سوال 1 تمرین‌های کلاس تمرین

الف)

$$\int_{-\infty}^{\infty} \delta(\alpha x)\, dx = \int_{-\infty}^{\infty} \delta(u)\, \frac{du}{|\alpha|} = \frac{1}{|\alpha|}$$

and so

$$\delta(\alpha x) = \frac{\delta(x)}{|\alpha|}.$$

ب)

Let $x = \sqrt{u}$, so $\mathrm{d}x = \frac{\mathrm{d}u}{2\sqrt{u}}$, then

$$\int_0^{\infty} f(x)\delta(x^2 - a^2)\,\mathrm{d}x = \int_0^{\infty} \frac{f(\sqrt{u})}{2\sqrt{u}}\delta(u - a^2)\,\mathrm{d}u = \frac{f(|a|)}{2|a|}.$$

Let $x = -\sqrt{u}$, so $\mathrm{d}x = -\frac{\mathrm{d}u}{2\sqrt{u}}$, then

$$\int_{-\infty}^{0} f(x)\delta(x^2 - a^2)\,\mathrm{d}x = \int_0^{\infty} \frac{f(-\sqrt{u})}{2\sqrt{u}}\delta(u - a^2)\,\mathrm{d}u = \frac{f(-|a|)}{2|a|}.$$

Hence

$$\int_{-\infty}^{\infty} f(x)\delta(x^2 - a^2)\,\mathrm{d}x = \frac{1}{2|a|}(f(|a|) + f(-|a|)) = \frac{1}{2|a|}(f(a) + f(-a)).$$

سوال 1 تمرین‌های کلاس تمرین

ج)

$$I = \int_{-\infty}^{\infty} t\delta'^{(t)}dt = t\delta(t)|_{-\infty}^{\infty} - \int_{-\infty}^{\infty} \delta(t)dt = -\int_{-\infty}^{\infty} \delta(t)dt = \int_{-\infty}^{\infty}(-\delta(t))dt$$

➔ $t\delta'(t)$ = -$\delta(t)$

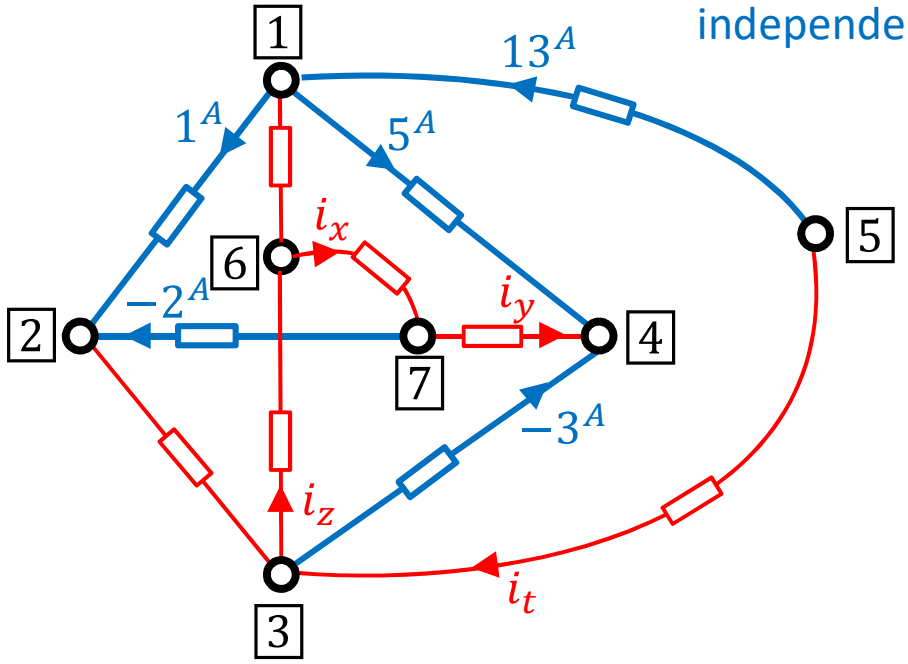
Hint: f(x) = x , x_0 = 0 , $\int_{-\infty}^{\infty} f(x)\delta(x - x_0)dx = f(x_0)$ ➔ $\int_{-\infty}^{\infty} x\delta(x)dx = 0 \Rightarrow t\delta(t) = 0$

