AL-Qadisiya University
College of Engineering
CHEMICAL ENGINEERING DEPT.
Second semester test (2014-2015)
Examiner : Mustafa Jawad

Subject: Engineering analysis
Class: Third year
Time : 90 minute
Max. Marks: 100
Date: 13/5/2015

Answer all Question

Q1) Material (M) enters the tank with a flowrate (F_m) (m^3/hr) and temperature (θ_1). The temperature is raised to (θ_2) by a flow of hot water through the jacket with a flow of (F_w) (m^3/hr) and temperature of (T_1). The mass in the tank is constant and equal to (M),also the water in the jacket is constant at (W). If the temperature of outlet water from the jacket is (T_2) and ($T_2>\theta_2$). Find the variation of (θ_2) with time?

(25 mark)

Q2) A tank contains 150 kg of 15 % wt NaCl solution. Another aqueous solution containing 2 % wt NaCl is pumped into the tank at a rate of 30 kg/min. The tank is well mixed during the process and solution is discharged from it at the same rate. Calculate the time required to reduce NaCl content to 3 % wt NaCl?

(25 mark)

Q3) Solve the following partial differential equation by Laplace transformation:

$$\frac{\partial c}{\partial t} = D\frac{\partial^2 c}{\partial x^2}$$

i) $c(x,0)=0$
ii) $c(0,t)=c_i$
iii) $c(\infty,t)=0$

(25 mark)

Q4) Solve the following differential equation by using Laplace transformation:
($y^{=}+ 4y =16\ t$) at ($y^{-}(0) = -6$ and $y(0) =3$) (25 mark)

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