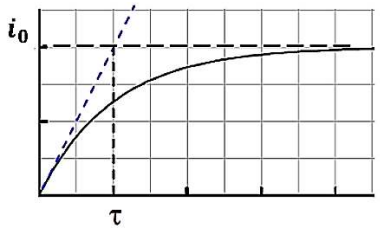
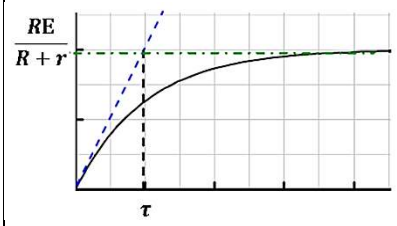
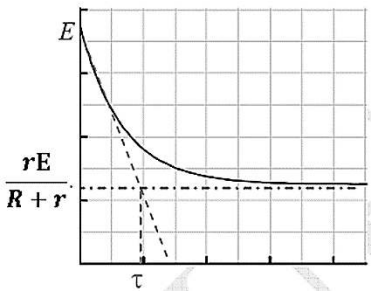
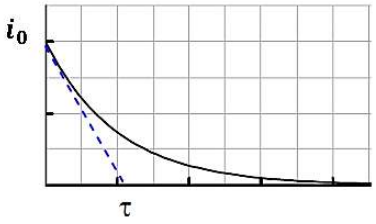
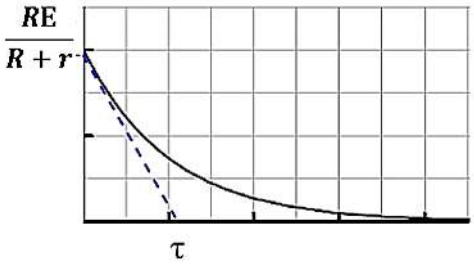
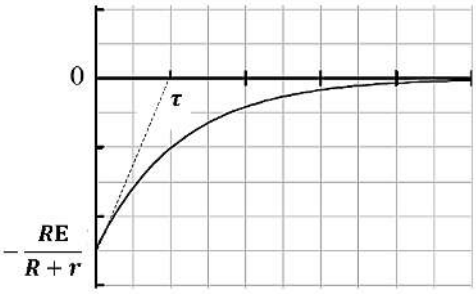
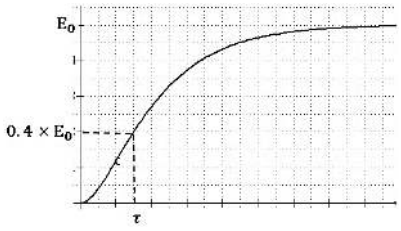
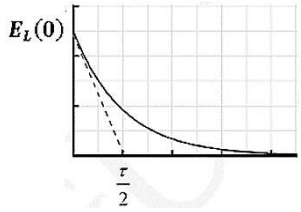
| | |
|---|---|
| $u_L = L\frac{di}{dt} + ri$ | |
| $u_L = L\frac{di}{dt}$ | |
| $u_L = ri$ | |
| $\tau = \frac{L}{R+r}$ | $\tau$ |

