring heat to a fluid at 30^0C. then rate of heat transfer is _____ watt

Q4. A 5 mm diameter spherical ball at 50^0C is covered by a 1 mm thick plastic insulation (k = 0.13 w/m^0C). The ball is exposed to a medium at 15^0C , with a convection heat transfer coefficient of 20 w/m^2 C. The plastic insulation will

a) Decrease the heat transfer from the wire
b) Not effect the heat transfer from the wire
c) Increase the heat transfer from the wire
d) None of the above

Q5. A cold can of juice $\left[m = 2.5kg, c_p = 4200 J/Kg^0C\right]$ at 5^0C is left on table in a room. Average temperature of the drink is observed to rise to 15^0C in 30 minutes. The average rate of heat transfer to the drink is

(a) 23 w (b) 29 w

(c) 58 w (d) 88 w

Q6. Alluminium fins $\left(\eta_{fin} = 0.99\right)$ of triangular profile are attached to a plane wall whose surface temperature is 250^0C. The fin base thickness is 2 mm and its length is 6 mm. The system is in ambient air at a temperature of 20^0C and the surface convection coefficient is 40 w/m^2k. The fin effectiveness is _____

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Q7. The Biot number can be thought of as the ratio of

a) The conduction thermal resistance to the convective thermal resistance
b) The convective thermal resistance to the conduction thermal resistance
c) The thermal energy storage capacity to the convective thermal resistance
d) The thermal energy storage capacity to the convection thermal resistance

Q8. An electronic semiconductor device generate heat equal to 480×10^{-3} watts in order to keep surface temperature at the upper safe limit of 70^0C, the generated heat is to be dissipated to the surrounding which is at 30^0C to accomplish this task, Alluminium fins of $[0.7\,mm]^2$ cross section and 12 mm long are attached to the surface. The thermal conductivity of Alluminium fins is 170 w/mK. The heat transfer coefficient h is 12 w/m^{2}k. If the tip is assumed to be insulated the no. of fins required are _____

Q9. A rectangular fin with length L and cross section area A is used to dissipate heat from a body in different surrounding conditions. The fin will be most effective in which of the following surrounding conditions

a) Still water
b) Still air
c) Water flowing at a uniform average velocity
d) An air filled room in which air is circulated with help of a fan

Q10. A cylindrical resistor of 1.2 cm length and 0.3 cm diameter dissipates 0.15 W of power in an environment at 40^0C. if heat to be transferred uniformly from all surfaces, and for a convective heat transfer coefficient of 9 w/m^2 C, the surface temperature of the resistor is _____ ^{0}C