Capacitor and inductor

التاريخ: / /

الموضوع: sec (1)

Capacitor:-

→ Two Conductor separated by an insulator

→ Store electric charge with (-) on one Conductor and (+) on the other.

→ symbol- —||— C (F)

→ Capacitance: ability of capacitor to store charge

- $C = \frac{Q}{U}$ ← Charge (C); U ← potential difference between Two Conductors

C → F (Farad) (MF, mF

- $C = \varepsilon \frac{A}{d}$ ← A: Area of either plate (m^2); d ← separation (m)

Permitivity (F/m) ← هي سماحية او قدرة المادة على تخزين طاقة

$\varepsilon = \varepsilon_0 \varepsilon_r$

ε_0 ← permitivity of vacuum (8,85 pf)

ε_r → air 1.0006

paraffine paper 2.5

mica 5

glass 7.5

mica 7500

التاريخ: / /

الموضوع:

total Capacitance عكس المقاومة *

Parallel $C_T = C_1 + C_2 + C_3 + \dots$

Serise $\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \dots$

Energy storage $W_c = \frac{1}{2} C V^2$

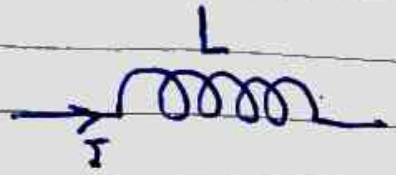
(W_c: J, C: F, V: Volt)

inductor :.

* passive electrical Component
* Stores energy in magnetic field when electric current Flows through it

Flux Φ (wb) فيض

Flux density (B) كثافة الفيض



التاريخ: / /

الموضوع:

عدد اللفات

$Li = N\Phi$ → Linkage flux

inductance (H)

$L = \frac{N\Phi}{I}$ ← Current

$L = \frac{N^2 \mu A}{\ell}$ ← Cross section Area (m^2)

Permability ↑ ← Length (m)

$\mu = \mu_0 \mu_r$

↳ permeability of vacuum ($4\pi * 10^{-7}$ H/m)

μ_r → نفاذية المادة لمرور المجال المغناطيسي

induced voltage (e) $e = \frac{N d\Phi}{dt} = L\frac{di}{dt}$

Total inductance التوصيل على التوالي والتوازي *

Serise

$L_T = L_1 + L_2 + L_3 + \cdots$

Parallel

$\frac{1}{L_T} = \frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3} + \cdots$

Energy Storage $W_L = \frac{1}{2} L i^2$

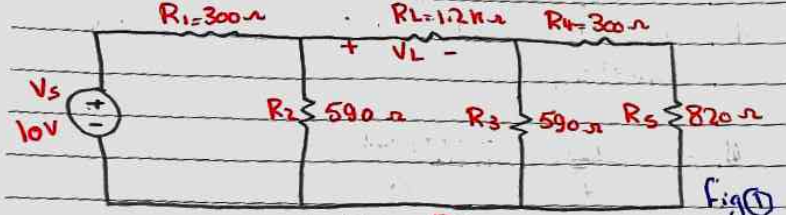
20/11/2023 عمل
4/12/2023 عمله
التاريخ: / /

بسم الله الرحمن الرحيم

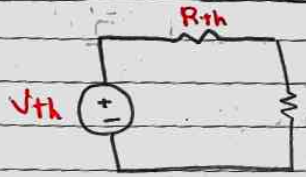
الموضوع: Sec (7)

Lab (3) Thevenin Equivalent Circuit

objective:- verify Thevenin's Theorem by obtaining The Thevenin equivalent voltage Vth and Thevenin equivalent resistance Rth for the given circuit.

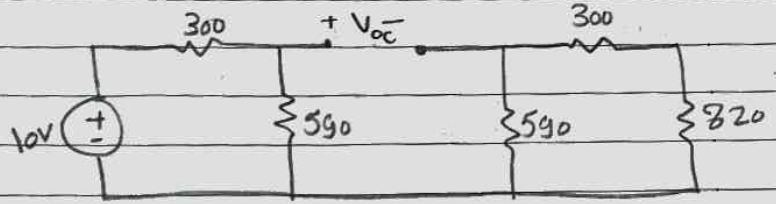


Fig①



① هنوصل Fig① ونقيس الجهد RL ونسجل قراءة VL

② هنطفي Thevenin لإيجاد قيمة Vth هنرفع الحمل وهو RL ونخلي مكانه open ونقيس جهده وده هو الـ Vth

