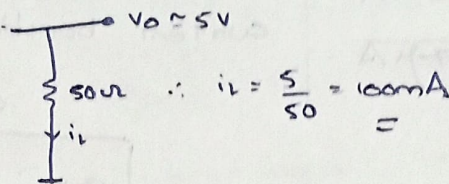
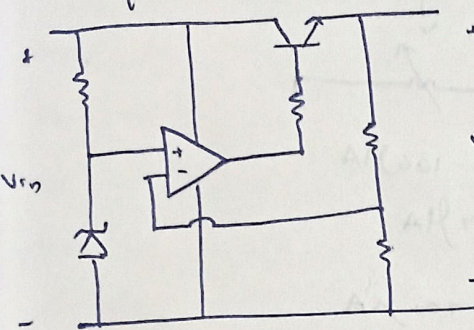


Voltage regulator (5V, 2A_{max})

Day 1:

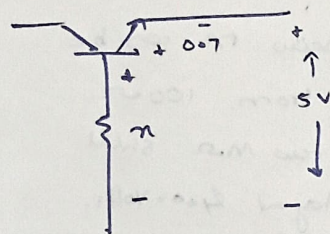


LM741

→ Supply voltage $\pm 15V$ \rightarrow $\pm 18V$

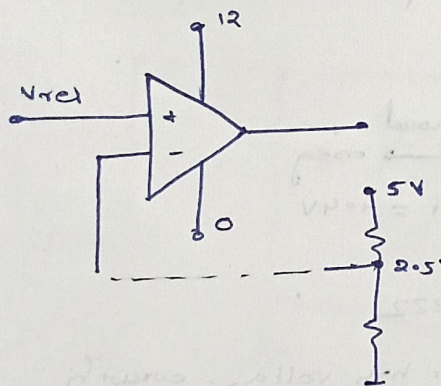
★ o/p s.c current = 25mA

→ supply current max 2.8mA (1/p side)

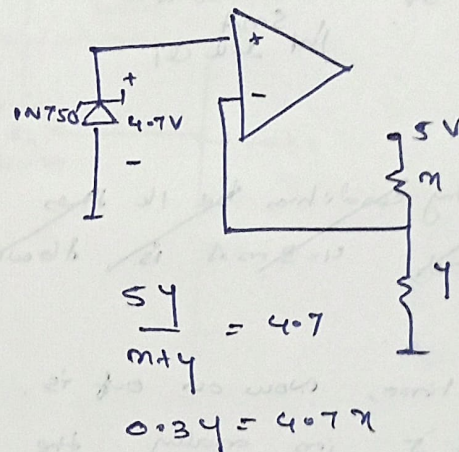


$m = 5.07V$
is max at
the base

but what if we have



opamp tries to
make $v_e^+ = v_e^-$
suppose sampling is
 $\therefore V_{ref}$ should
be at 2.5V for
regulation



