P1/2

Electric Circuit and Electronics

Institute of Aeronautics ans Astronautics

1. In Figure 1, (a) Find an equivalent circuit by Bartlett Bisection Theorem, (巴茶特平分定理)

    (b) Find branch current I,

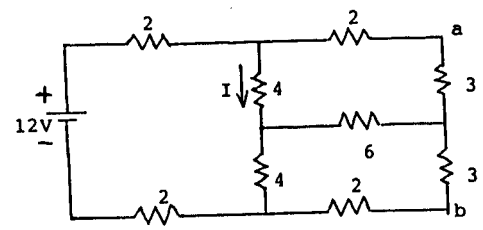   (c) Find node voltage V_{ab}.   (15%)

Figure 1.

2. In Figure 2, if $i_1(0^+)=2$, $i_2(0^+)=-1$, $V_c(0^+)=3$,

    (a) Formulate the state equations to solve this curcuit,

    (b) Calculate $V_2(0^+)$, $\frac{dV}{dt}2(0^+)$.
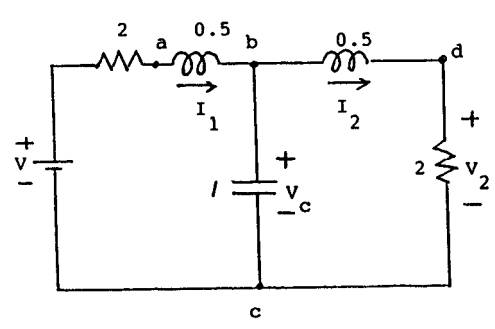
    (15%)

Figure 2.

3. (a) Describe the V-I characteristic of a tunnel diode.   (5%)

    (b) Describe the R-S Flip-Flop circuit and its truth table.   (5%)

    (c) Define the input offset voltage for an operational amplifier.   (5%)

4. An amplifier is shown in Figure 3, with its specifications in Table 1.

   (a) Draw the alternative equivalent circuit by using Miller's Theorem,

   (b) Calculate R_i, R_i', A_v, A_{vs}, and $A_I' = -I_2/I_1$.   (15%)
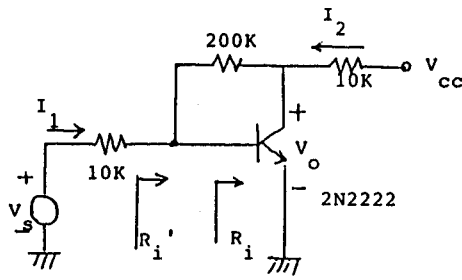

Figure 3.

Table 1.
(h-Parameters of 2N2222 at I_E=1.3 mA)

	CE	CC	CB	
h_i	1,100	1,100	21.6	ohm
h_r	2.5×10^{-4}	~ 1	2.9×10^{-4}	
h_f	50	-51	-0.98	
h_o	24	25	0.49	$\mu A/V$
$1/h_o$	40K	40K	2.04M	

5. Prove how does transistor transconductance g_m vary with $|I_c|$ and T at high frequency operation.   (15%)

6. In stability problem, define (a) rise time,

                            (b) delay time,

                            (c) overshoot,

                            (d) settling time.

   Draw a step response of a two-pole feedback amplifier for a damping factor K=0.3, and show the above items in the response curve.   (15%)

   ** The drawing is not necessary to be precision in scale.
   (此圖毋需十分精確，僅引示意，即可   )

7. (a) Explain what is the "thermal runaway".   (5%)

   (b) Define and explain the Common Mode Rejection Ratio.   (5%)