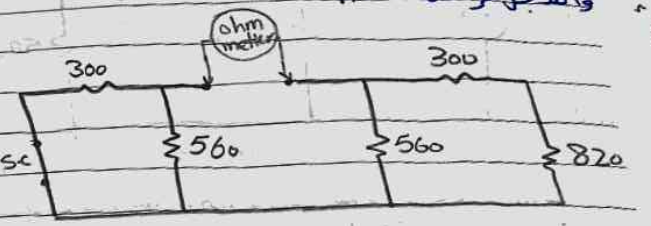


note Vth is the voltage on 590Ω

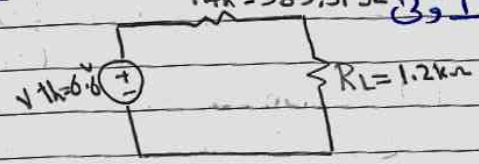
التاريخ: / /

الموضوع:

③ هنلغي المصادر عشان اجيب قيمة Rth عشان هوصر الدايرة short واسجل قراءة Rth



④ اوصل مكان Thevenin واحسب قيمة VL & RL



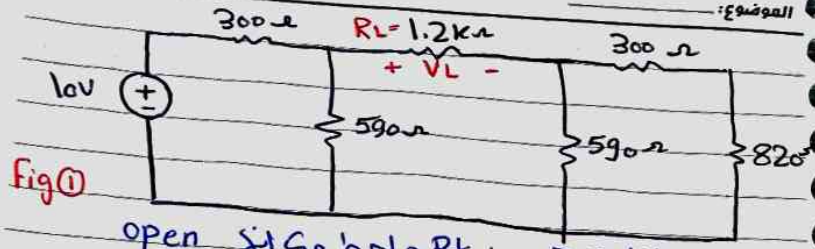
Vth = 6.5 V.6 Rth = 594Ω ممكن نشتغل على حسابي القراءة الاولى

واحسب VL

Ex/ Fig① by using Thevenin Theorem Find V_L at 1.2 kΩ.

التاريخ: / /

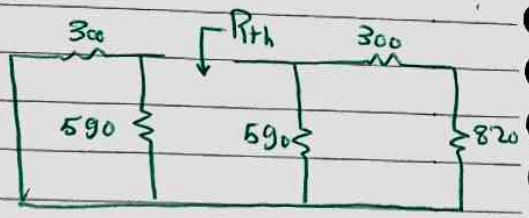
الموضوع:



Fig①

1) خطوات الحل ① حذف R_L واعمل مكانها open
2) احسب المقاومة المكافئة من نقطة الـ open بعد الغاء المصادر المستقلة بتحويل مصدر الجهد لـ s.c ومصدر التيار لـ o.c
3) هرجع المصادر تاني واحسب جهد الـ open اللي هو V_{th}
4) هرسم مكان Thevenin على التوالي (V_{th}, R_L, R_{th}) وايجاد قيمة الجهد او التيار على الـ R_L

To Find R_{th}



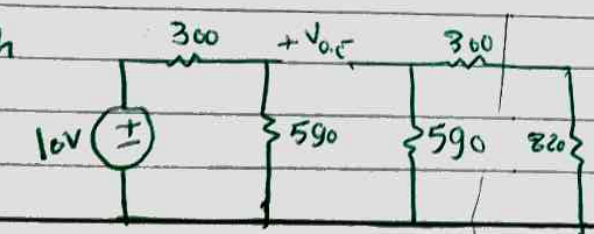
(300 // 590) = 198.876

(300 + 820) = 1120

1120 // 590 = 386.43

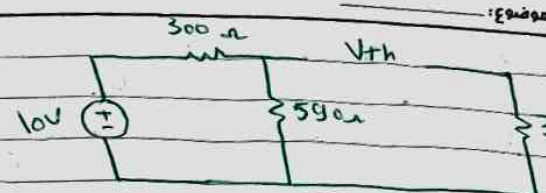
R_{th} = 198.876 + 386.43 = 585.31 Ω

To Find V_{th}



التاريخ: / /

الموضوع:

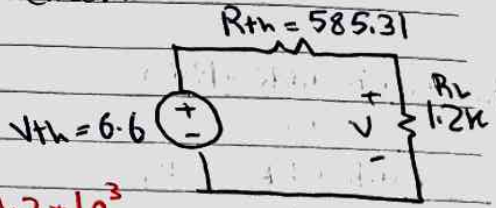


by using voltage divider (590) حوالي مقاومة V_{th}

$$V_{th} = 10 * \frac{590}{300+590} = 6.6\ v$$

(590) المقاومة القريبة — (10) الجهد الكلي — (300+590) مجموع المقاومتين

Thevenin equivelant circuit



V_L by using voltage divider is

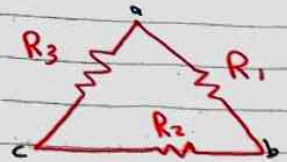
$$V_L = 6.6 * \frac{1.2*10^3}{1.2*10^3 + 585.31} = 4.4\ volt$$

التاريخ: / /

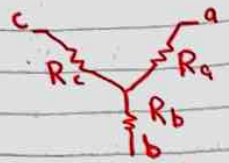
بسم الله الرحمن الرحيم

الموضوع: sec(8)

Delta - Star Transformation



Delta Δ



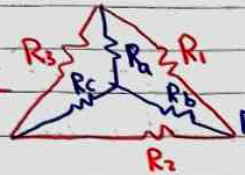
Star Y

Y - Δ (ضرب متشرفش / الوسيطين)

$$R_1 = \frac{R_aR_b + R_bR_c + R_cR_a}{R_c}$$

$$R_2 = \frac{R_aR_b + R_bR_c + R_cR_a}{R_a}$$

$$R_3 = \frac{R_aR_b + R_bR_c + R_cR_a}{R_b}$$



Δ - Y (الاكتيابي / جوه)

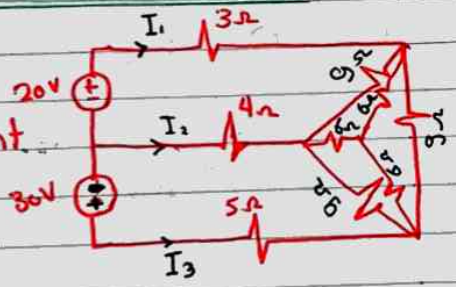
$$R_a = \frac{R_1R_3}{R_1+R_2+R_3}$$

$$R_b = \frac{R_1R_2}{R_1+R_2+R_3}$$

$$R_c = \frac{R_2R_3}{R_1+R_2+R_3}$$

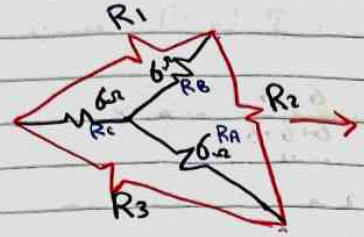
Ex **app**

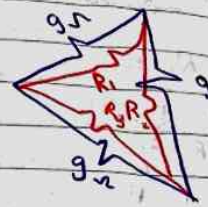
Find indicated Current in The Circuit



التاريخ: / /

الموضوع:





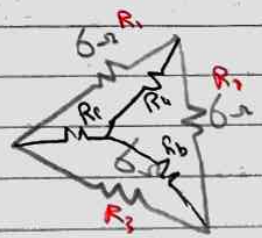
Y → Δ

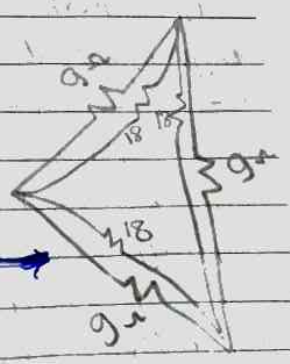
$$R_1 = \frac{R_AR_B + R_BR_C + R_CR_A}{R_A} = \frac{6\times6 + 6\times6 + 6\times6}{6} = 18\,\Omega$$

$$R_2 = \frac{R_AR_B + R_BR_C + R_CR_A}{R_C} = 18\,\Omega$$

$$R_3 = \frac{R_AR_B + R_BR_C + R_CR_A}{R_B} = 18\,\Omega$$

$18\,\Omega \,//\, 9\,\Omega = 6\,\Omega$





التاريخ: / /

الموضوع:

Δ → Y

$$R_a = \frac{R_1 * R_2}{R_1+R_2+R_3} = \frac{6*6}{6+6+6} = 2\,\Omega$$

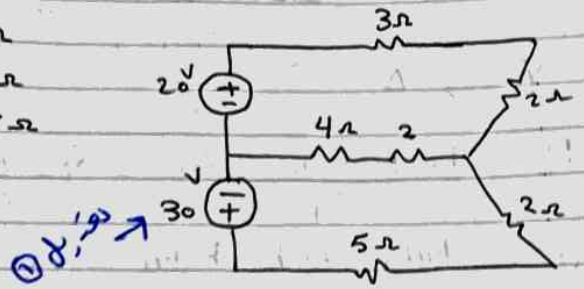
$$R_b = \frac{R_2 * R_3}{R_1+R_2+R_3} = 2\,\Omega$$

$$R_c = \frac{R_1 * R_3}{R_1+R_2+R_3} = 2\,\Omega$$

$(3+2) = 5\,\Omega$

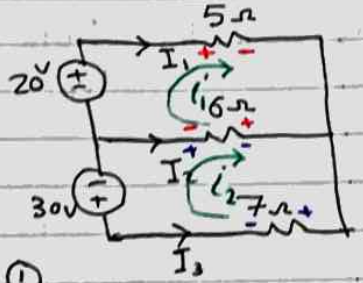
$(4+2) = 6\,\Omega$

$(5+2) = 7\,\Omega$



② نحذف

To find I_1, I_2, I_3 using mesh



by applying KVL at mesh ①

$20 - 5I_1 - 6(i_1 - i_2) = 0$

$20 - 11i_1 + 6i_2 = 0$

$11i_1 - 6i_2 = 20 \longrightarrow ①$

by applying KVL at mesh ②

$-30 - 6(i_2 - i_1) - 7i_2 = 0$

$-30 + 6i_1 - 13i_2 = 0$

$6i_1 - 13i_2 = 30 \longrightarrow ②$

التاريخ: / /

الموضوع:

by solve ① and ②

$i_1 = \frac{80}{107}$ A, $i_2 = \frac{-210}{107}$ A

$I_1 = i_1 = \frac{80}{107} = 0.747\,A$

$I_2 = i_2 - i_1 = \frac{-210}{107} - \frac{80}{107} = \frac{-290}{107} = -2.71\,A$

$I_3 = -i_2 = \frac{210}{107} = 1.96\,A$

② نعوض

التاريخ: / /

الموضوع:

LAB (4) Norton Equivalent Circuit

objectives:- Verify norton theorem by obtaining The norton equivalent circuit (I_N, R_N)

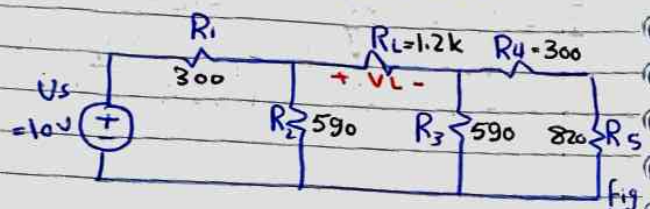
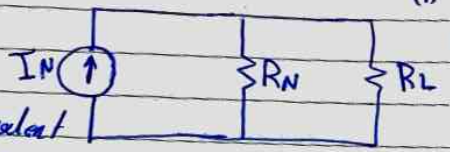


fig (1)



Norton equivalent circuit

Procedure:-

1. Construct the circuit as shown in fig (1)
2. measure the voltage V_L across the load R_L
3. find I_N by remove The load resistance and measure The current of short circuit $I_{s.c} = I_N$
4. find I_N Remove voltage Source and the load and measure open circuit resistance
5. obtaining I_N, R_N as shown in fig(2)
6. measure The voltage on $R_L \rightarrow V_L$

التاريخ: / /

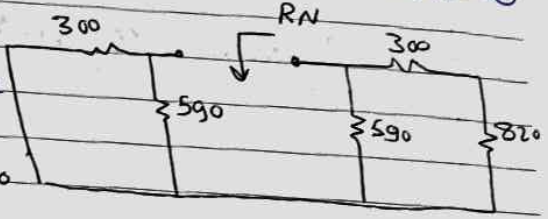
الموضوع:

خطوات حل دائرة Norton

1. احذف R_L واحط مكانها open circuit
2. احذف المصادر (جهد ← s.c) (تيار ← o.c)
3. احسب R_N مكان الدائرة
4. ارجع المصادر تاني واحسب التيار اللي هيمر في shortcut مكان الـ load $I_N = I_{s.c}$
5. ارجع الدائرة Norton واحسب التيار او الجهد المطلوب

To find R_N

$R_N = R_{th} = R_{o.c}$



$(300+820) // 590$

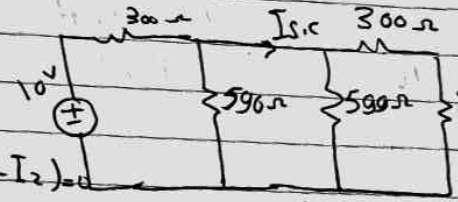
$= 386$

$300 // 590 = 198$

$R_N = 386 + 198 = 584\ \Omega$

to find I_N

$I_N = I_{s.c}$



by using mesh

$10 - 300 I_1 - 590(I_1 - I_2) = 0$

$+890 I_1 - 590 I_2 = 10 \rightarrow (1)$

$-590(I_2 - I_1) - 386 I_2 = 0$

$590 I_1 - 976 I_2 = 0$

$I_1 = 0.0187\ A$

$I_2 = 0.0113\ A$

$I_{s.c} = I_2 = 11.3\ mA$

التاريخ: / /

الموضوع:

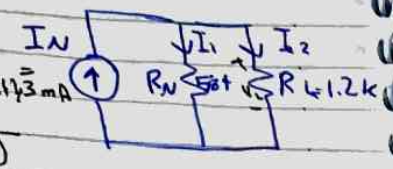
Norton equivalent Circuit

$$I_2 = I_N * \frac{R_N}{R_N + R_L}$$

$$I_2 = 11.3 * 10^{-3} * \frac{584}{584 + (1.2 * 10^3)}$$

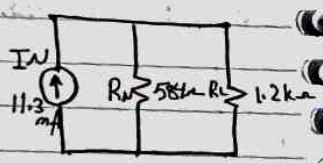
$$I_2 = 3.699 \text{ mA}$$

$$\text{or } V_L = I_2 R_L = 3.699 * 10^{-3} * 1.2 * 10^3 = 4.4 V$$



العملي

V_L جهد الدائرة كاملة	4.4 V
R_N	584 Ω
$I_N = I_{s.c}$	11.3 mA
V_L جهد الدائرة المكافئة	4.4V



التاريخ: / /

الموضوع: Lab(5)

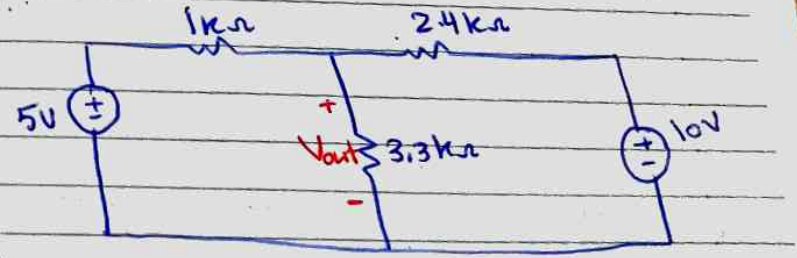
objective :-

Verify The superposition theorem.

Theory :-

In this exercise superposition theorems are examined by applying it to the circuit Given below

superposition States that the response in a linear circuit with multiple sources can be obtained by applying adding the individual responses caused by separate independant source acting alone. for an independant source acting alone all other voltage are replaced by short circuits and all independant current source are replaced by open circuit



التاريخ: / /

الموضوع:

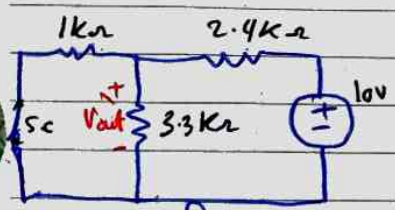
Pro Cedure

1. Construct the circuit fig①
2. measure voltage at 3.3kΩ (Vout)
3. remove 5volt and replace it by short circuit as fig ②
4. measure Vout' at 3.3kΩ
5. replace 10volt by short circuit as fig③
6. measure Vout'' at 3.3kΩ
7. Calculate the total response (Vout) for circuit by adding the response from Fig②/fig③

