

$$z = 15$$

$$T(t) = 25 - 15e^{kt} \quad \text{--- Particular solution}$$

After 5 minutes $T(5) = 20^\circ$

$$20 = 25 - 15e^{5k}$$

$$25 - 15e^{5k} = 20$$

$$-15e^{5k} = 20 - 25$$

$$-15e^{5k} = -5$$

$$e^{5k} = 0.33$$

$$5k = -1.09$$

$$k = -0.22$$

$$T(t) = 25 - 15e^{-0.22t}$$

| i) | A | B | T(t) | |
|----|----|---|--|--------------|
| 2 | 0 | | $= 25 - 15 \cdot \exp(-0.22 \cdot A_2)$ | $= 10$ |
| 3 | 1 | | $= 25 - 15 \cdot \exp(-0.22 \cdot A_3)$ | $= 12.96222$ |
| 4 | 2 | | $= 25 - 15 \cdot \exp(-0.22 \cdot A_4)$ | $= 15.35945$ |
| 5 | 3 | | $= 25 - 15 \cdot \exp(-0.22 \cdot A_5)$ | $= 17.24723$ |
| 59 | 57 | | $= 25 - 15 \cdot \exp(-0.22 \cdot A_{59})$ | $= 24.99975$ |
| 60 | 58 | | $= 25 - 15 \cdot \exp(-0.22 \cdot A_{60})$ | $= 24.99996$ |
| 61 | 59 | | $= 25 - 15 \cdot \exp(-0.22 \cdot A_{61})$ | $= 24.99997$ |
| 62 | 60 | | $= 25 - 15 \cdot \exp(-0.22 \cdot A_{62})$ | $= 24.99997$ |

Command window

clear

clc

close all

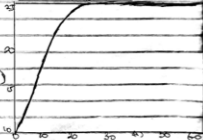
t = (0:1:60)

T = 25 - 15 * exp(-0.22 * t)

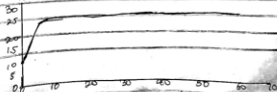
plot(t, T)

~~hold on~~

Matlab Simulation



Excel Simulation



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ENGG 28A Assignment V

1) a) Mathematical Modelling is the process of developing an abstract model that uses mathematical language to describe the behaviour of a system.

b) * Differential Equation

* Calculus Variation

c) $T(0) = 10^\circ\text{C}$ $T(5) = 20^\circ$ where $T =$ Temperature of the thermometer

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

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

$$\ln(T - T_A) = kt + C$$

$$T - T_A = e^{kt} \cdot e^C$$

$$\text{but } e^C = C$$

$$\therefore T - T_A = Ce^{kt}$$

$$T(t) = T_A + Ce^{kt} \quad \text{--- Model}$$

At initial condition: $T(0) = 10$

$$T_A = 25$$

$$T(t) = 25 + Ce^{kt}$$

$$10 = 25 + C$$

iii) The steady state temperature is 24.9989°C

v) for $t \rightarrow \infty$

$$T(t) = 25 - 15e^{-0.22t}$$

at $t \rightarrow \infty$, $15e^{-0.22t} \rightarrow 0$,

$$T(\infty) = 25 - 0$$

$$T = 25^{\circ}\text{C}$$