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Dept: Computer Engineering

Engineering Mathematics Assignment

Soln

$$\frac{dy}{dt} = ky$$

or

$$\int \frac{1}{y} dy = \int k dt$$

$$\ln y = \int k dt$$

$$\ln y = kt + c$$

$$\ln y = kt + \ln e^c$$

$$\ln y = \ln(e^{kt} \cdot e^c)$$

$$y = e^{kt} \cdot e^c$$

$$y = Ce^{kt}$$

At the beginning of the experiment

$$t = 0 \text{ and } y = 20$$

$$20 = Ce^{k(0)}$$

$$20 = C \quad \text{--- (1)}$$

$$\text{At } t = 5 \text{ hrs}$$

$$y = 20$$

$$y = 20 \times 20 = 40 \quad \text{--- (2)}$$

Inputting the value of C into y in eqn (1)

$$40 = 20e^{kt}$$

$$40 = 20e^{kt}$$

$$2 = e^{5k}$$

$$\ln 2 = 5k$$

$$0.6931 = 5k$$

$$k = \frac{0.6931}{5} = 0.13863$$

$$k = 0.13863$$

$$\text{Model } y = 20e^{0.13863t}$$

$$\textcircled{2} \quad 1\frac{1}{2} \text{ day} = 24 \text{ hrs} + 12 \text{ hr} \Rightarrow$$

$$t = 36 \text{ hrs}$$

$$y = 20 e^{0.13863(36)}$$

$$= 147.036 \times 20 = 2940 \text{ bacueng}$$

$$\text{If } C = 10$$

$$y = 10 e^{kt}$$

$$y = 10 e^{0.13863t}$$

$$y = 10 e$$

$$\text{When } C = 30$$

$$y = 30 e^{kt}$$

$$y = 30 e^{0.13863t}$$

$$= 30 e$$

$$\text{When } e = 50$$

$$y = 50 e^{kt}$$

$$= 50 e^{0.13863t}$$

$$\text{time } t = 0 \quad \text{to } t = 30 \text{ hrs}$$