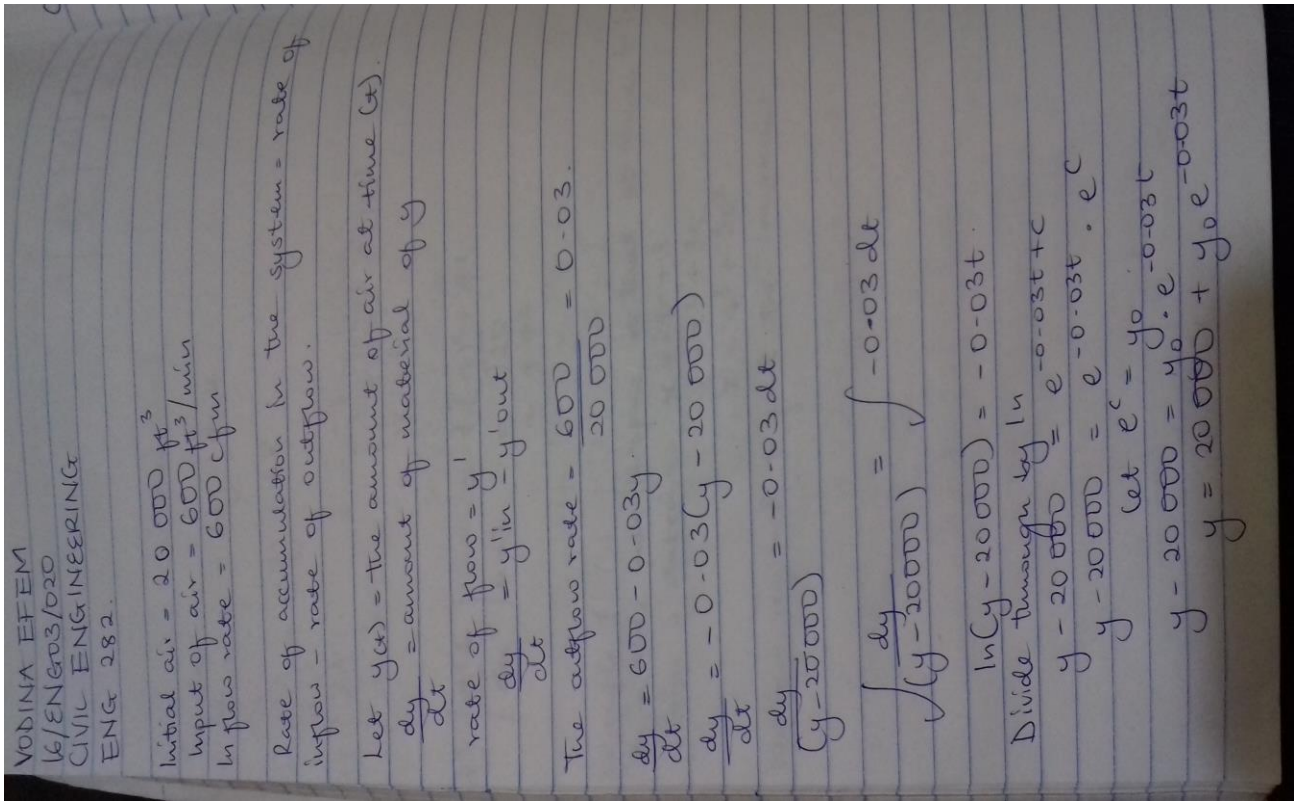
16/ENG03/020

CIVIL ENGINEERING

ENG 282



Sign: [redacted]

Calculating for y_0, If $t=0$

$0 = 20\,000 + y_0 e^{-0.03(0)}$

$0 = 20\,000 + y_0$

$y_0 = -20\,000$

$\therefore y(t) = 20\,000 - 20000e^{-0.03t}$.

