APPENDIX A

DESIGN and PRACTICAL READINGS for REGULATED POWER SUPPLY

A.1 DESIGN FOR REGULATED POWER SUPPLY

As explained in chapter 7 regulated power supply is controlled transistor series regulator and equations used to determine values of resistors are standard transistor equations.

As T_1 is series pass element its V_{CEO} should be high and as per datasheet of 2N3773 V_{CEO} is 140V hence this power transistor is selected. For T_2 current gain and V_{CEO} should be high and as per datasheet of 2N3501 h_{FE} is 300(maximum) and V_{CEO} is 150V hence this transistor is selected. BD139 is used for negative feedback from output.[Ref. Fig. 7.3]

The voltage provided by potential divider R_1' and R_2' is equal to sum of base-emmiter voltage of transistor T_3 and zener diode.

$$V_{BE3}+ V_Z=V_2' = \frac{R_2'}{R_2' + R_1'} V_{out}$$

Output voltage required is 40V or 80V, zener is taken as 6.2V for emitter voltage of T_3. Assume value for one of the resistors and find other. Negative feedback gain can be adjusted by inserting potentiometer in circuit. Current through zener is limited by resistance R_1.

$$I_Z = \frac{V_1 - V_Z}{R_1}$$

where V_1 is unregulated DC obtained from bridge rectifier.

I_Z is I_{E3} which is maximum 1A from datasheet ($I_C = I_E + I_B$) thus I_Z taken as less then 500mA. Hence from equation R_1 is found.

A.2 PRACTICAL RESULTS FOR REGULATED POWER SUPPLY

Practical readings obtained for voltage regulator are given in Table A.1 and A.2. Transformer used is 230/40V and 210/40V for testing. Load resistor is varied such that output current is from 0 to maximum i.e 5A. Load regulation is calculated by given equation:

% Load Regulation = $(V_{NL} - V_{FL})/V_{NL} * 100$

where V_{NL} is output voltage at no load

V_{FL} is output voltage at full load

Table A.1 Load regulation for 230V input

Unregulated output (V)	Regulated output voltage(V)	Load current(A)
54.7	42.3	0
50.7	39.9	1.5
49.7	39.8	2
49	39.7	2.5
47.8	39.6	3
46.5	39.5	4
45.5	39.4	4.5
44.5	39.3	5

% Load Regulation = (42.3-39.3)/42.3 *100

= 7.09%

Table A.2 Load regulation for 210V input

Unregulated output (V)	Regulated output voltage(V)	Output current(A)
55.5	40.8	0
51.5	40.4	1.5
50.4	40.3	2
49.3	40.2	2.5
47.9	40.2	3
46.3	39.9	4
45.3	39.6	4.5
44.9	38.1	5

% Load Regulation = (40.8-38.1)/40.8 *100

= 6.61%