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18/ENG02/031
COMPUTER ENG.
ENG 282 QUIZ

Using

Taking initial temperature to be 10°C
 $\therefore T_0 = 10^{\circ}\text{C}$

$$T_a = \frac{20 + 25}{2} = 22.5^{\circ}\text{C}$$

$$\text{Using } \frac{dT}{dt} = k(T - 22.5)$$

$$\frac{dT}{(T - 22.5)} = k dt$$

$$\ln(T - 22.5) = kt + C$$

$$e^{\ln(T - 22.5)} = e^{(kt + C)}$$

$$\therefore T - 22.5 = \cancel{e^{kt}} e^C \cdot e^{kt}$$

$$T - 22.5 = e^{kt} T_0$$

$$T = T_0 e^{kt} + 22.5$$

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

$$\therefore 10 = T_0 e^{k(0)} + 22.5$$

$$10 - 22.5 = T_0(1)$$

$$T_0 = -12.5^\circ\text{C}$$

$$\therefore T = -12.5e^{kt} + 22.5$$

Then if after 5 minutes interval $T = 20$

\therefore when $t = 5\text{mins}$ $T = 20$

$$20 = -12.5e^{k(5)} + 22.5$$

$$12.5e^{k(5)} = 22.5 - 20$$

$$12.5e^{k(5)} = 2.5$$

$$e^{5k} = \frac{2.5}{12.5}$$

$$e^{5k} = 0.2$$

$$\ln(e^{5k}) = \ln(0.2)$$

$$5k = \ln 0.2$$

$$k = \frac{\ln(0.2)}{5}$$

$$k = \underline{\underline{-0.32}}$$

$$\therefore T = -12.5e^{-0.32t} + 22.5$$



