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18/Eng02/070  
Computer Engineering  
Eng 281

Question 1

$$T_{\text{max}} = 10^{\circ}\text{C} \quad T = 20^{\circ}\text{C} \quad @ 5 \text{ mins}$$

$$T_{\text{actual}} = 25^{\circ}\text{C}$$

$$\frac{dT}{dt} \propto (T - T_A)$$

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

$$\frac{dT}{dt} = k(T - 25)$$

Collecting like terms

$$\frac{dT}{(T - 25)} = k dt$$

Integrating both sides

$$\ln(T - 25) = t k + C$$

$$\therefore T - 25 = e^{tk + C} \quad \text{where } e^C = A$$

$$T - 25 = e^{tk} \cdot e^C$$

$$T - 25 = A e^{tk}$$

$$T = A e^{tk} + 25$$

At initial conditions  $t = 0$   $T = 10^{\circ}\text{C}$

$$T_0 = A e^k - 25$$

$$A = 35$$

$$\therefore T = 35 e^{kt} - 25$$

$$\text{at } T = 30^\circ\text{C } t = 5 \text{ mins}$$

$$20 = 35 e^{5k} - 25$$

$$45 = 35 e^{5k}$$

$$e^{5k} = 45/35$$

$$5k = \ln(45/35)$$

$$k = \frac{0.251}{5}$$

$$T = 35 e^{0.05t} - 25 //$$

$$T = 20.9 \text{ at } t = ?$$

$$20.9 = 35 e^{0.05t} - 25$$

$$49.9 = 35 e^{0.05t}$$

$$e^{0.05t} = 49.9/35$$

$$e^{0.05t} = 0.355$$

$$t = 7.1 \text{ minutes}$$

```
commandwindow
clear
clc
close all
format short g
mdata=xlsread('onlinequizdata','fluiddata')
x=mdata(1:2:250,1)
y=mdata(1:2:250,2)
plot(x,y)
grid on
grid minor
```

I

Command Window

```
86
88
90
92
94
96
98
100
102
```

script

Ln 11 Col 11