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18/ENG041018

Electrical Engineering.

Question 1.

$$T_1 = 10^\circ\text{C}, \quad T_2 = 20^\circ\text{C} \text{ @ } 5 \text{ mins.}$$

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

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

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

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

Collecting like terms

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

Integrating both sides.

$$\ln(T - 25) = tK + C$$

$$T - 25 = e^{tK + C}$$

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

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

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

at initial condition $t = 0$ $T = 10^\circ\text{C}$

$$10 = A e^0 + 25$$

$$A = -15$$

$$T = -15 e^{tK} + 25$$

at $T = 20^\circ\text{C}$ $t = 5 \text{ mins}$

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

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

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

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

$$k = \frac{0.251}{5} \quad k = 0.05$$

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

$$T = 24.9 \text{ at } t?$$

$$24.9 = 35 e^{0.05t} - 25$$

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

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

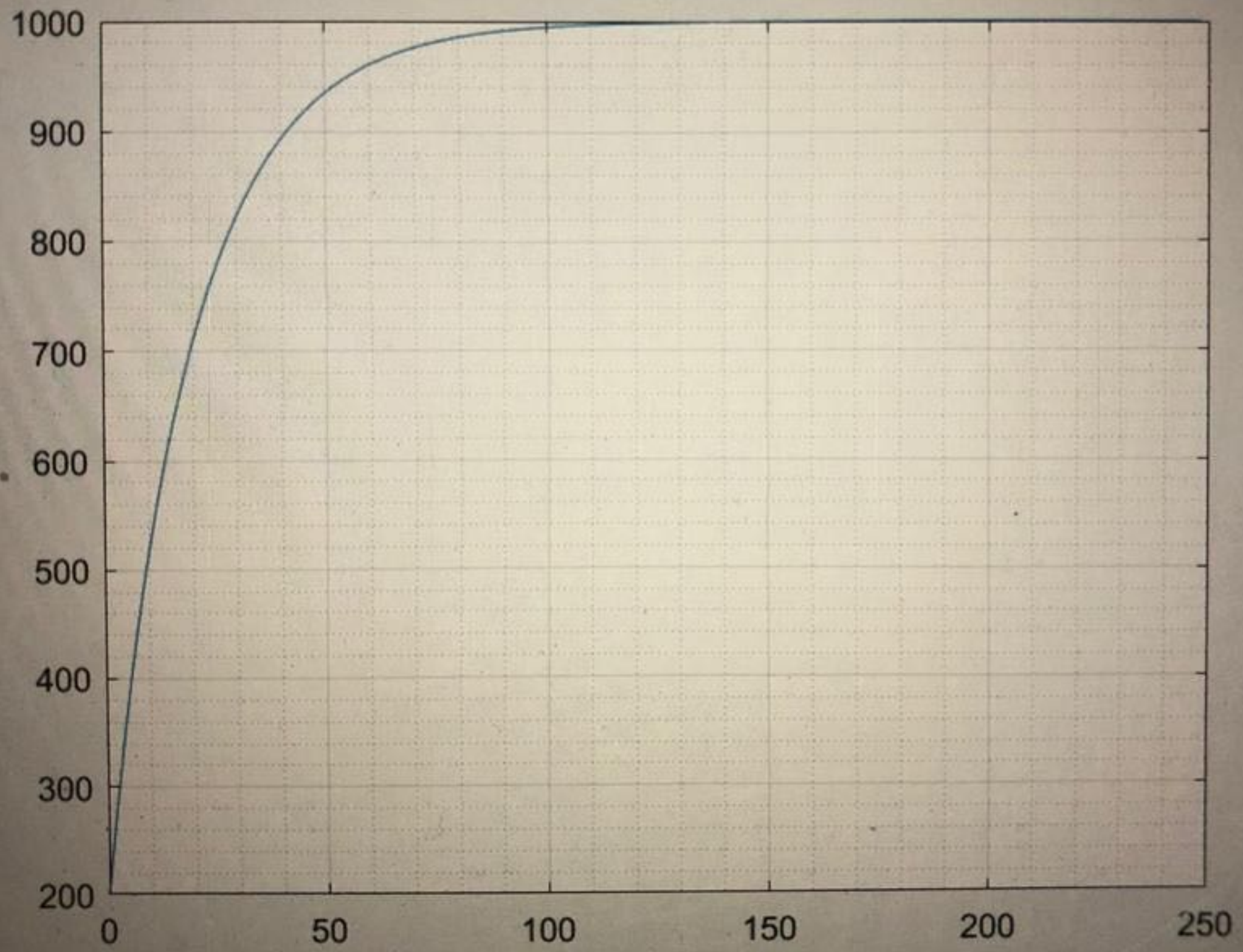
$$t = 7.1 \text{ minutes}$$

EDITOR

Figure 1



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```
yimaquiz2.m x +  
- 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
fx 102