د)

$$I = \int_{-\infty}^{\infty} f(x)\delta'(x)dx = f(x)\delta(x)|_{-\infty}^{\infty} - \int_{-\infty}^{\infty} f'(x)\delta(x)dx = -f'(0)$$

Hint: f(x) = 0 for |x| < b and x_0 = 0 , $\int_{-\infty}^{\infty} f(x)\delta(x)dx = f(0)$ ➔ $\int_{-\infty}^{\infty} f(x)\delta(x)dx = 0$
So $f(x)\delta(x)$ = 0.

١-الف



independent current variables

5: $i_t = -13^A$

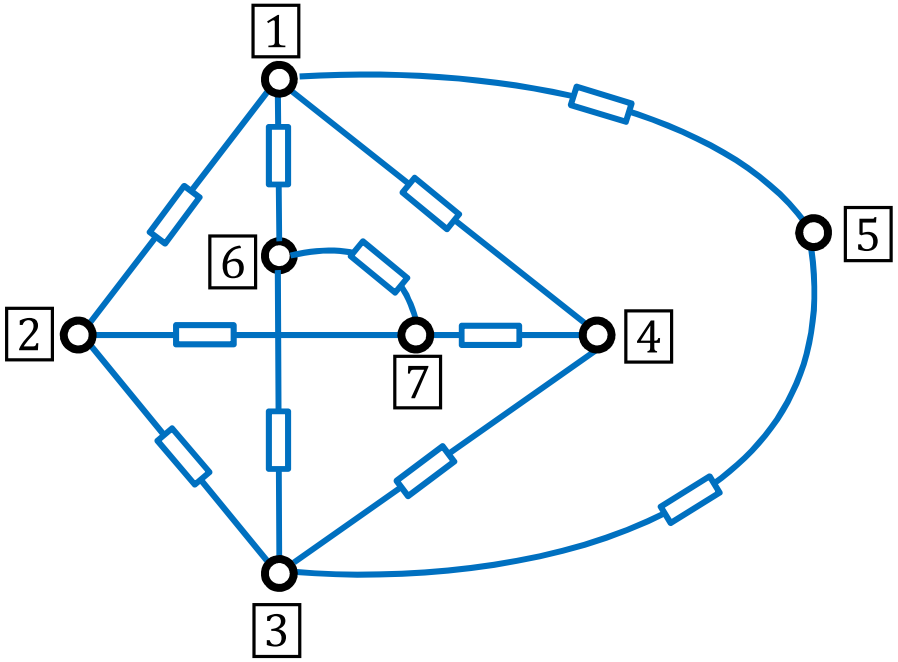
