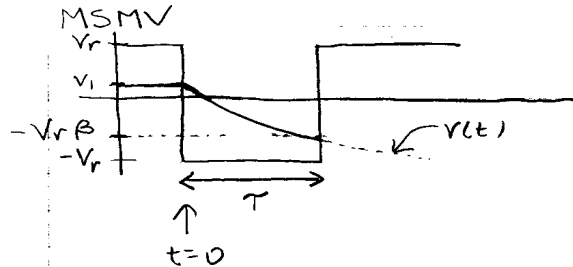


EE 5340 Homework 5 Solutions

Solutions to monostable multivibrator and astable multivibrator problems:

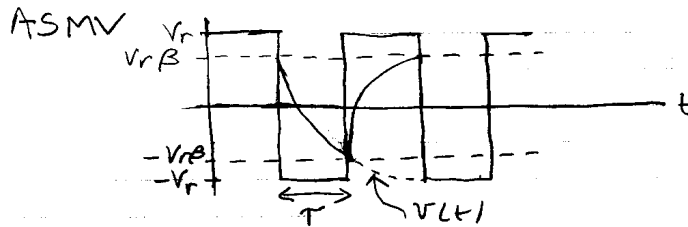


$$V(t) = (V_i + V_r) e^{-t/RC} - V_r$$

$$V(T) = (V_i + V_r) e^{-T/RC} - V_r = -V_r \beta$$

SOLVING FOR T:

$$T = RC \ln \left\{ \frac{1 + V_i/V_r}{1 - \beta} \right\}$$



$$V(t) = (V_r \beta + V_r) e^{-t/RC} - V_r$$

$$V(T) = (V_r \beta + V_r) e^{-T/RC} - V_r = -V_r \beta$$

$$(V_r \beta + V_r) e^{-T/RC} = V_r - V_r \beta$$

$$e^{-T/RC} = \frac{V_r (1 - \beta)}{V_r (1 + \beta)}$$

$$-T = RC \ln \left\{ \frac{1 - \beta}{1 + \beta} \right\}$$

$$T = RC \ln \left\{ \frac{1 + \beta}{1 - \beta} \right\}$$

Solution to SPICE membrane modeling problem:

```

Cell membrane potential-hmwk4
VIN 1 0 PULSE (0 1 .5E-3 0 0 1E-3)
RI1 2 1 370
RI2 2 5 370
C1 3 2 146E-9
RT1 3 2 1K
RE1 3 0 191
RE2 3 4 191
RI3 5 6 370
RI4 6 9 370
C2 6 7 146E-9
RT2 6 7 1K
RE3 4 7 191
RE4 7 8 191
RI5 9 10 370
RI6 10 13 370
C3 10 11 146E-9
RT3 10 11 1K
RE5 8 11 191
RE6 11 12 191
RI7 13 14 370
RI8 14 17 370
C4 14 15 146E-9
RT4 14 15 1K
RE7 12 15 191
RE8 15 17 191
.TRAN .01e-6 3E-3
.PROBE
.END

```

Date/Time run: 10/22/97 13:37:18 Cell membrane potential-hmwk4 Temperature: 27.0

