

MATRIC NO: 17/MH301/314

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DEPARTMENT: Mechanical Engineering

COURSE: ENG 282; Engineering mathematics

Given that,

for case A; $u(t) \geq 50$

for case B; $g(t) \geq 150$

and $(0 \leq t \leq 15)$ hr

Considering case A,

$$u(t) = 3u_0(t) \text{ at 9hrs} \quad \text{--- ①}$$

Using $y = y_0 e^{kt}$,

$$\Rightarrow u(t) = u_0(t) e^{9k}$$

But $u(t) = 3u_0(t)$

$$\Rightarrow 3u_0(t) = u_0(t) e^{9k}$$
$$3 = e^{9k}$$

$$\ln 3 = 9k$$

$$k = \frac{\ln 3}{9}$$

$$\therefore k = 0.122$$

Thus for case A,

$$u(t) = 50 e^{0.122t}$$

Considering case B,

$$g(t) = 3g_0(t) \text{ at 9hrs} \quad \text{--- ①}$$

Using $y = y_0 e^{kt}$,

$$\Rightarrow g(t) = g_0(t) e^{9k}$$

$$3g_0(t) = g_0(t) e^{9k}$$

$$3 = e^{9k}$$

$$\ln 3 = 9k$$

$$\therefore k = 0.122$$

Thus for case B,

$$g(t) = 150 e^{0.122t}$$

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$$u(t) = 50 \cdot \exp(0.122 \cdot t)$$

$$g(t) = 150 \cdot \exp(0.122 \cdot t)$$

$$t = 0, 1, \dots, 15$$

$u(t) =$

50
56.488
63.817
72.098
81.453
92.022
103.962
117.451
132.681
149.908
169.359
181.334
216.181
244.209
275.896
311.894

$g(t) =$

150
169.463
191.452
216.293
244.358
276.595
311.885
352.354
398.973
449.725
506.078
574.003
648.483
732.628
827.587
935.083

$u(t)$ = Number of bacteria for case B
 $g(t)$ = Number of bacteria for Case A

