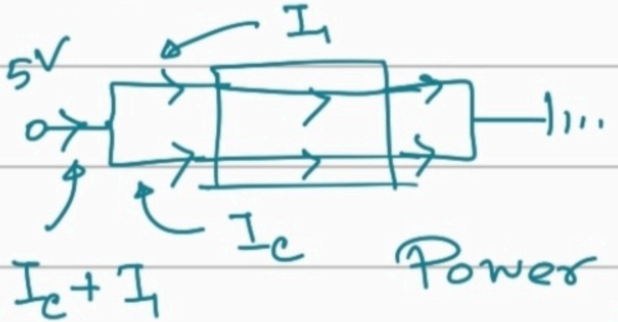
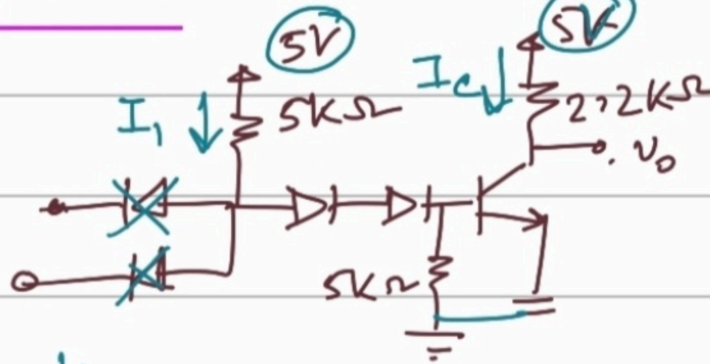
Maximum Power Dissipation :-

