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Electrical Engineering
17 Eng 04 1041
Assignment V

A) Modelling is the mathematical representation and simulation of a system which involves solving the model and obtaining output variable for different values of input variables

- B) Methods of
i) Differentiating
ii) Analysis
iii) Balance law

C) Newton law of cooling

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

$$\int \frac{dT}{T - T_A} = \int k dt \Rightarrow \ln(T - T_A) = kt + C$$

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

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

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

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

T = thermometer initial reading = 10°C

T_A = actual temperature = 25°C

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

$$10 - 25 = C e^{kt}$$

$$10 - 25 = C e^{k(1)}$$

$$-15 = C$$

After 5 mins, the temp of therm' $T = 20^\circ\text{C}$

$E \rightarrow$

$$T - T_1 = Ce^{kt}$$

$$20 - 25 = -15e^{k(10)}$$

$$-5 = -15e^{10k}$$

$$\Rightarrow e = e^{10k}$$

$$0.33 = e^{10k}$$

$$\ln 0.33 = 10k$$

$$\frac{-1.0986}{10} = k$$

$$k = -0.222$$

model is

$$T = T_1 + Ce^{kt}$$

$$T = 25 - 15e^{-0.222t}$$

11) Exce)

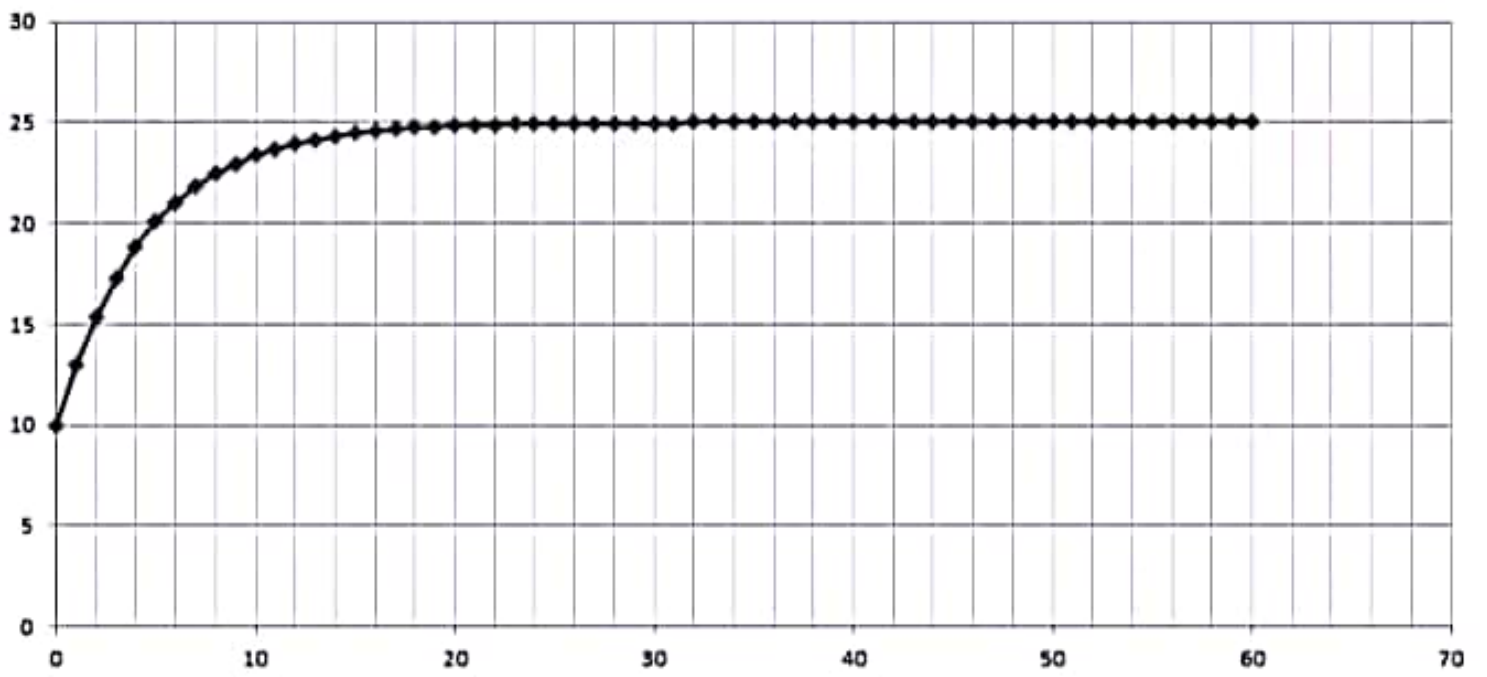
$$T = 25 - 15 * (\exp(-0.222 * t))$$

table (1-60)

some select

t	T
0	10
6	21.98627
12	23.95491
18	24.72416
24	24.92718 24.92719
30	24.98078
36	24.99493
42	24.99866
48	24.99965
54	24.99991
60	24.99998

T



III) MATLAB
 code
 I) command window
 II) clear
 III) clc
 IV) close all
 V) syms t
 VI) t = 0:1:60
 VII) 25 - T = 25 - 15 * (exp(-0.222 * t))
 VIII) Tn = subs(T)
 IX) plot (t, Tn)
 X) label ('Time (min)')
 XI) ylabel ('Temperature')
 XII) axis tight
 XIII) grid on
 XIV) grid minor

