

電路學 (一) 第一次測驗 四電機二 A 2014 年 10 月 13 日 (星期一)

1) 滿分 120 分，考試時間 2 小時。

2) 答案應有正確之數值與單位。

1. A DC current of 5 A is flowing in a conductor. How many electrons pass a fixed point on the conductor in 1 minute? (10%)
2. An AC current $i(t) = 5.0 \sin(100t)$ (A) is flowing in an inductor of 1 mH. (a) Find the voltage $v(t)$ across the inductor. (10%) (b) Find the maximum instantaneous power dissipated by the inductor. (10%)
3. Find the value of R_{eq} looking into terminals a and b of the circuit shown in **Fig. 1**. (10%)
4. If the DC current source I_s in **Fig. 2** delivers electric power of 155 W to the circuit, find the values of I_s and I_x . (20%)
5. In the circuit shown in **Fig. 3**, $R=0$, and I_1 and I_2 are unknown. Find i and v_{AC} . (20%)
6. In the circuit of **Fig. 4**, find the resistance seen by the voltage source, $R_{in} = v_s / i_s$, as a function of a . (10%)

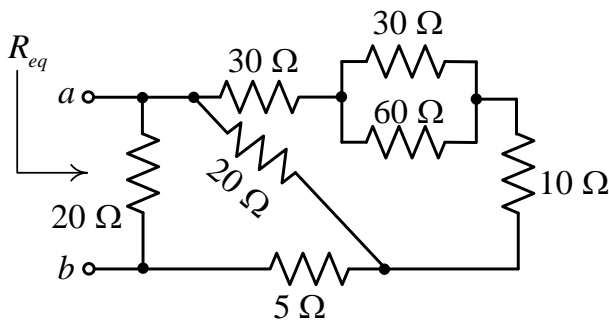


Fig. 1

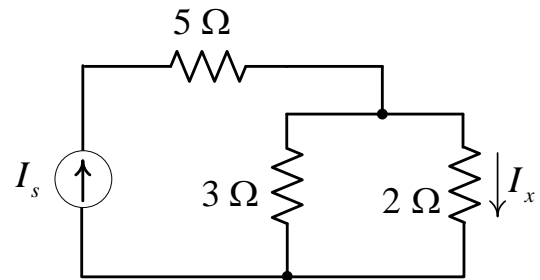


Fig. 2

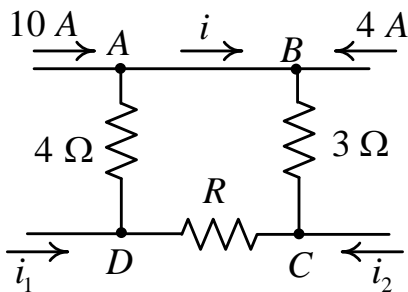


Fig. 3

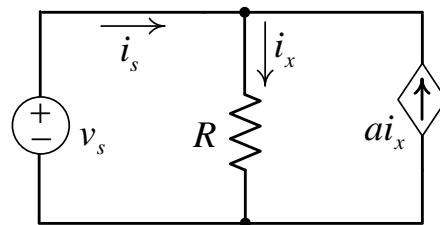


Fig. 4

7. Find the equivalent capacitance C_{eq} looking into terminals a and b of the circuit shown in **Fig. 5**. (10%)
8. A network is composed of resistors of R and $2R$ connected in series and parallel to construct a semi-infinite ladder circuit as shown in **Fig. 6**. Find the resistance looking into terminals a and b . (10%)

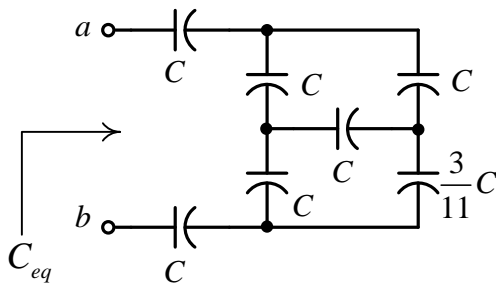


Fig. 5

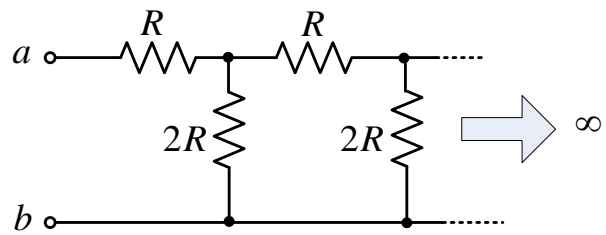


Fig. 6

9. An infinitely extending resistor grid of triangles is shown in **Fig. 7** in which all the resistors have the same resistance of 1Ω . Compute the resistance between two arbitrary adjacent nodes A and B . (10%)

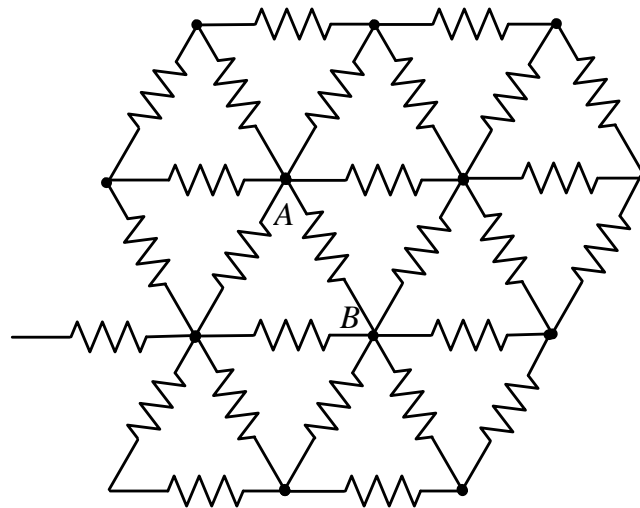


Fig. 7