| | | | |
|---|---|---|---|
|  | $i = i_0\left(1 - e^{-\frac{t}{\tau}}\right)$<br>$i = \frac{\mathrm{E}}{R+r}\left(1 - e^{-\frac{t}{\tau}}\right)$ | $E = u_L + u_R$<br>$\Rightarrow E = L\frac{di}{dt} + ri + Ri$<br>$\Rightarrow E = L\frac{di}{dt} + (r+R)i$<br>$\Rightarrow \frac{E}{r+R} = \frac{L}{r+R} \times \frac{di}{dt} + i$ | $i$ |
|  | $u_R = \frac{\mathrm{R}\mathrm{E}}{R+r}\left(1 - e^{-\frac{t}{\tau}}\right)$ | $u_L + u_R = E$<br>$L\frac{di}{dt} + ri + u_R = E$<br>$\Rightarrow L\frac{d\left(\frac{u_R}{R}\right)}{dt} + r\frac{u_R}{R} + u_R = E$<br>$\Rightarrow \frac{L}{R}\frac{du_R}{dt} + \left(\frac{r}{R} + 1\right)u_R = E$<br>$\Rightarrow \frac{du_R}{dt} + \frac{R}{L}\left(\frac{R+r}{R}\right)u_R = \frac{R}{L}E$<br>$\Rightarrow \frac{du_R}{dt} + \left(\frac{R+r}{L}\right)u_R = \frac{R}{L}E$ | $u_R$ |
|  | $u_L = \frac{\mathrm{E}R}{R+r}e^{-\frac{t}{\tau}} + \frac{r\mathrm{E}}{R+r}$ | $u_L + u_R = E \Rightarrow u_R = E - u_L$<br>$\Rightarrow Ri = E - u_L \Rightarrow i = \frac{E - u_L}{R}$<br>$\Rightarrow \frac{E}{r+R} = \frac{L}{r+R} \times \frac{d\left(\frac{E-u_L}{R}\right)}{dt} + \frac{E-u_L}{R}$<br>$\Rightarrow \frac{E}{r+R} = -\frac{L}{R(r+R)} \times \frac{du_L}{dt} + \frac{E}{R} - \frac{u_L}{R}$<br>$\Rightarrow \frac{E}{r+R} - \frac{E}{R} = -\frac{L}{R(r+R)} \times \frac{du_L}{dt} - \frac{u_L}{R}$<br>$\Rightarrow \frac{RE}{r+R} - E = -\frac{L}{(r+R)} \times \frac{du_L}{dt} - u_L$<br>$\Rightarrow \frac{rE}{r+R} = \frac{L}{(r+R)} \times \frac{du_L}{dt} + u_L$ | $u_b$ |

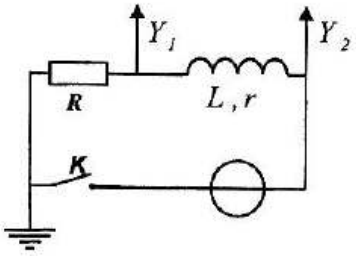
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| | | | |
|---|---|---|---|
|  | $i = i_0 e^{-\frac{t}{\tau}}$<br>$i = \dfrac{\mathrm{E}}{R+r} e^{-\frac{t}{\tau}}$ | $0 = u_L + u_R$<br>$\Rightarrow 0 = L\dfrac{di}{dt} + ri + Ri$<br>$\Rightarrow 0 = L\dfrac{di}{dt} + (r+R)i$<br>$\Rightarrow 0 = \dfrac{L}{r+R} \times \dfrac{di}{dt} + i$ | $i$ |
|  | $u_R = \dfrac{R\mathrm{E}}{R+r} e^{-\frac{t}{\tau}}$ | $u_L + u_R = 0$<br>$L\dfrac{di}{dt} + ri + u_R = 0$<br>$\Rightarrow L\dfrac{d\left(\frac{u_R}{R}\right)}{dt} + r\dfrac{u_R}{R} + u_R = 0$<br>$\Rightarrow \dfrac{L}{R}\dfrac{du_R}{dt} + \left(\dfrac{r}{R}+1\right)u_R = 0$<br>$\Rightarrow \dfrac{du_R}{dt} + \dfrac{R}{L}\left(\dfrac{R+r}{R}\right)u_R = 0$<br>$\Rightarrow \dfrac{du_R}{dt} + \left(\dfrac{R+r}{L}\right)u_R = 0$ | $u_R$ |
|  | $u_L = -\dfrac{RE}{R+r} e^{-\frac{t}{\tau}}$ | $u_L + u_R = 0 \Rightarrow u_R = -u_L$<br>$u_R$<br>$\dfrac{du_L}{dt} + \left(\dfrac{R+r}{L}\right)u_L = 0$ | $u_b$ |