$$\frac{5V}{m+y} = 4.7$$

$$0.34 = 4.7 \pi$$

$$\text{Assume } \gamma = 6.8k, \pi = 430$$

Now, 1N750

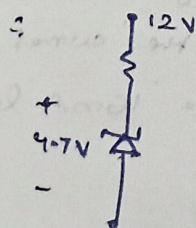
Power rating = 500mW

$$V_Z = 4.7V$$

$$\therefore V_Z = 500mW$$

$$I \approx 106mA$$

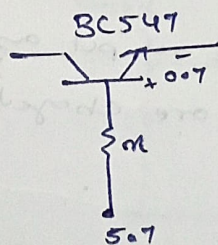
but let's limit to 70mA



$$i = \frac{12 - 4.7}{R}$$

$$\text{Let } R = 100$$

$$i = 73mA$$



IC rating 100mA

$$\frac{5}{\pi} \leq 5mA$$

at 6V V_{BE} , limit is 5mA

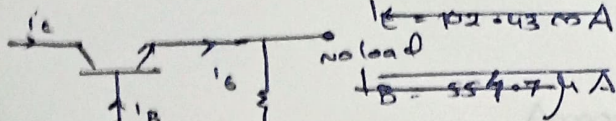
or for BC547B

$$\therefore m \geq 1k\Omega$$

$$R = \frac{12 - 4.7}{106m} = 68\Omega$$

Now, the

$$\beta = 60$$



$$\beta = 184.6$$

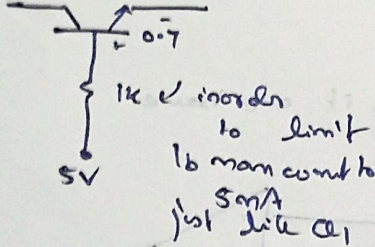
$$I_B = 700 \mu A$$

$$I_E = 701 \mu A$$

$$I_B = 2.24 \mu A$$

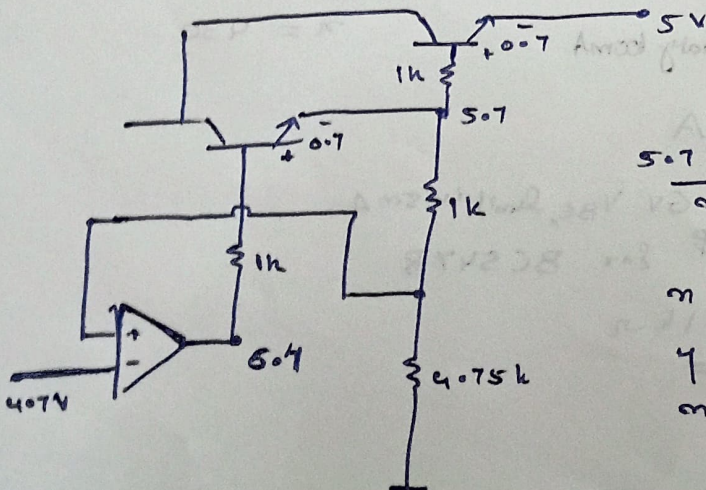
$$\therefore \beta = I_C / I_B = 312$$

Q2



let limiting condition be 1k Ω
at 1k load, 4.3 mA is slowly through the

In the mean time, Now our out is 4.3 so in order to make it 5 in making the basic out put as 5.7V for that sampling resistor are changed



$$\frac{5.7 \times \alpha}{\alpha + 1} = 4.7$$

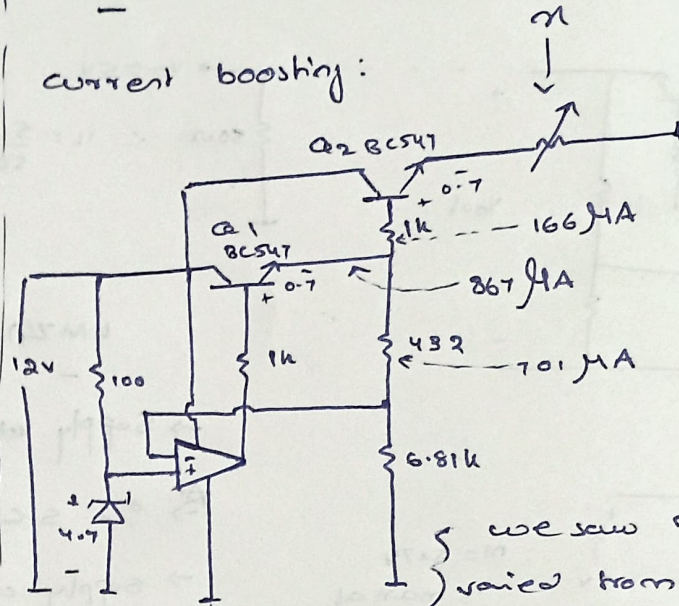
$$\alpha = 4.79$$

$$\gamma = 1k$$

$$\alpha = 4.7k$$

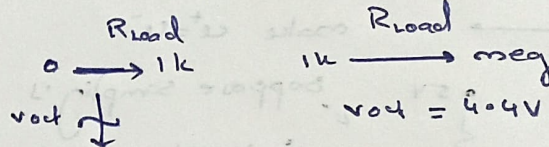
DAY 2 :

current boosting:



we saw α can be varied from 100Ω to a few mΩ still o/p stayed 4.00 Volts.

now, circuit will never provide Ampere currents



2N222

is for high voltage circuit
I think

In this circuit.

