AGUWAMIRU ROSEMARY
17/ENG01/003
CHEMICAL ENGINEERING
TEST 4

(a) Modelling is the mathematical representation of a system. It is describing the system using mathematical concepts and language

(b) Methods of generating A model
i.) Using balance law
ii) Using partial differential equation
iii.) Differentiation

(c) $\frac{dT}{dt} = k(T - T_A)$

$$\int \frac{1}{T - T_A} dT = \int k dt$$

$$\ln(T - T_a) = kt + c$$
$$T - T_a = e^{kt+c}$$
$$T - T_A = e^{kt} \cdot e^{c}$$
$$T - T_A = T_0 e^{kt}$$

when $t = 0$

$$10 = 25 + T_0 e^{k(0)}$$
$$10 = 25 + T_0$$
$$T_0 = 10 - 25 = 15^\circ C$$
$$T_0 = -15^\circ C$$

$$T(t) = 25 - 15e^{kt}$$
at $t = 5\ min = 20^\circ$
$$20 = 25 - 15e^{k(5)}$$
$$15e^{kt} = 5$$
$$e^{kt} = 5/15$$

$5k = \ln(0.333)$

$k = -0.2197$

$T(t) = 25 - 15\exp -0.2197t$

d) Steady temperature of the system is 25°C

e) at $t = 24.9$°C

$24.9 = 25 - 15 \times \exp(-0.2197t)$

$-0.1 = -15\exp(-0.2197t)$

$\ln(-0.1/15) = -0.2197t$

$t = 22.8$ secs,

temperature of s

The system becomes stable at a temperature of 25°C,