| | | | |
|---|---|---|---|
|  | $E_L = \dfrac{1}{2}Li^2 = \dfrac{1}{2}Li_0{}^2\left(1 - e^{-\frac{t}{\tau}}\right)^2$<br>$E_{L_{max}} = \dfrac{1}{2}Li_0{}^2$ | $t_{\frac{1}{2}} = \tau\, ln\left(\dfrac{\sqrt{2}}{\sqrt{2}-1}\right)$ | |
|  | $E_L = \dfrac{1}{2}Li^2 = \dfrac{1}{2}L\left(i_0 e^{-\frac{t}{\tau}}\right)^2$ | $t_{\frac{1}{2}} = \dfrac{\tau}{2}\ln 2$ | |

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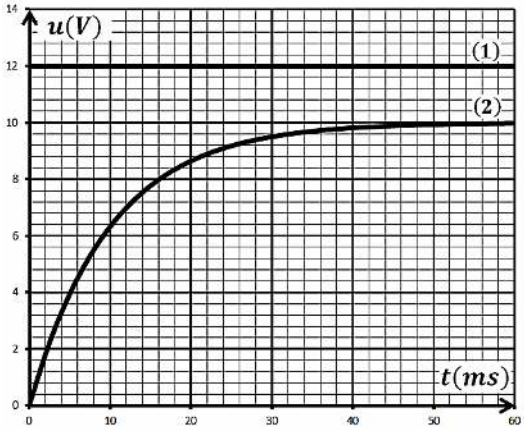
2012 1




$K$ – $E$ -

$R = 100\Omega$ $r$ $L$ -

$K$ $t = 0s$




(2) (1)

-1

$i(t)$

$E$ -2

$I_0$

$r$

$L$ $\tau$ -3

-4

2008 :2

1

$R = 10\Omega$ $E = 12V$ -

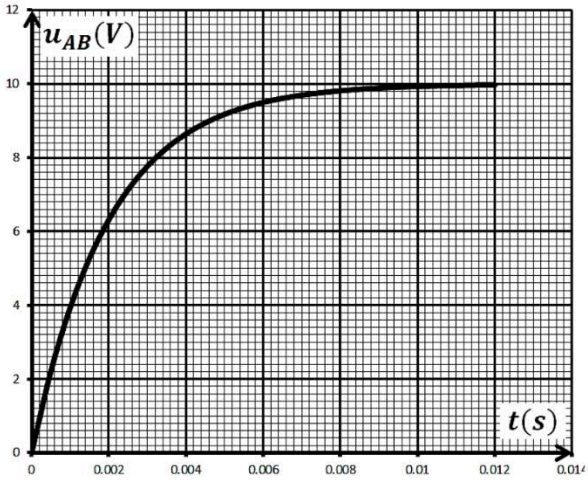
$K$ $r$ $L$ -

$u_{CB}$ $u_{AB}$ -1

-

$t = 0$ $K$ -2

$u_{AB} = f(t)$




$u_{AB}$ -

$u_{CB}$ -

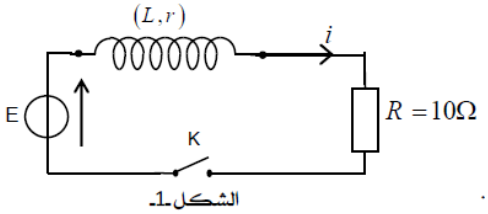
2 -3

$\tau$ -

-

-4

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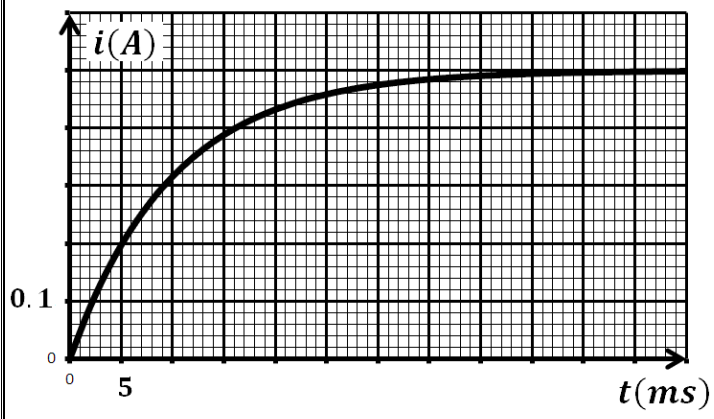
الشكل-1-