4: $i_y = 3 - 5 = -2^A$

7: $i_x = -2 - 2 = -4^A$

2: $i_{2\to3} = 1 - 2 = -1^A$

3: $i_z = -13 + 3 - 1 = -11^A$

١-ب

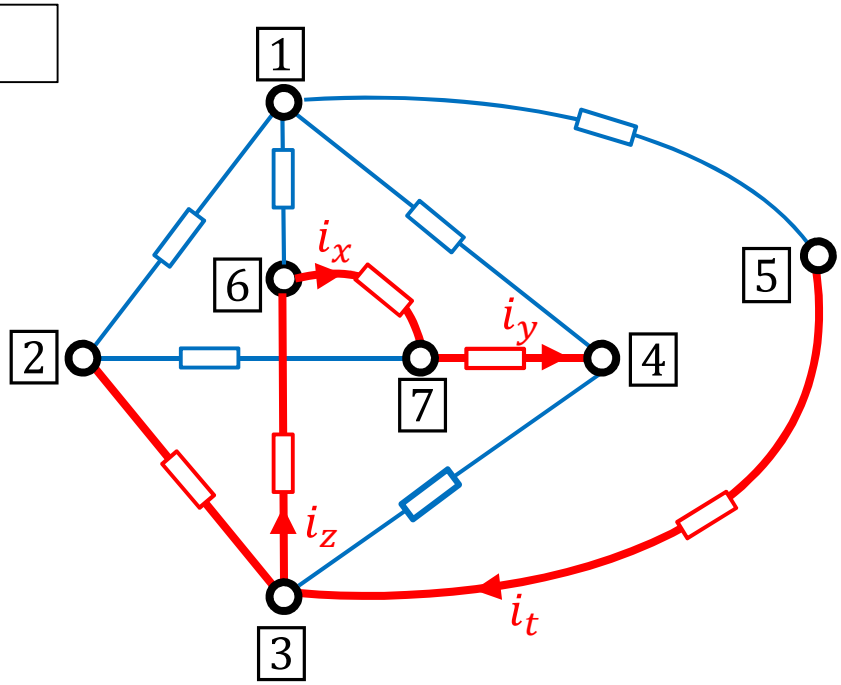


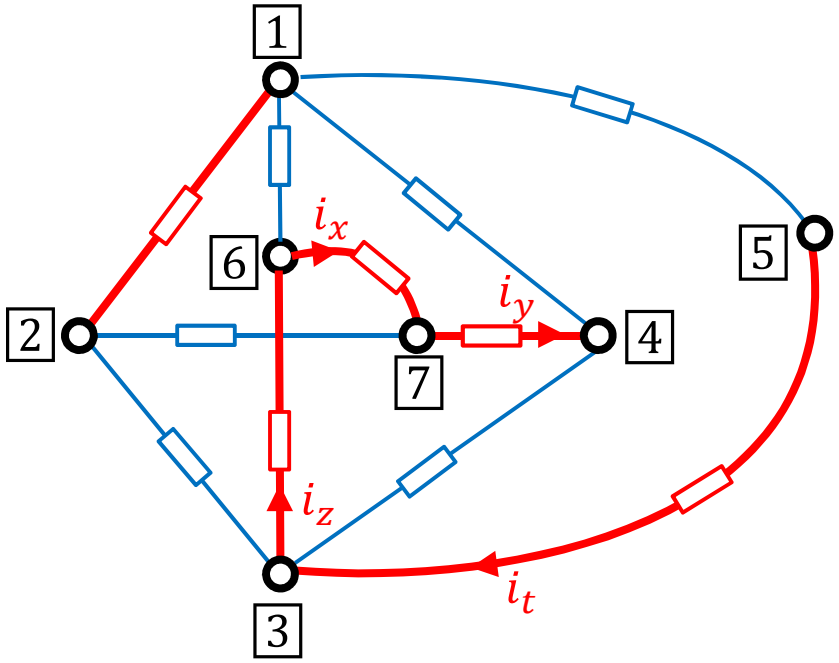
# of branches = 11 → # unknown currents = 11

# of nodes = 7 → # independent KCL equations= 6

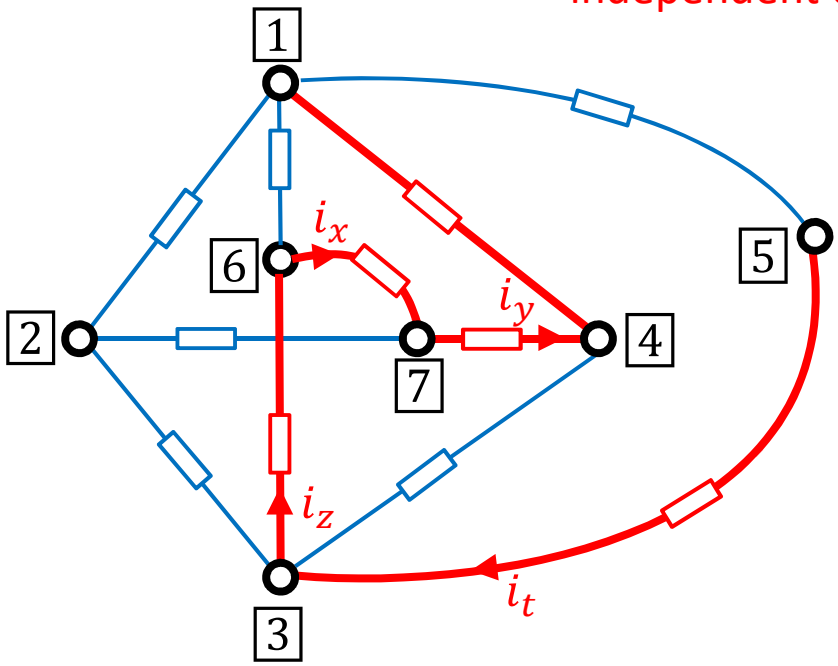
→ # of independent current variables = 11-6 = 5