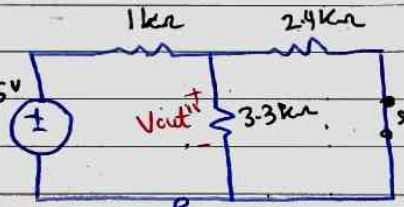
$V_{out}' = 0.88 \times 10^{-3} \times 3.3 \times 10^{3} = 2.9$ Volt

$V_{out}'' = 3 * 157 \times 10^{-3} \times 3.3 \times 10^{3} = 10.4$ volt

$V_{out} = 13.3$ volt



Fig(2)



Fig(3)

التاريخ: / /

الموضوع: Capacitor and inductor

sec (4)

Capacitor:-

- → Two Conductor separated by an insulator
- → Store electric charge with (-) on one Conductor and (+) on the other
- → symbol- —||— C(F)
- → Capacitance: ability of capacitor to store Charge

$C = \frac{Q}{U}$ ← Q: Charge (C); U: Potential difference between Two Conductors

C → F (Farad) (μF, nF

$C = \varepsilon \frac{A}{d}$ ← A: Area of either plate (m^2); d: separation (m)

Permitivity (F/m) ↳ ثابت سماحية وقدرة المادة على تخزين طاقة

$\varepsilon = \varepsilon_0 \varepsilon_r$

↳ permitivity of vacuum ($8.85 \cdot p$

ε_r → air 1.0006

parafine paper 2.5

mica 5

glass 7.5

mica 7500

A54

التاريخ: / / الموضوع:

total Capacitance عكس المقاومة *

Parallel $C_T = C_1 + C_2 + C_3 + \dots$

Serise $\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \dots$

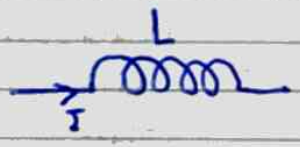
Energy storage $W_c = \frac{1}{2} C V^2$ (J, F, volt)

inductor:

- passive electrical component
- Stores energy in magnetic field when electric current flows through it

Flux Φ (wb) فيض

Flux density (B) كثافة الفيض



التاريخ: / / الموضوع:

عدد اللفات

$L i = N \Phi$ → Linkage flux

inductance (H)

$L = \frac{N \Phi}{I}$ ← current

$L = N^2 \mu \frac{A}{l}$ ← Cross section Area (m^2)

Permeability ↑ ← Length (m)

$\mu = \mu_0 \mu_r$

↳ Permeability of vacuum $(4\pi * 10^{-7})$ H/m

μ → صفة المادة لتمرير المجال المغناطيسي

induced voltage (e) $e = \frac{N d\Phi}{dt} = L \frac{di}{dt}$

Total inductance محاثة كلية *

Serise

$L_T = L_1 + L_2 + L_3 + \dots$

Parallel

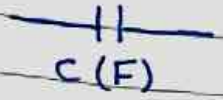
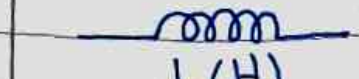
$\frac{1}{L_T} = \frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3} + \dots$

Energy Storage

$W_L = \frac{1}{2} L i^2$

التاريخ: / /

الموضوع:

	Capacitor	inductor
Symbol	 C(F)	 L(H)
Calculation	$C = \frac{Q}{V}$	$L = \frac{N\Phi}{i}$
	$C = \varepsilon \frac{A}{d}$	$L = N^2 \mu \frac{A}{\ell}$
	Permittivity $\varepsilon = \varepsilon_0 \varepsilon_r$ $\varepsilon_0 = 8.85\ pF/m$ ε_r → تتغير باختلاف المادة	Permeability $\mu = \mu_0 \mu_r$ $\mu_0 = 4\pi * 10^{-7}\ (H/m)$ μ_r → تتغير باختلاف المادة
total Serise	$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \cdots$	$L_T = L_1 + L_2 + L_3 + \cdots$
Total Parallel	$C_T = C_1 + C_2 + C_3 + \cdots$	$\frac{1}{L_T} = \frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3} + \cdots$
Energy Storage	$W_C = \frac{1}{2} C V^2$ (J)	$W_L = \frac{1}{2} L i^2$ (J)

حل شيت 4