$(L;r)$

$E = 6V$ -

$K$ $R = 10\Omega$ -

$K$ -1




$R$ $u_R$

$: u_b$

-2

$i(t)$

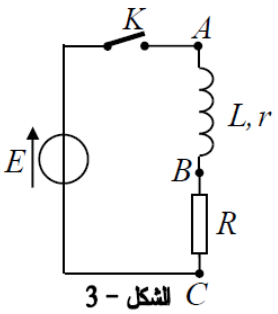
-3

$i(t) = \frac{E}{R+r}\left(1 - e^{-\frac{R+r}{L}t}\right)$ -4

$r$ -

$L$ $\tau$ -

-5



الشكل – 3

2014 4

$r = 10\Omega$ $L$ $E$

$K$ $R = 50\Omega$

$t = 0$ $K$

-1

$I_0$

$u_R = u_{BC}$ -2

$u_{BC}(t)$ -

$i(t)$ -

$i(t) = 0.2(1 - e^{-50t})$

$L$ $\tau$ $E$

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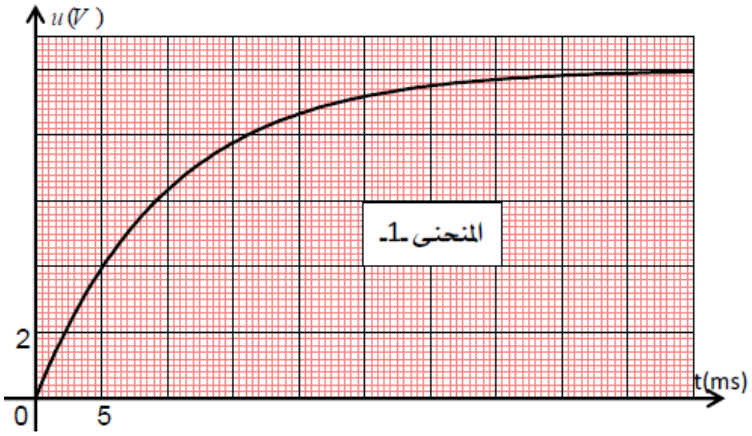
$r$ $L$ $E$ -