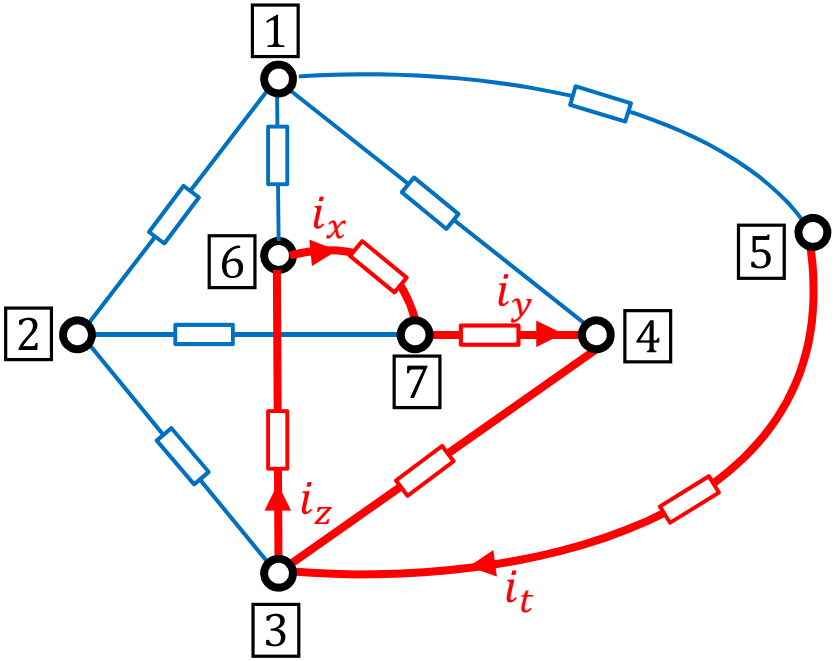
۱-پ



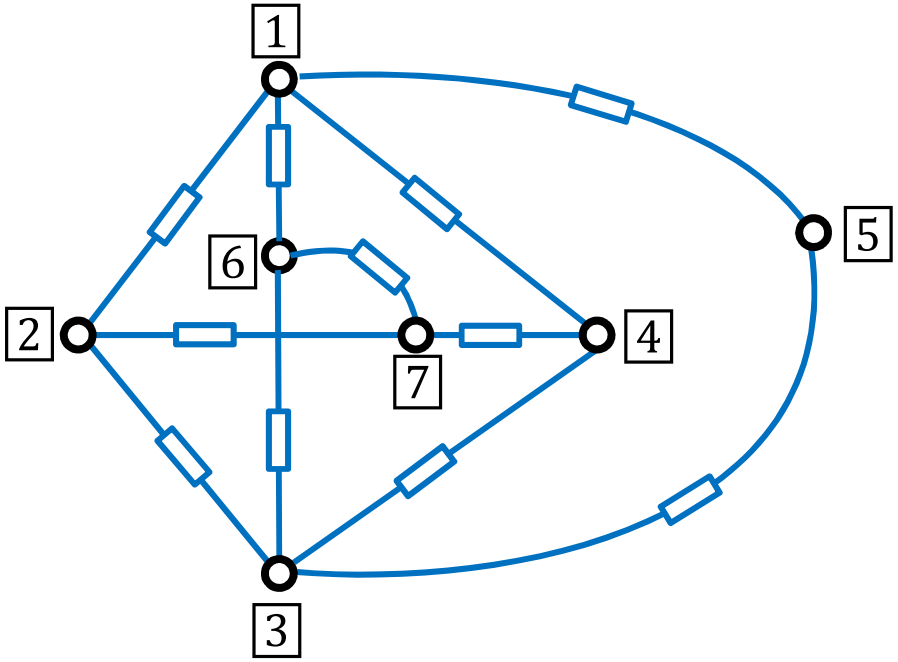


independent current variables





٢-الف



unknown currents & voltages = 22

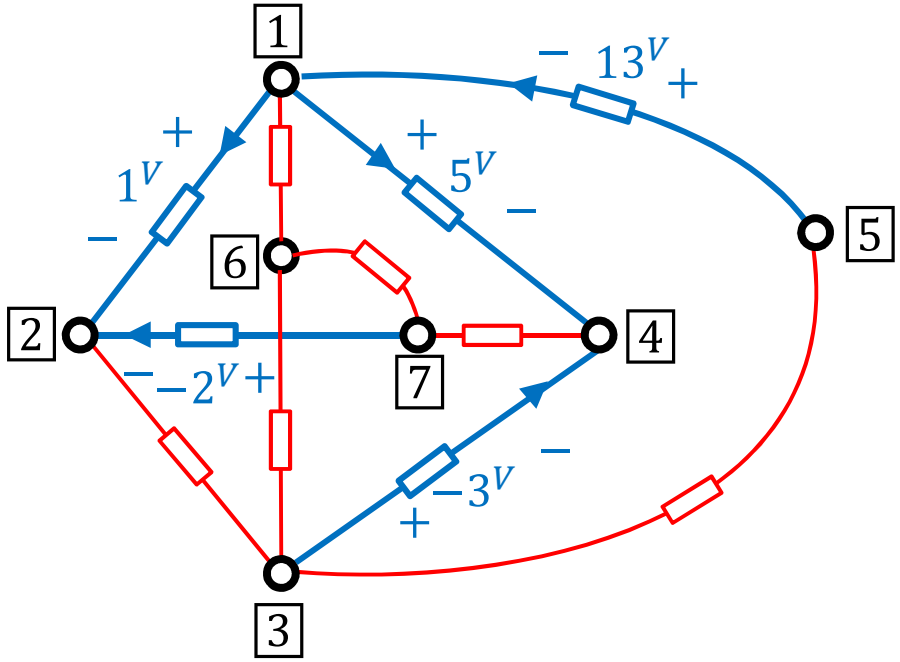
independent KCL equations= 6

equations for each branch= 11

→ # of independent voltage equations =22-11-6= 5

