eq/m eqn for ideal case i-

$$y - xy - kx + kxy = 0$$

$k = \frac{P\_acetone\ (Sat)}{P\_Chloroform\ (Sat)}$, ratio of saturation pressure.

enriching eqn :-

$$y = \frac{R}{R+1}x + \frac{x_d}{R+1}$$

Feed line $\Rightarrow y = \frac{q}{q-1}x - \frac{x_f}{q-1}$

stripping section line :-
by finding interseection of feed and enriching line :-

if $q = 1$

$a = x_f$

$b = Ra + c_1 \quad \left(c_1 = \frac{x_d}{R+1}\right)$

Otherwise

$$a = (-c_2 - c_1)/(R - \theta)$$

$$b = \theta a - c_2$$

where, $c_2 = \frac{x_f}{q-1}$, $\theta = \frac{q}{q-1}$

and eqn of stripping line

$$y = \text{Slope}(x - x_w) + x_w$$

$$\text{Slope} = \frac{(b - x_w)}{(a - x_w)}$$

$x_w \rightarrow$ bottom fraction

For real case :-

Eqlm eqn

$$y = \frac{x}{t(1-x)+x}$$

~~$t = \frac{(RATIO)(gamma2}{(gamma1)K}$~~ $\boxed{t = \frac{\alpha \times \gamma_2}{\gamma_1 \times K}}$

$$K = \frac{P_1(sat)}{P_2(sat)}, \quad \alpha = \frac{\phi_1}{\phi_2}$$

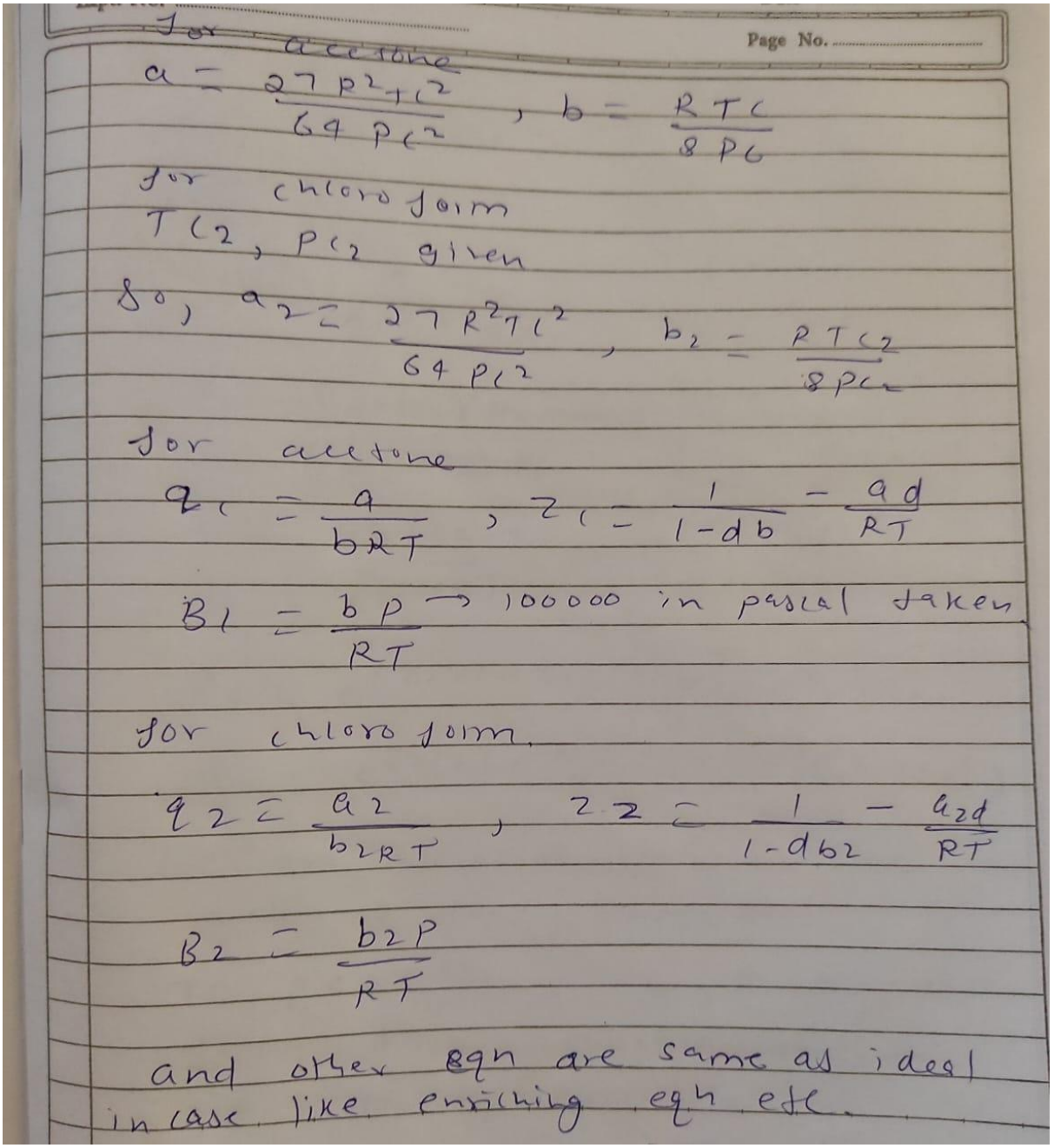
$$\phi_1 = e^{(Z_1 - 1 - \log(Z_1 - B_1) - q_1 B_1 / Z_1)}$$

