1 Thevenin and 's theorems

1) Task

In the system in Fig.1, determine:

a) currents flowing through individual resistors (mark the direction),

b) Voltage drops on individual resistors (mark the direction),

c) equivalent diagrams from Thevenin's theorem and Norton's theorem

for the calculation assume:

– In the system in Fig.1 *:* $E = 15V$, $R_1 = 1k5$, $R_2 = 2k2$, $R_3 = 3k6$, $R_4 = 5k1$;

– In the system in Fig.2 *:* $Uin = 10V$, $R_1 = 3k3$, $R_2 = 4k7$, $R_3 = 6k8$;

– in circuit in Fig.3 *:* $Uin = 24V$, $R_1 = 3$, $R_2 = 6k$, $R_3 = 4k$

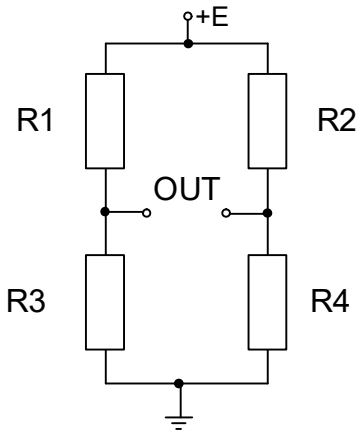

Fig.1 . Bridge circuit.

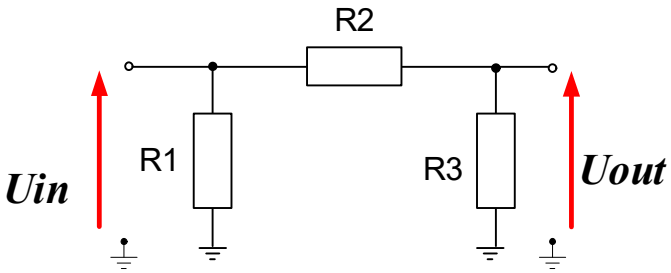

Fig.2 . Pi type layout.

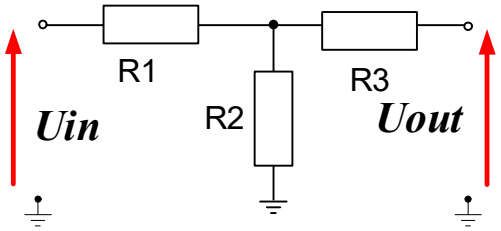

Fig.3 . T-type layout.

2) Task

In the circuit in Fig.4 calculate the power dissipated on the resistor R_3. For the calculation assume: $Uin = 15V$, $R_1 = k5$, $R_2 = 4k7$, $R_3 = 1k$.

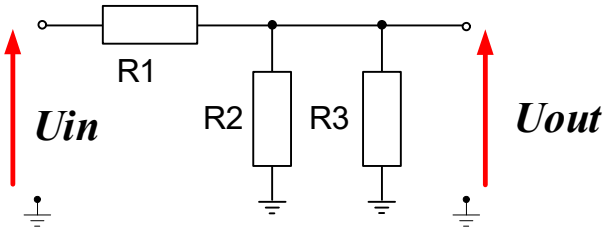

Fig.4 . Resistor circuit.

2 RC circuits

3) Task

For the system in Fig.5 sketch the frequency characteristics (amplitude and phase); plot the amplitude characteristics in V/V and dB, and the phase characteristics in degrees. For calculations assume: R = 4k7, C = 4n7. Plot the Bode characteristics.

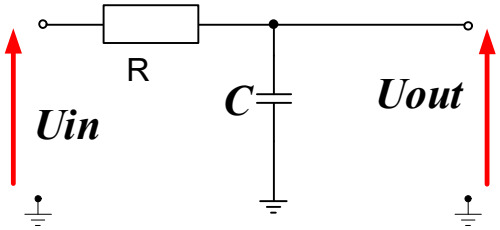

Fig.5 . Basic RC (low-pass) circuit.

4) Task

For the system in Fig.6 sketch the frequency characteristics (amplitude and phase); plot the amplitude characteristics in V/V and dB, and the phase characteristics in degrees. For calculations assume: R = 5k1, C = 8n2. Plot Bode's characteristics.

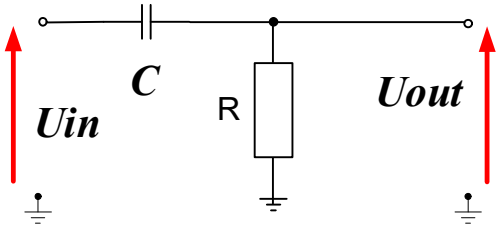

Fig.6 . Basic CR (high pass) circuit.

5) Task

What is the 3 dB cutoff frequency in the system in Fig.7 ? For calculations assume: R_1 = 2k2, R_2 = 2k8, C = 560p. Plot the Bode characteristics.

6) Task

What is the 3 dB cutoff frequency in the system in Fig.8 ? For calculations assume: R_1 = 100, R_2 = 2k2, C = 1n. Plot the Bode characteristics.

7) Task

To get a compensated divider in the circuit in Fig.9 what value should it take:

a) resistor R_2 at: R_1 = 3k6, C_1 = 30p, C_2 = 100p,

b) C_1 capacitor at: R_1 = 9M1, R_2 = 1M, C_2 = 100p.

8) Task

Analyze the circuit in Fig.9 in LTspice for the values calculated in the previous task and for the case when one of the elements (analyze all cases) is larger or smaller than calculated. Carry out frequency and time analysis with rectangular wave excitation.

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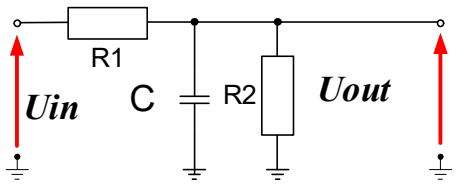

Fig.7 . Low-pass circuit.

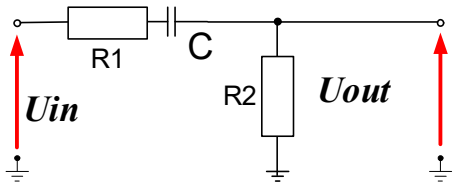

Fig.8 . High-pass circuit.

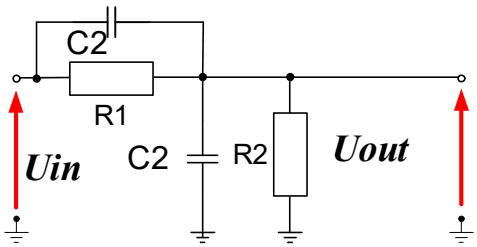

Fig.9 . Compensated divider.