→ # of independent voltage variables =11-5= 6

٢-ب



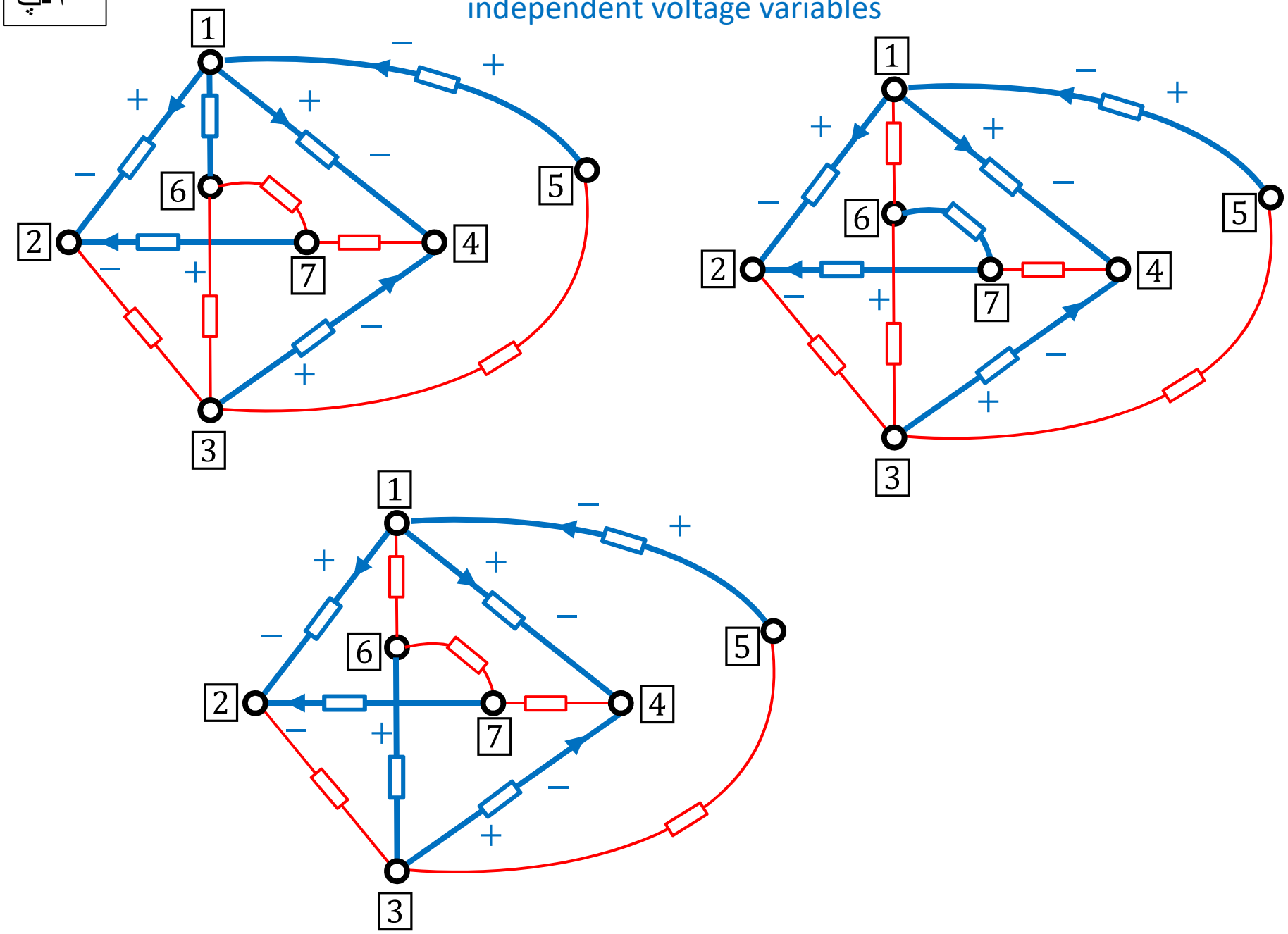
independent voltage variables = 6

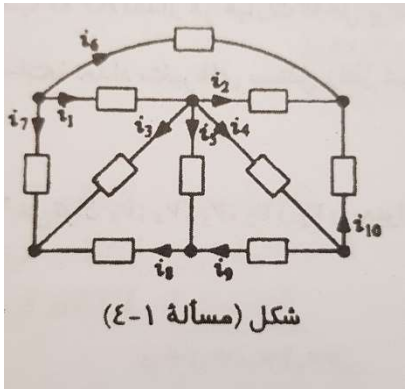
given voltages = 5

→ unsolvable,
1 more indep. voltage is needed

۲-پ

independent voltage variables





شکل (مسألة ١-٤)

Subject.

Date.

سوال ۴)

الف)

تعداد متغیر مستقل؟ $= 10 - 6 + 1 = 5$

① : $i_7 + i_6 + i_1 = 0$

② : $i_2 + i_3 + i_4 + i_5 - i_6 = 0$

③ : $-i_2 - i_6 - i_{10} = 0$

④ : $-i_7 - i_3 - i_8 = 0$

⑤ : $-i_{10} - i_9 + i_8 = 0$

کلی از حالاتی که بتوان جریان‌ها را بتوان مستقل برحسب جریان ۴و۶ و ۱و۲و۳ مستقل باشند