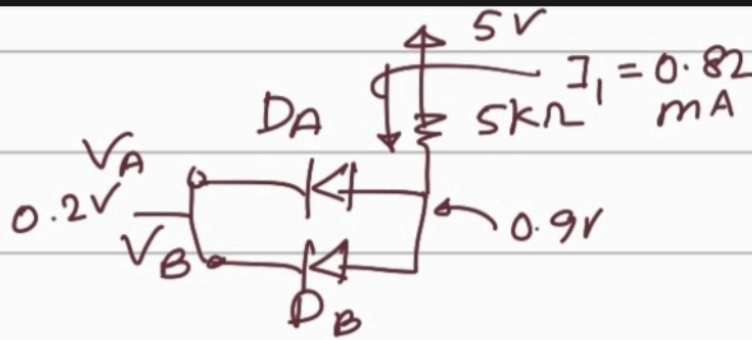
* Case (3) $V_A = V_B = 5V$





Power dissipation
$= (5-0) \times (2.182 + 0.56)$
$= \boxed{13.71\ mW}$

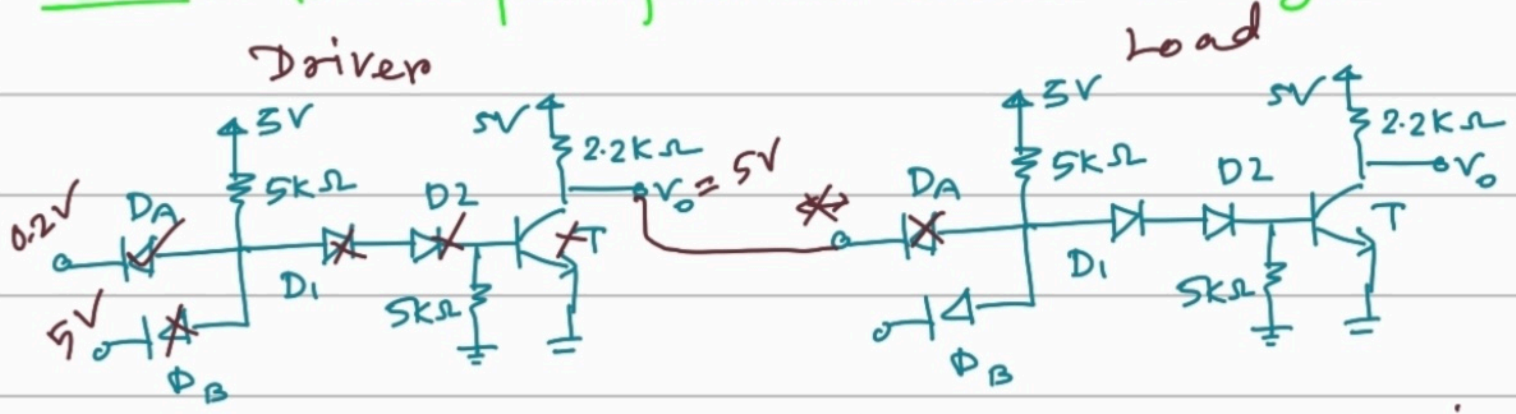
Case (1) $V_A = V_B = 0.2$



Power dissipation, $(5-0.2) \times 0.82$
$= \boxed{3.936\ mW}$

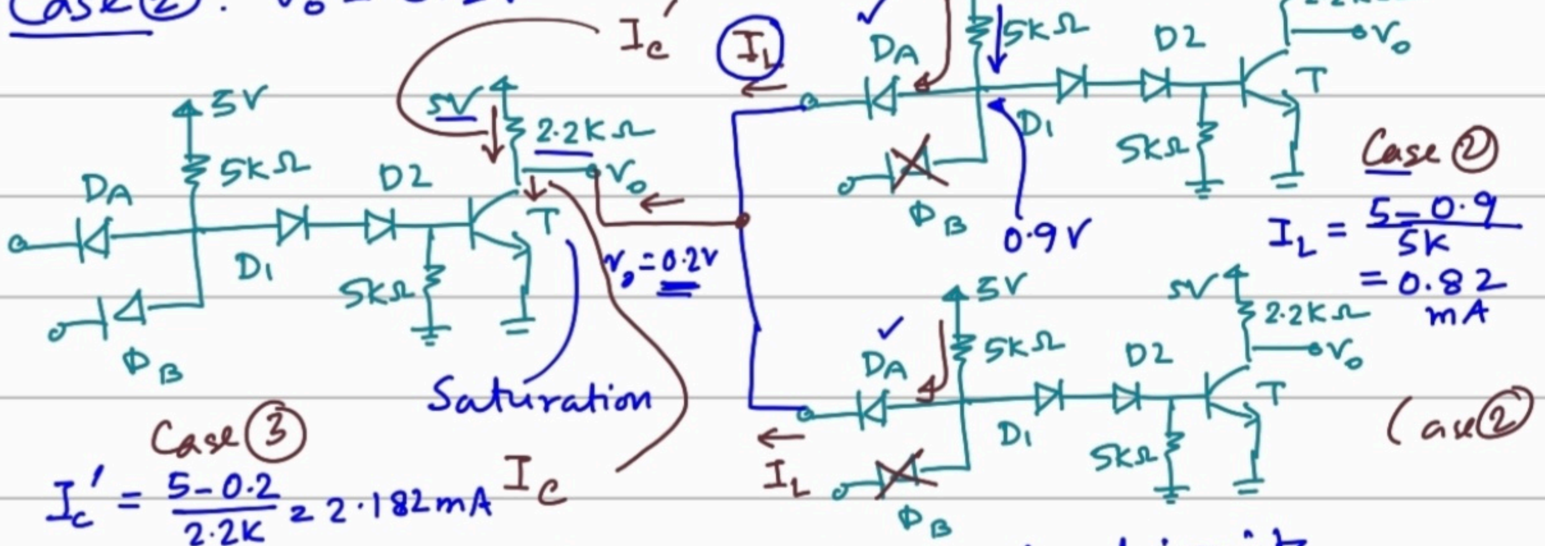
Maximum fanout Calculation :-

Case① . The output of driver circuit is high.



The demand current is zero. and supply is zero. also. Thus we can connect as much as load circuits we want. max fanout = ∞.

Case ②. $V_o = 0.2V$



Case ②: $I_L = \frac{5-0.9}{5K} = 0.82\ mA$

Case ③: $I_c' = \frac{5-0.2}{2.2K} = 2.182\ mA$ I_c

We want to consider worst case scenario, thus we will consider D_B of load circuits are off.

I_c = total collector current, I_c' = no. load collector current.

I_L = standard load (current), N = fanout

$$\boxed{I_c = I_c' + N I_L} = 2.182 + N \times 0.82$$

transistor

Constraint: When driver circuit's is operating in saturation mode, the collector current can not exceed a certain value. Otherwise, the driver transistor T will change its operating mode saturation to forward active.

Marginal situation will be achieved if $\beta_{forced} \approx \beta_F$ for driver transistor T.

$$\beta_{forced} \approx \frac{I_c}{I_B} \Rightarrow I_{c,max} = \beta_F \times I_B$$

Case ③

$$= 30 \times 0.4 = 1.2mA$$

Maximum fanout is N'. then the main equation becomes, $I_{c,max} = I_c' + N' I_L$

$$1.2 = 2.182 + N' \times 0.82$$

$$\Rightarrow N' = 11.96$$

we can not choose maximum fanout $N' = 12$ because that will exceed the value of permitted collector current.

Therefore, maximum fanout for this case $[N'] = 11$

Finally maximum fanout $= \min(11, \infty)$

$$= \boxed{11}$$