Pre-lab - Exp-7 :-

Name - Balasubramanian MC

Roll :- EE18B155

① R' of Adder can be any value - in this case, taken 1k = R

We know that Vinac - has 2x amplitude of Vin,

$V_{in,amp.} = 0.45V$ or $(0.45V_m)$

$\therefore V_{inac\ amp.} = 0.90V$

∴ The peak detector detects peak of 0 biased, 0.9 Vamp. sinusoid i/p as $0.9V = V_{peak}$

$$V_{ref} = 250mV = \frac{(V_{peak}) \cdot R_3}{R_2 + R_3}$$

$$\therefore \frac{R_3}{R_2 + R_3} (0.9) = 0.25V$$

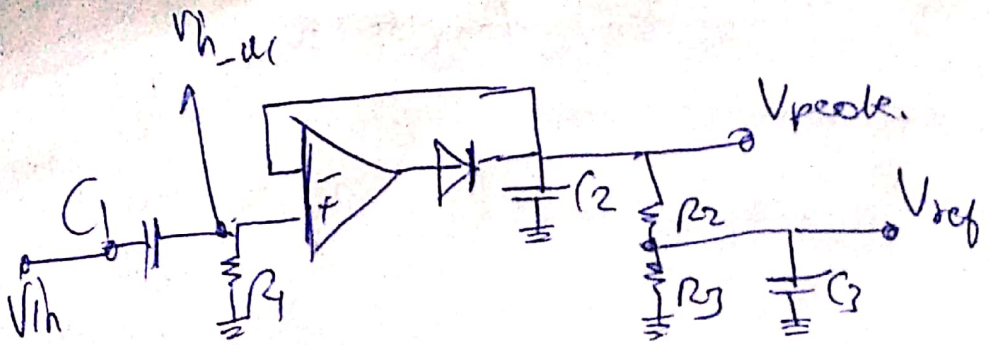
$$\therefore 0.65 R_3 = 0.25 R_2$$

$$6.2 R_3 = R_2$$

~~$2.3 R_3 = 5 R_2$~~

or $R_3 = 0.4 R_2$

$V_{peak\ ripple} = 100mV.$



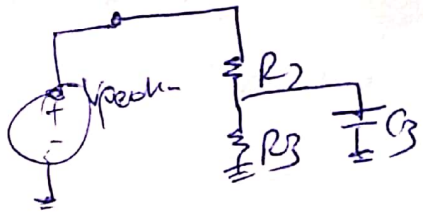
Vin_ac.

Vin1/Vin2 non amp. = 0.75V (Vm=1) Then, non amp. at

Vin_ac = 0.90V (since it's a BPF)
non amp

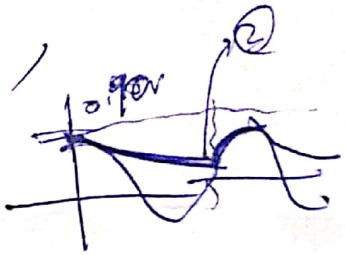
Vpeak ripple = 100mV max.

For ripple at Vpeak:-



in the circuit,

RC const. $\therefore R_{eq} = \frac{R_2 R_3}{R_2 + R_3}$ ($C_{eq} = C_3$)



$(0.90V)\cdot\cos(2\pi \cdot f \cdot t_{discharge}) = 0.90\,(\approx e^{-t/RC})$

$t_{discharge} = 1/f$

at ③, $(0.90V) - 100mV = 0.90\,e^{\frac{-1}{f RC}}$ Eqn ①

$+\ln\left(\frac{0.90}{0.80}\right)\cdot f = 1/RC$

$RC = \frac{1}{f \ln\left(\frac{0.90}{0.80}\right)} = \frac{8.49}{f}$

We know. $R_3 = 0.16 R_2$

$$\frac{(0.16)R_2 \cdot C_3}{1.16} = \frac{8.49}{f}$$

$\therefore R_2 C_3 = 61.55ms$

Take f = 1kHz, so that for higher freq Eqn ① will be lesser.

Let's take $R_2 = 1k$, $C_3 = 61.55\mu F$, the ripple was found to be less than 100mV range, and V_{ripple} for-V_{ref} was $< 10mV$. This works for both, 3kHz and 1kHz

$\therefore R = 1k$, $R_2 = 1k$ $R_3 = 160\Omega$ $C_3 = 61.55\mu F$ $C_2 = 5\mu$

Finally, for the given BPF we needed V_{ref} to hit 250mV. $\therefore$ R_3 had to be changed to 1.2k to get 250mV. Other conditions still hold.