Q2, I_C can be max. 16mA

ie, below $R_L = 332 \Omega$ ie 1.216mA

the circuit won't regulate so

we need to make the current

limiting circuit to be 16mA limit

upon further studies we found
current limiting is used in order
to prevent excessive damage to IC
rather than limiting the current
through the load.

So we should be focusing on
not degrading the series pass
element rather than what
the output current is?

we defined current limiting for 14mA

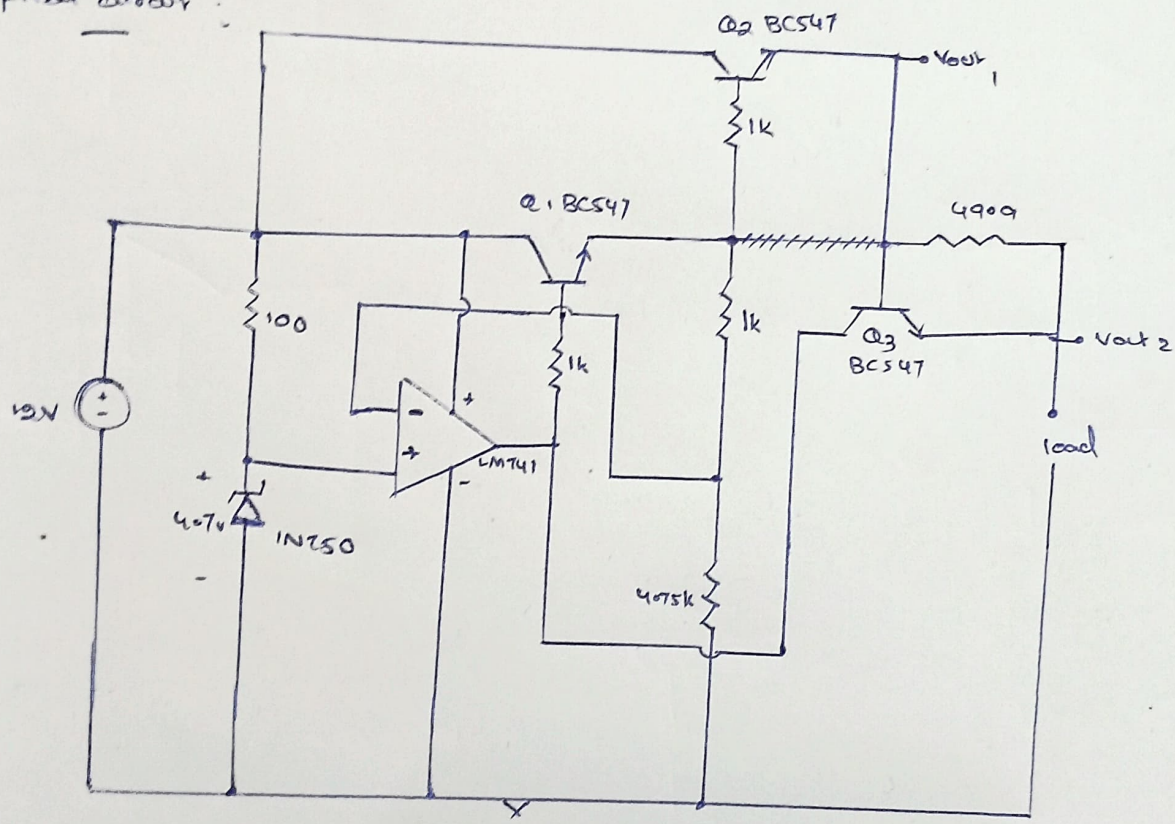
$$0.7 = 14mA \times R ; R = 49\Omega$$

for Q3
to be on

∴ current above 14mA comes from Q3
is on. it absorbs current from ^{error} amplifier
opamp out this reduces the
base current of Q1 and reduces I_{B2} ∴ reduces I_{C2}
(series pass element)

∴ requires stability.

Final circuit:



- Voltage output $\approx 5V$
- Current limiting App 14mA
- Line regulator 8V to 15V
- Load regulator for $R > 1k$.

$$\eta = 5.7 \text{ min as theory.}$$

note: min input voltage
must be below the Zener input
or less likely
(better)

Power rating prob. ∴

$$1 \times R \geq 106mA \times 100$$

$$\eta \leq 1.4 - 4.07$$

$$\eta > 15V?$$