1. For the circuit in Fig. 1(a) and Fig. 1(b), determine the output v_o. (20%)

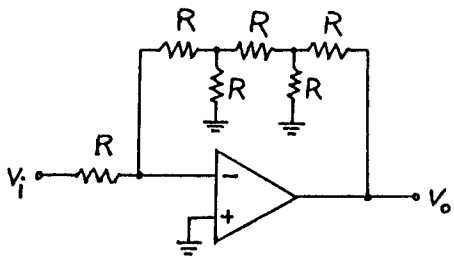

Fig. 1(a)
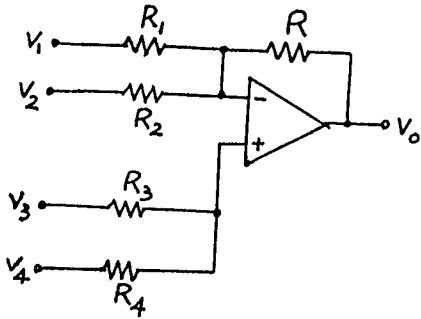

Fig. 1(b)

2. A circuit shown in Fig. 2, the parameters of the JFET are: $g_m = 1$ m℧, $r_d = 40 k\Omega$, $C_{gs} = 5pF$, $C_{gd} = 1pF$ and $C_{ds} = 1pF$. Determine the approximate value of the upper 3-dB frequency. (20%)
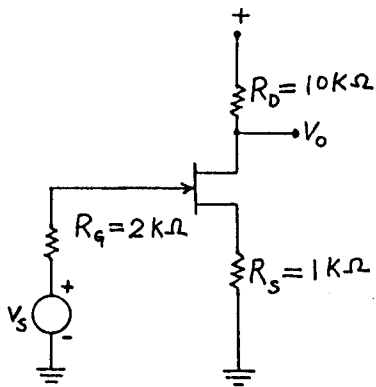

Fig. 2

3. An astable multivibrator circuit is shown in Fig. 3. Explain its operation and determine the frequency of the output v_o. (20%)
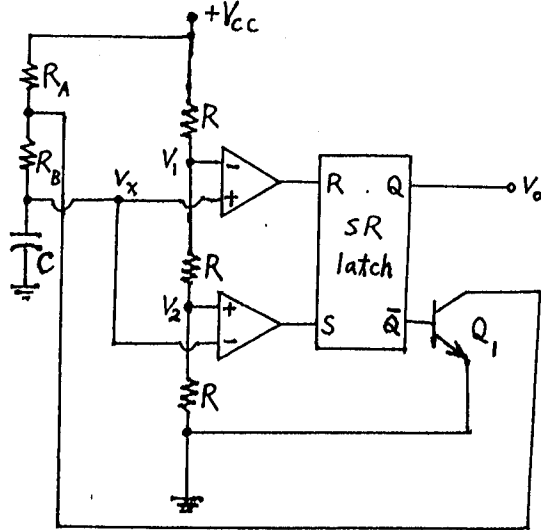

Fig. 3

4. For the circuit in Fig. 4, assuming all transistors to be identical with β infinite, and keeping the current in each junction the same.

(a) Derive an expression for the output current I_o. (5%)

(b) What must the relationship of R_E to R be? (5%)

(c) For $V_{cc} = 15$ V, and assuming $V_{BE} = 0.7$ V, determine R_E and R to obtain an output current of 1 mA. (5%)

(d) What is the lowest voltage that can be applied to the collector of Q_3? (5%)
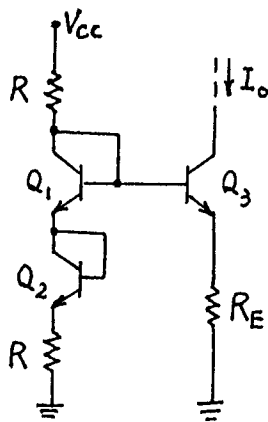

Fig. 4

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5. The BJT in the circuit shown in Fig. 5 begins
   to conduct at $v_{BE}=0.7$ V and is fully
   conducting at $v_{BE}=0.8$ V. The same applies to
   D_7. The Schottky diodes have a voltage drop
   of 0.5 V.

(a) What is the logic function performed? (6%)

(b) Find the noise margins. (8%)

(c) Find the current drawn from the supply when
    A is high, B is high, and C is low. (6%)
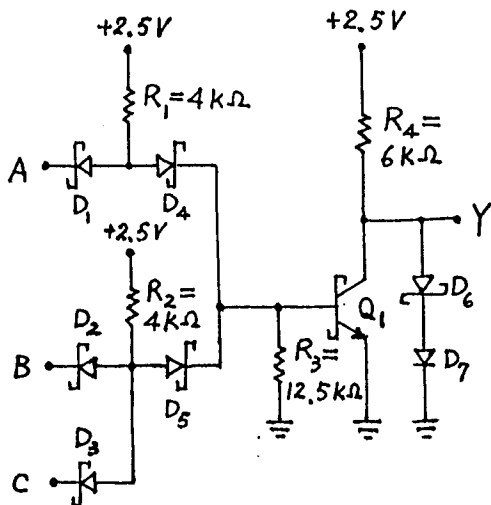

Fig. 5

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