

b)  $90/100 \times 20000 = 18000$

$\therefore y = 18000$

$y = -20000e^{-0.03t} + 20000$

$18000 = -20000e^{-0.03t} + 20000$

$18000 - 20000 = -20000e^{-0.03t}$

$-2000/-20000 = e^{-0.03t}$

$0.1 = e^{-0.03t}$

$\ln(0.1) = -0.03t$

$t = \frac{-2.302}{-0.03}$

$\therefore t = 76.8 \text{ mins} \rightarrow 76.8 \text{ mins}$

c) Dynamic response for  $t=0$  to  $t=6 \text{ hrs}$  with a step time of 5 mins  
 $60 \text{ mins} \rightarrow 1 \text{ hr}$   
 $\times 6 \text{ hrs}$

$= 60 \times 6$

$= 360 \text{ mins}$

$\therefore t=0$  to  $t=360 \text{ mins}$  with a step time of 5 mins

d) Steady state value  $= 20000$

e) At the time interval between 160 min to 360 min, the amount of fresh air was at Steady state at 20000 ft<sup>3</sup>.