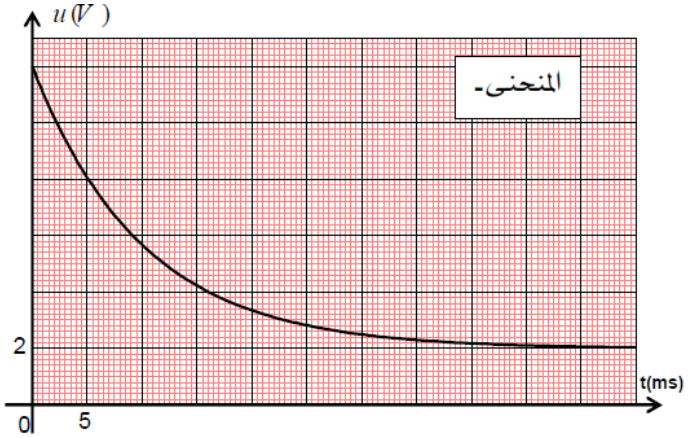
$K$ $R = 100\Omega$ -

$u_R(t)$ $u_b(t)$

$u_R(t)$ $u_b(t)$ -1

$u_R(t)$ $u_b(t)$ $t = 0$




-

$\frac{di}{dt} + Ai(t) = B$ -2

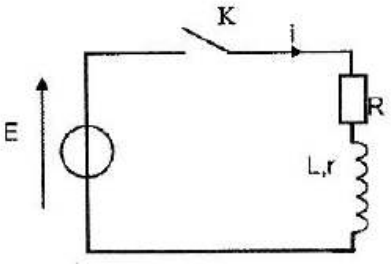
$R$ $r$ $L$ $E$ $B$ $A$

$i(t) = \frac{B}{A}(1 - e^{-At})$

$I_0$

$L$ $r$ $E$ $\tau$






$K$ $E = 2V$ -

$R = 100\Omega$ $r$ $L$ -

$K$ -1

$u_b(t)$ -

$E$ $u_R(t)$

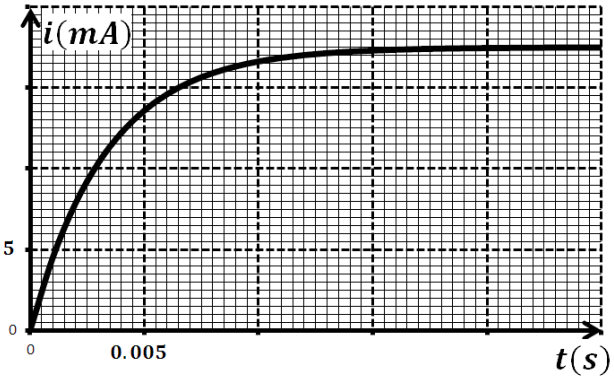
$_R( )$ $( )$ $u_b(t)$ -

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$u_R(t)$ -

$m$ $B$ $A$ $u_R(t) = A + Be^{-mt}$ -2

$i(t)$ $ExAO$ -3




$I_0$ •

$I_0$ -

$r$ $I_0$ -

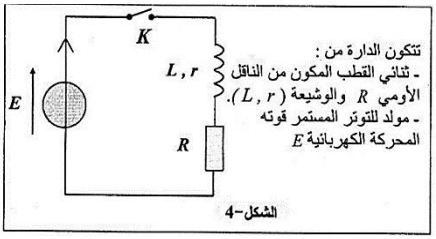
τ τ -

$L$ τ -

2012 7

$L$ $R$ $RL$ $i(t)$

4




$R$ $u_R(t)$ -1

-

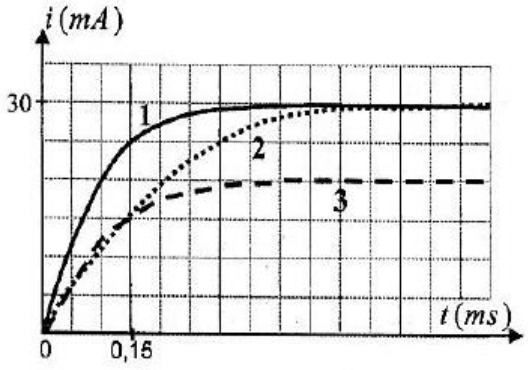
$i(t)$ $u_R(t)$ -

-2

$i(t)$ -

$\tau$ $A$ $i = A\left(1 - e^{\frac{-t}{\tau}}\right)$ -

$r$ -3




$L$

$t$ $i(t)$

$R$ $L$

| | التجربة : 1 | التجربة : 2 | التجربة : 3 |
|---|---|---|---|
| $L(mH)$ | 30 | 20 | 40 |
| $R(\Omega)$ | 290 | 190 | 190 |