با استفاده از روابط بالا

$i_5 = i_1 - i_2 + i_3 - i_4$

$i_7 = -i_1 - i_6$

$i_8 = i_1 + i_6 - i_3$ ← ساخت دیگر

$i_9 = i_7 + i_2 + i_4$ جریان‌ها به راس

$i_{10} = -i_2 - i_6$ جریان‌های مستقل

$V_1 i_1 + V_2 i_2 + \cdots + V_{10} i_{10} = 0$ ؟

بر حسب (۴و۶و۱و۲و۳) $i_5, i_7, i_8, i_9, i_{10}$ جایگذاری

$\Rightarrow \sum V_i = 0$

ب) ثابت ب نیز مشابه حالت الف می‌باشد.

تعداد ولتاژ ناشناخته $6 - 1 = 5$

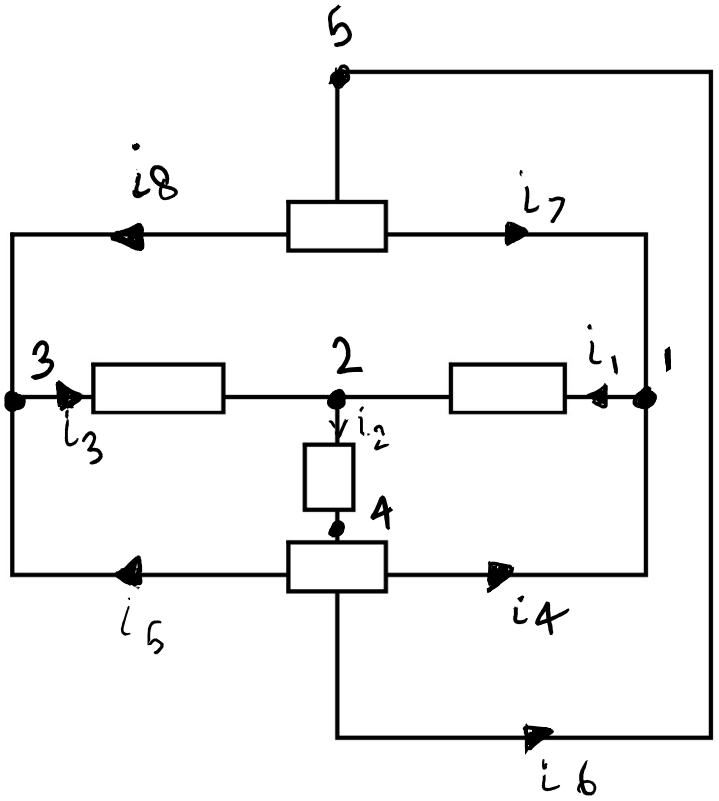
مستقل V_1, V_2, V_3, V_4, V_5

یک سری ولتاژهای مستقل اند!

$\sum V_i = 0$

11

/1 نکته این مساله این است که برای مدار های دارای عناصر سه سر یا ۴ سر مانند مدار های شامل عناصر دو سر قوانینkvl وkcl برقرار است.



lokcl:

1) $i_4 + i_7 = i_1$

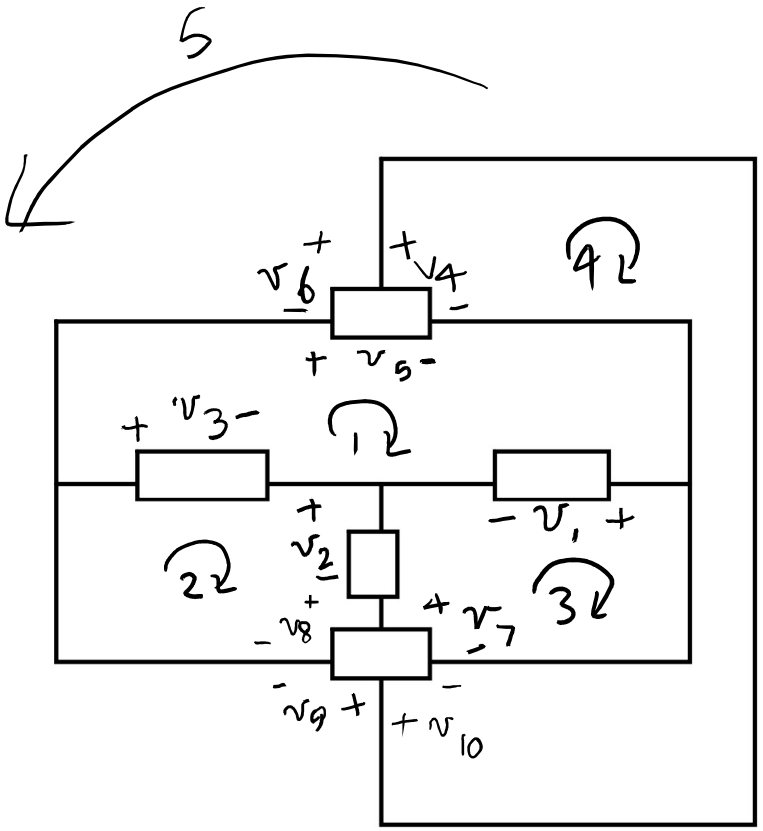
2) $i_1 + i_3 = i_2$

3) $i_5 + i_8 = i_3$

4) $i_4 + i_5 + i_6 = i_2$

5) $i_7 + i_8 = i_6$

11
/2



Lokvl:

1) $-v_3 + v_5 + v_1 = 0$

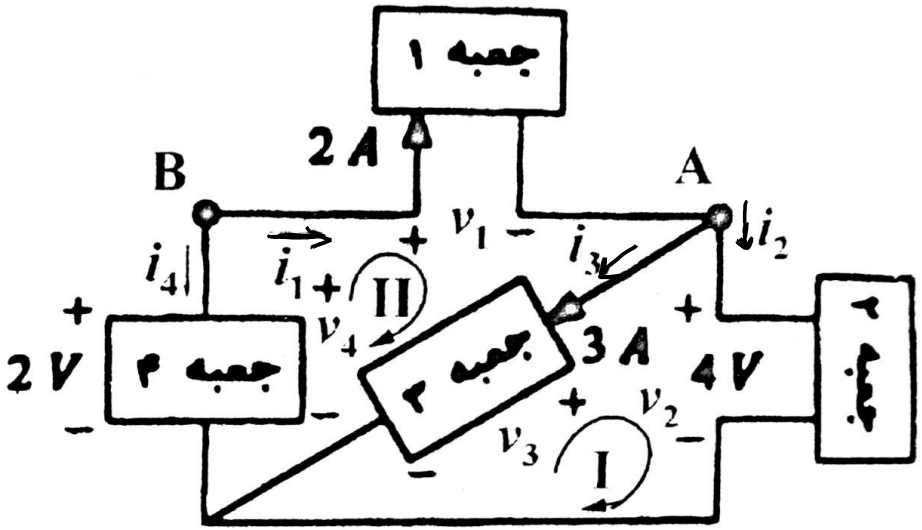
2) $v_3 + v_2 + v_8 = 0$

3) $-v_7 - v_2 - v_1 = 0$

4) $-v_4 + v_{10} = 0$

5) $-v_9 + v_6 = 0$

14



KVL I) $v_2 - v_3 = 0 \Rightarrow \boxed{v_3 = 4v}$

KVL II) $v_1 + v_3 - v_4 = 0 \Rightarrow$

$\boxed{v_1 = 2 - 4 = -2v}$

KCL A) $i_1 = i_2 + i_3 \Rightarrow \boxed{i_2 = -1A}$

KCL B) $-i_1 = i_4 \Rightarrow \boxed{i_4 = -2A}$

$P = vi \Rightarrow$

$P_1 = -2 \times 2 = -4w$

$P_2 = 4 \times -1 = -4w$

$P_3 = 4 \times 3 = 12w$

$P_4 = 2 \times -2 = -4w$

$$\sum_{i=1}^{4} P_i = -4 - 4 + 12 - 4 = 0$$

صورتی از قضیه تلگن برقرار است