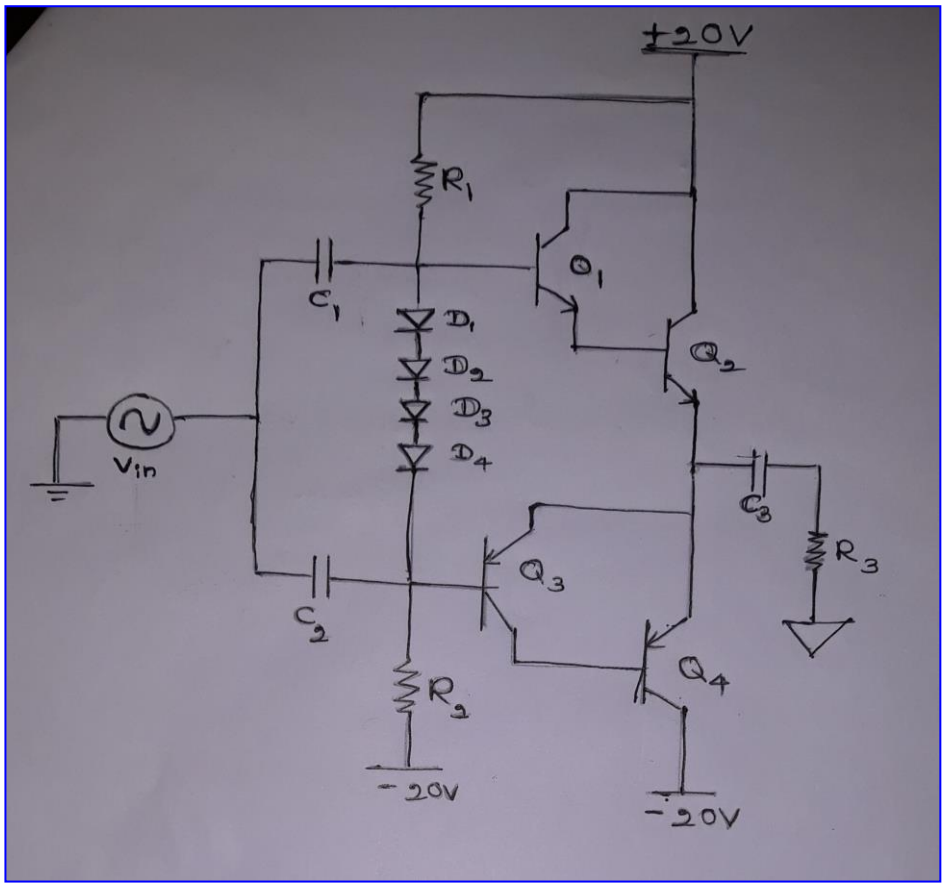
Q1.



Base Emitter Voltage of a Transistor – 0.7V

Maximum Output Current I_{max} - 3A

Current Gain – 50

Supply Voltage - +20V, -20V

Output Power – 22.5W

Signal Diodes – D1, D2, D3, D4

- 1N4148

Capacitors –

- C1 – 1uF
- C2 – 1uF
- C3 – 1uF

Transistors –

- Q1 – 2N3904 (NPN)
- Q2 – 2N3904 (NPN)
- Q3 – 2N3906 (PNP)
- Q3 – 2N3906 (PNP)

Resistors –

- R1 – 1K
- R2 – 1K

*Complementary Symmetry is used.