$$\phi_2 = e^{(Z_2 - 1 - \log(Z_2 - B_2) - q_2 B_2 / Z_2)};$$

we are using 1 for acetone and 2 for chloroform.

T_C, P_C, T_{C_2}, P_{C_2}, R are taken from data available online.

d → density also taken.



Aim:

1. Actual number of stages(trays) required to achieve separation(with graph) in a Distillation column with the help of McCabe-Thiele method.

2. Minimum number of stages(trays) required to achieve their separation (with graph)
3. Minimum Reflux Ratio

Azeotrope tables - Wikipedia Data taken from here.

References used:-

McCabe-Thiele Plot | Neutrium

https://youtu.be/7e2iiaEcKeU

https://youtu.be/rnTL-wMhsWk

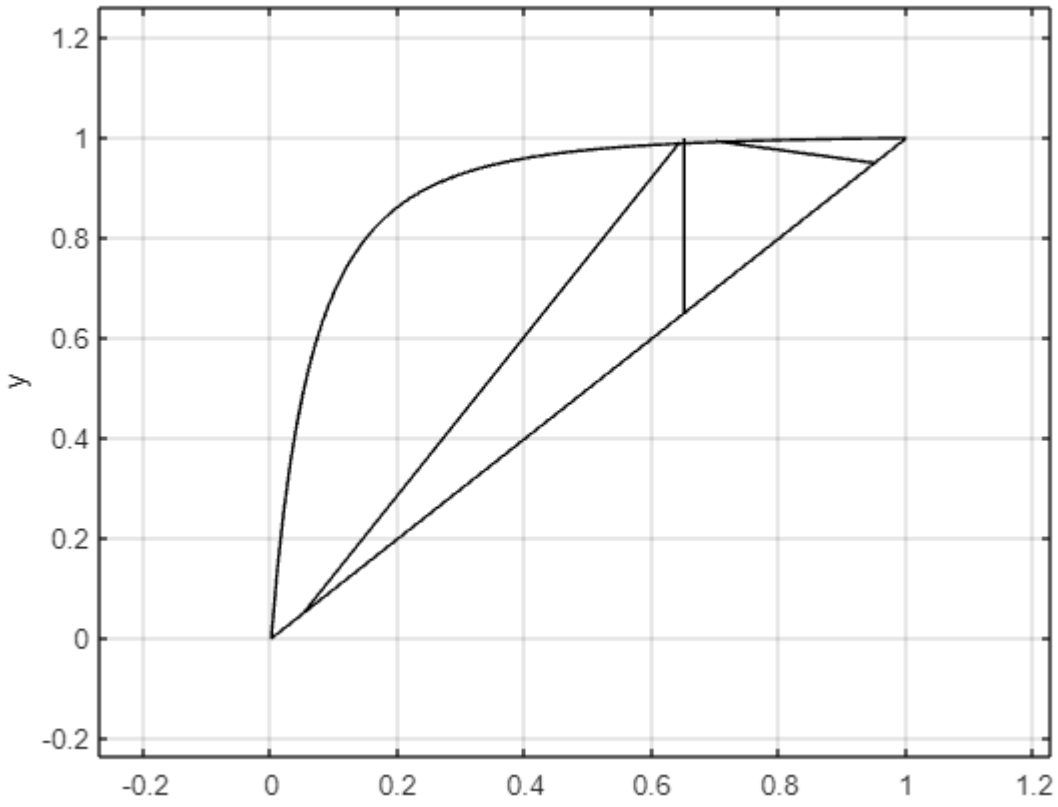
Work done by us:-

Harjap:- Feed line equation , enriching line equation , stripping line equation.

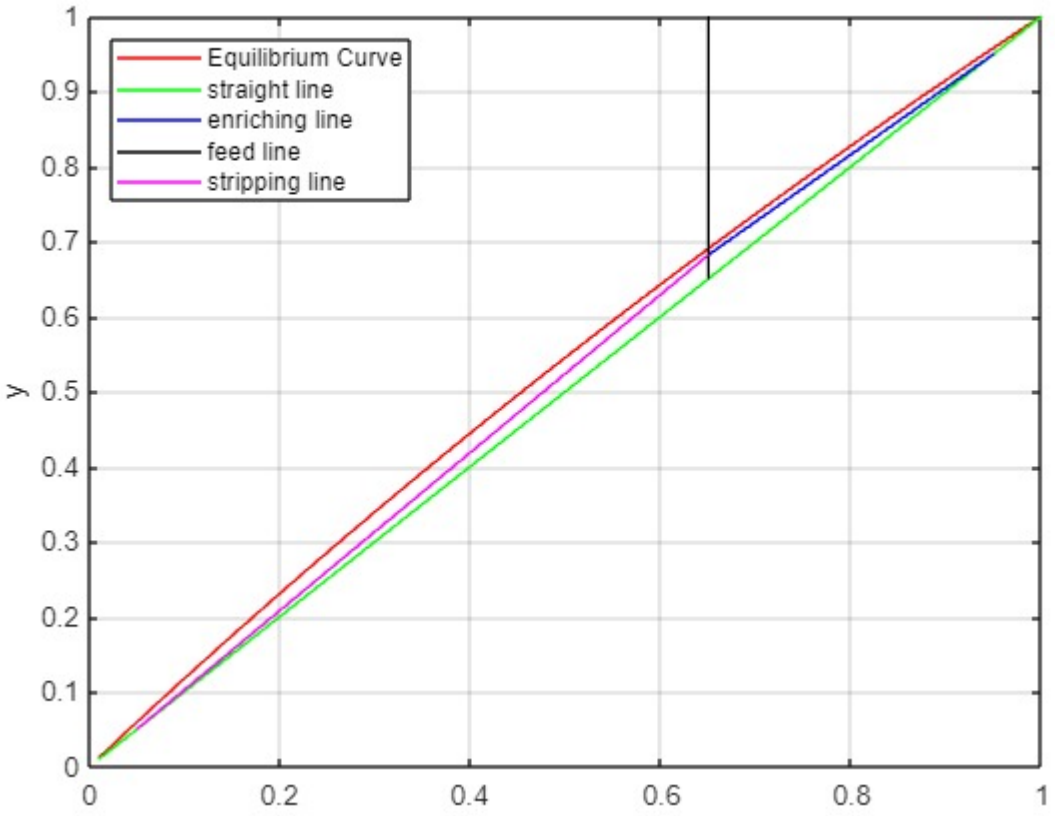
Aditya :- Stages counting for top and bottom stages.

And other things taken from previous assignment.