-

$r$ -

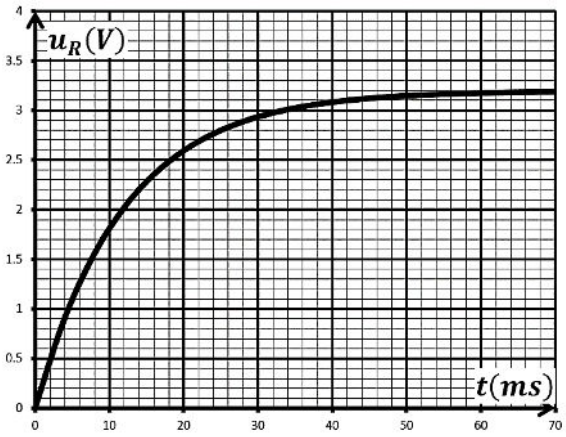
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2013 8

$r = 5\Omega$ $L$ $E$

$K$ $R = 5\Omega$

$u_R = f(t)$ $t = 0s$




-1

-2

$$\frac{du_R}{dt} + \frac{R+r}{L}u_R = \frac{R}{L}E$$

$$u_R(t) = A\left(1 - e^{-\frac{t}{\tau}}\right)$$ -3

$\tau$ $A$

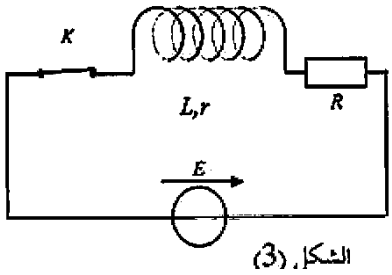
$\tau$ -4

$E$ $L$ -5

2015 9

$R = 15\Omega$ $r$ L

$E$



الشكل (3)

-1

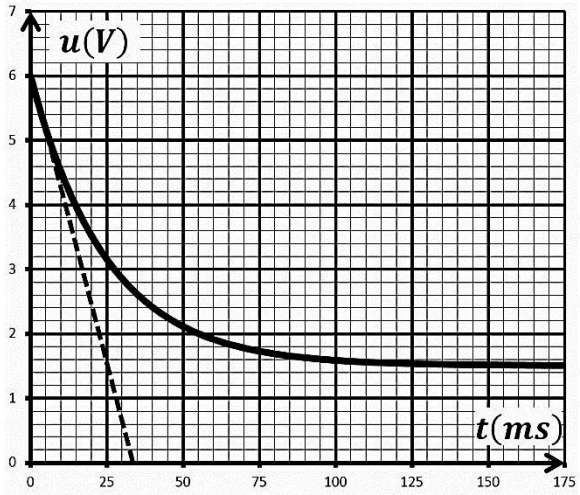
β $\alpha$ $\frac{di(t)}{dt} + \alpha i(t) = \beta$

$E$ $r$ $R$ L

$$i(t) = \frac{\beta}{\alpha}(1 - e^{-\alpha t})$$ -2

$$u_b = \frac{E}{r+R}\left(r + Re^{\frac{-t}{\tau}}\right)$$ -3

-4




-

-

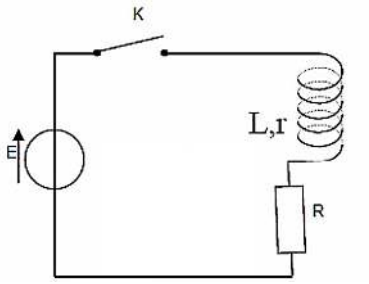
$E$ -

$r$ -

L $\tau$ -

$E_L$ -5

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$R = 90\Omega$

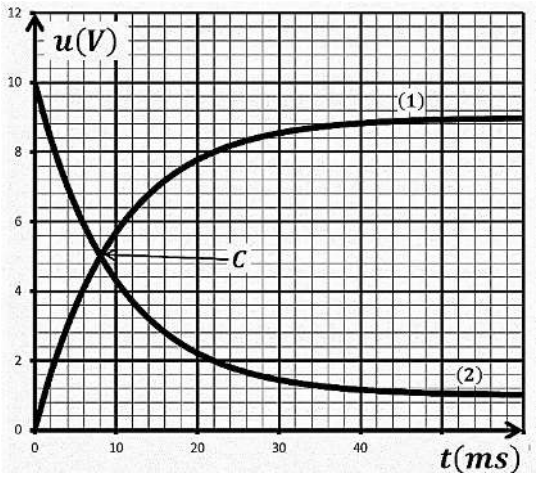
$t = 0ms$ $K$ -

-1

$$\frac{du_R}{dt} + \frac{R+r}{L}u_R = \frac{R}{L}E$$

$B$ $A$ $u_R(t) = \frac{B}{A}(1 - e^{-At})$ -2

-3




-

(2) (1)