Total Current Gain – h1xh2 = 50 x 50 = 2500

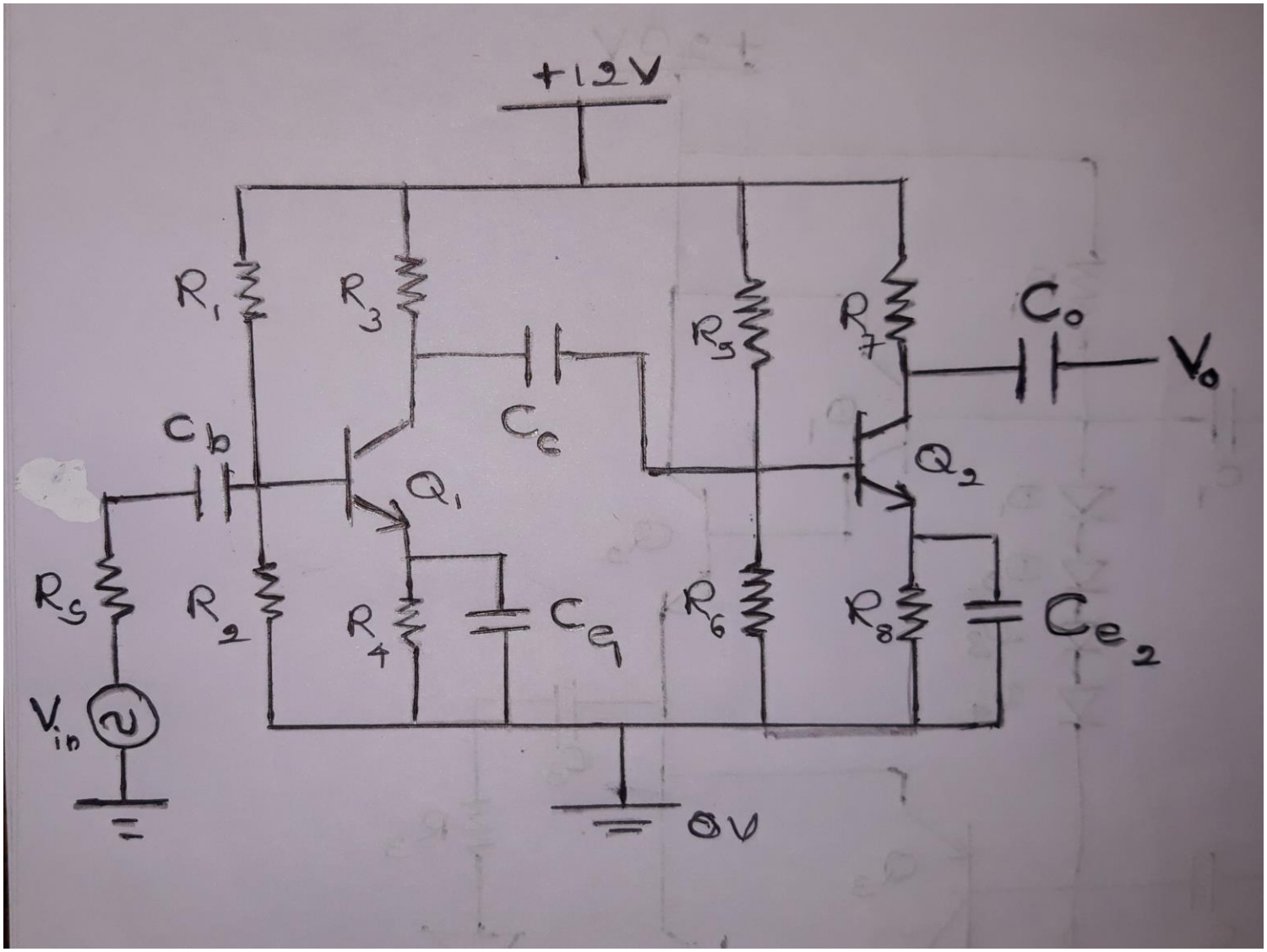
I_{base} = 3A/2500 = 1.2mA

I_{bias} = 1.2mA x 50 = <u>60mA</u>

V_{bias} per Darlington pair= 0.7V x 2 = 1.4V

V_{bias} Total = 1.4V x 2 = <u>2.8V</u>

Q2.



Given

A = 200

C_{BC} = 2pF

C_{BE} = 6pF

R_S = 500Ω

V_{BE} = 0.5V

X_i = 10kΩ

X_o = 6kΩ

f_L = 15kHz

V_{BE} = 0.5V

R_L = 15kΩ

Take

R_1 = 150 kΩ

R_2 = 150 kΩ

C_C = 2nF

$$f_L = \frac{\mathbf{1}}{\mathbf{2\pi}(Rs+Xin)\mathbf{Cb}}$$

$$15000 = \frac{1}{2\pi(500 + 10000)Cb}$$

$C_b = 1.01x10^{-9}F$

C_b = 1Nf

In Q1

$I_b \sim 0A$

$V_b = 12V/2 = 6V$

$V_e = V_b - 0.5V = 6V - 0.5V = 5.5V$

$I_e = 5.5/R_4 \sim I_c$

$A = 200 = I_e / V_t \times R_3$

$R_3 / R_4 = 0.9091$

Take R_4 = 10 kΩ $R_3 = \sim$ 9 kΩ

$V_c = 12V - I_c \times R_3 = 12V - 5.5/R_4 \times R_3$

$= 12V - 7 \times 0.9091V = 5.636V$

$R_6 / R_5 = 5.636 / (12-5.636) = 0.8856$

Take R_5 = 10 kΩ $R_5 \sim$ 9 kΩ

In Q2

$I_b \sim 0A$

$V_b = 5.636V$

$V_e = V_b - 0.5V = 5.636V - 0.5V = 5.136V$

$I_e = 5.136/R_8 \sim I_c$

$A = 200 = I_e / V_t \times R_7$

$R_7 / R_8 = 0.9735$

Take $R_8 = 10\ k\Omega$ $R_7 \sim 10\ k\Omega$

$V_c = 12V - I_c \times R_7 = 12V - 5.136/R_8 \times R_7$

$= 12V - 5.136 \times 0.9735V = 7V$

$$f_L = \frac{1}{2\pi(R_L + Xo)Co}$$

$$15000 = \frac{1}{2\pi(15000 + 6000)Co}$$

$C_o = 500pF$