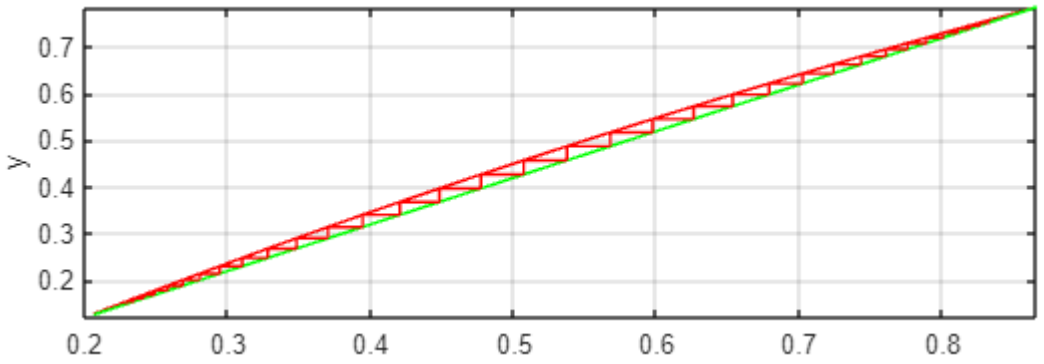
LINE PLOT FOR REAL CASE:



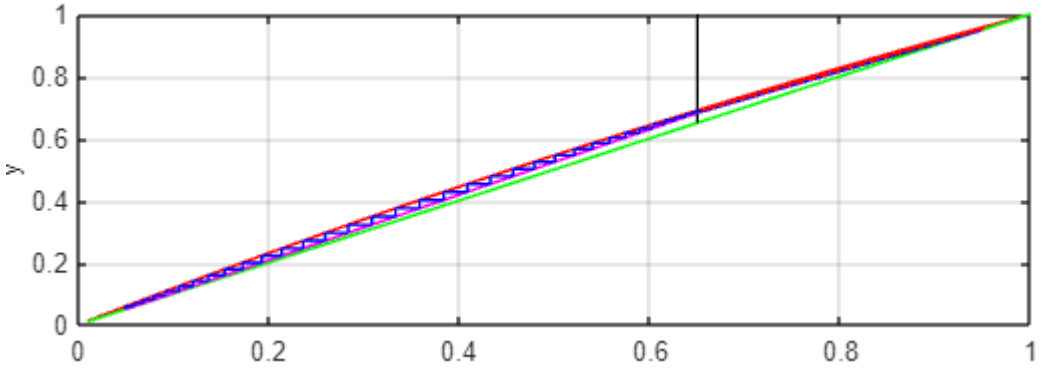
Set Up for ideal Case



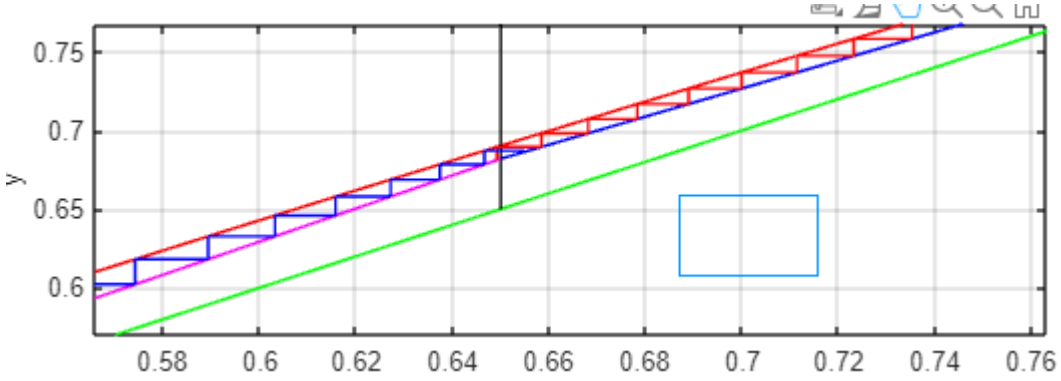
For Maximum Number of Trays in Ideal Case



TRAY Diagram for ideal Case



Zoomed IN



For Non-Ideal Solution Case **,Enriching section str**ays: