Solution

Page No............

Q. No.		Marks
1. (a)	Current mirror circuit (2M) Working (2M) Application (1M)	
(b)	$f = \frac{1}{2\pi\sqrt{L_T C}} = 500$ KHZ.	(3M)
	Let $C = 0.1nF$ $\therefore L_T = L_1 + L_2 = 1$ mH.	
	$A_f = \frac{L_2}{L_1} = 10$ $\therefore L_2 = 10 L_1$	
	Let $L_1 = 0.09mH$ $\therefore L_2 = 0.9$ mH.	
	Circuit (2M).	
(c)	Comparison - Any Five points (5M) block diagram, definition, type of gain, A_{fb}, R_{inf}, R_{of}, Input source	
(d)	Circuit diagram of negative clipper. (2M) working (2M) Waveforms (1M)	

2. (a) Type: Current shunt negative feedback (2M)

Circuit without feedback (1M)

$R_s' = R_s \parallel (R_f + R_E) = 916\,\Omega$ $\quad R_E' = R_E \parallel R_f = 909.1\,\Omega$ (1M)

$$A_I = \frac{h_{fe}^2 R_C R_s'}{[R_C + R_B + h_{ie} + (1+h_{fe}) R_E'][R_s' + h_{ie}]} = 148.66 \quad (2M)$$

$\beta = \dfrac{R_E}{R_E + R_f} = \dfrac{1}{11}$ (1M) $\quad R_{in} = R_s' \parallel h_{ie} = 478\,\Omega$ $\quad R_o = \infty \quad R_o' = R_{C2}$ (1M)

$A_{I_f} = \dfrac{A_I}{1 + A_I\beta} = 10.2$ (1M) $\quad A_{V_f} = \dfrac{A_{I_f} R_{C2}}{R_s} = 33.79$ (1M)

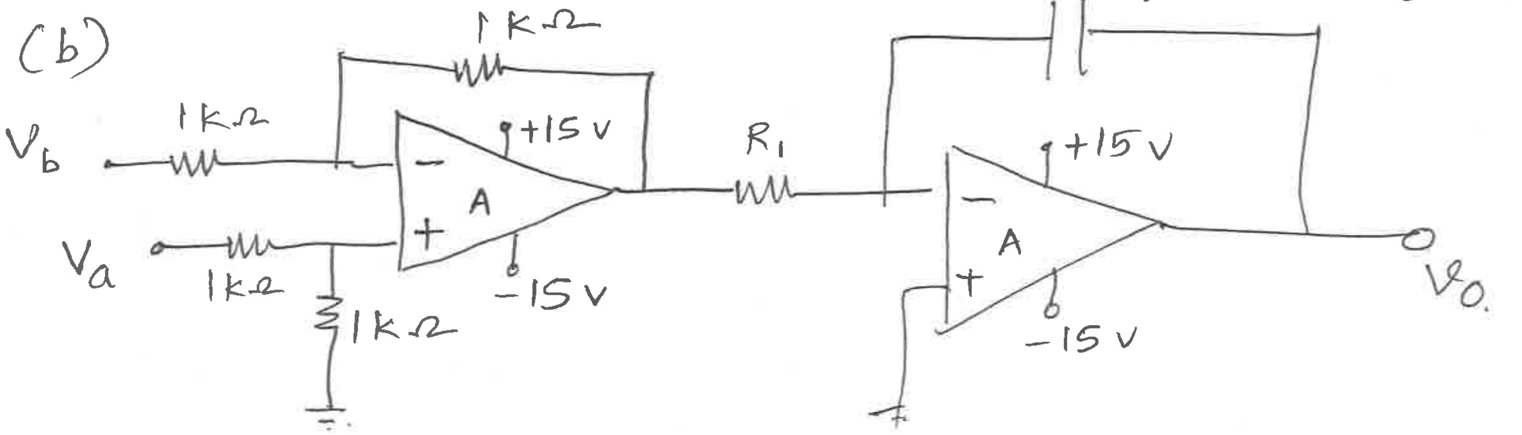
$R_{in_f} = \dfrac{R_{in}}{1 + A_I\beta} = 32.93\,\Omega$ (1M) $\quad R_{of} = \infty$

$R_{of}' = \dfrac{R_o'(1 + A_i\beta)}{1 + A_I\beta} = R_o'$ $\quad (\because A_i = A_I)$ (1M)

2. (b) Monostable multivibrator circuit (2M)
working (4M) waveforms (2M)

3. (a) DIUO circuit (2M)
Derivation - D.C. Analysis (3M)
A.C. Analysis (7)

(b) (8M)



$R_1 C_f = 1$ $\quad$ Let $C_f = 100\,\mu F \quad \therefore R_1 = 10\,k\Omega$

Q. No.		Marks

4. (a) $P_L = 3W$, $R_L = 5\Omega$, $V_{CC} = 20V$, $S \le 10$

ckt (2M) Let $\eta_T = 0.8$, $V_{RE} = 10\%$ of V_{CC},

(4M)

$V_{CE(sat)} = 1\ V$

$P_L' = \frac{P_L}{\eta} = 3.75\ W$, $V_{CEQ} = V_{CC} - V_{RE} - V_{CE(sat)}$
$= 17\ V$

$P_L' = \frac{V_{CEQ}^2}{2R_L'}$ $\therefore R_L' = 38.5\ \Omega$ $\frac{N_1}{N_2} = \sqrt{\frac{R_L'}{R_L}} = 2.8$

$P_L' = \frac{V_{CEQ} I_{CQ}}{2}$ $\therefore I_{CQ} = 0.44\ A$

$\therefore R_E = 4.5\ \Omega$, $P_{RE} = 0.9\ W$

Select ECN149 : $P_{D\,max} = 30W$, $V_{CE(max)} = 60V$,

$I_{C\,max} = 4\ A$, $V_{CE(sat)} = 1V$, $\beta_{max} = 110$,

$\beta_{typ} = 50$, $\beta_{min} = 30$

(4M)

$S = \frac{(1+\beta_{max})(1+k)}{1+k+\beta_{max}}$ $\therefore K = 9.89 = \frac{R_{th}}{R_E}$

$\therefore R_{th} = 43.16\ \Omega$. $V_{TH} = V_{BE} + \frac{I_C}{\beta}(R_{th}+R_E) + I_C R_E$

$\therefore V_{TH} = 3\ V$ $\therefore R_1 = \frac{V_{CC} R_{TH}}{V_{TH}} = 287\ \Omega$

$P_{R_1} = \frac{(V_{CC} - V_{TH})^2}{R_1} = 1\ W$

$R_2 = 50.8\ \Omega$, $P_{R_2} = \frac{V_{TH}^2}{R_2} = 0.18\ W$

Select $R_1 = 300\Omega/2W$, $R_2 = 47\Omega/0.4\ W$, $R_E = 4.5\Omega/2W$

$C_C = 10\ \mu F/20V$, $C_E = 100\ \mu F/20\ V$

$P_{DC} = V_{CC} I_{CQ} + \frac{V_{CC}^2}{R_1 + R_2} = 9.95\ V$ $\%\eta = 37.6$

4. (b) Antilog amplifier circuit (2M)
Derivation (6M).

5. (a) Simple integrator circuit (2M)
Derivation (2M) Freq response (2M)
Limitation (1M)

$$V_o = -\frac{1}{R_1 C_f}\int_0^t 2 \sin(2\pi\, 5\times10^3)t \; dt$$

$$= -\frac{1}{R_1 C_f}\left[\frac{-2 \cos(10\pi\times10^3)t}{10\pi\times10^3}\right]$$

$$V_o = 6.37 \cos(10\pi\times10^3 t) \quad V$$

(2M)

waveform (1M)

(b) Class-B push pull power amplifier
- Circuit (2M) working (4M)
Advantages (1M) Demerits (1M)
Derivation (5M)

6. (a) Barkhausen's criteria (2M)
RC phase shift oscillator circuit (2M)
Derivation (6M)

(b) Diff amp with swamping resistors
Circuit (2M) Explanation (3M)

(c) Crystal osc circuit (2M) working (3M)

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