b) Time taken for which 90% of air in room will become fresh

Initial air $= 20\,000 ft^3$

90% of 20 000

$\frac{90}{100} \times 20\,000 = 18\,000$

$18000 = 20\,000 - 20\,000e^{-0.03t}$

$-2000 = -20\,000e^{-0.03t}$

$\frac{-2000}{-20000} = e^{-0.03t}$

$0.1 = e^{-0.03t}$

$\ln(0.1) = -0.03t$

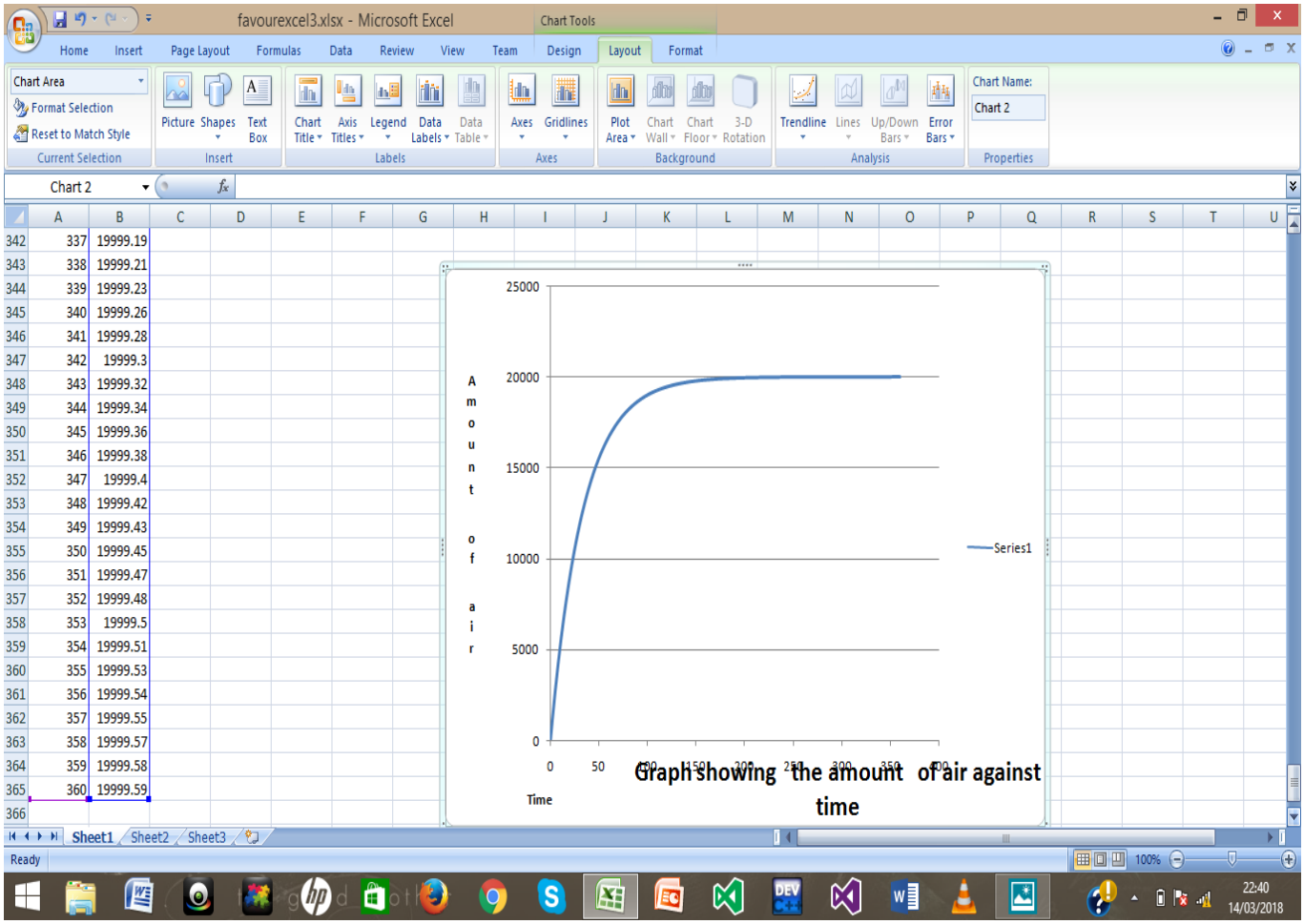
$-2.30 = -0.03t$

$t = 76.6$ mins.

c) See graph

d) The steady-state value is 20 000

e) It was observed that the difference in the value of y was not much, on increase in time (t), to an increase in y. When the graph was plotted, at a certain point there was no progression which is a steady state.



Graph showing the amount of air against time