-

$r$ $E$

(2) (1) -4

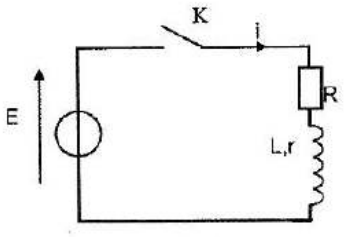
$\tau = \frac{t_c}{\ln\left(\frac{2R}{R-r}\right)}$ $\tau$ -

$t_c$

$U_b(t) = \frac{E}{r+R}\left(r + Re^{\frac{-t}{\tau}}\right)$

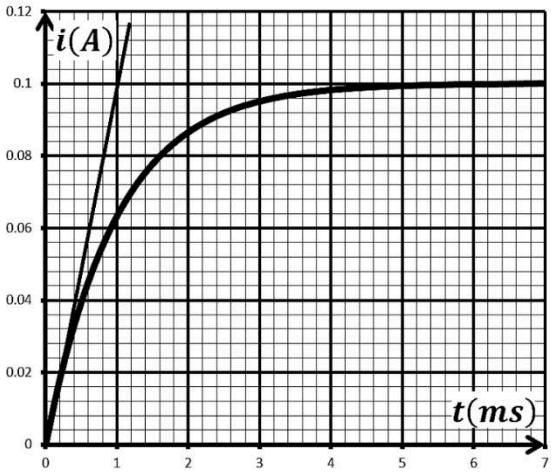
$L$ -

11




$R$ $E = 10V$ -

$K$ $r$ $L$ -




-1

$$i(t) = \frac{E}{R+r}\left(1 - e^{-\frac{R+r}{L}t}\right)$$

-2

$L$ $t = 0$ -

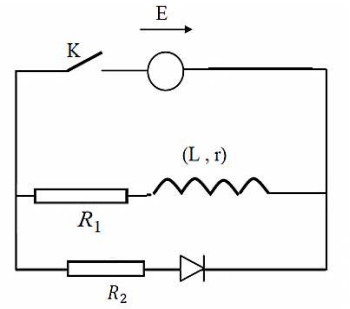
$\tau$ -

$\frac{u_R}{u_L} = 9$ . $R$ $r$ -

| التجارب | تجربة-1- | تجربة-2- | تجربة-3- |
|---|---|---|---|
| $R(\Omega)$ | $R_1 = R$ | $R_2 = 2R$ | $R_3 = 2R$ |
| $L(H)$ | $L_1 = 3L$ | $L_2 = 3L$ | $L_3 = L$ |

$\tau$ -

-

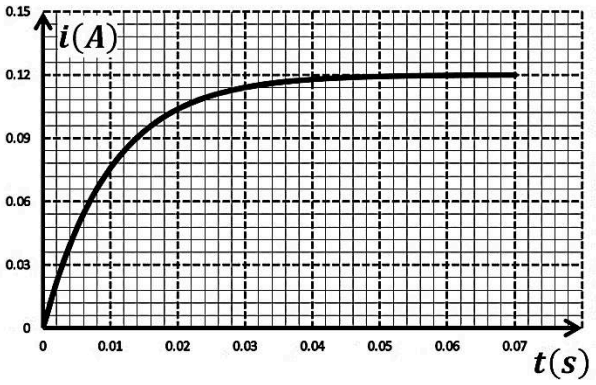



$E = 12V$ -

$K$ $R_1 , R_2$ -

$r = 20\Omega$ $L$ -

$t = 0$ $K$ -




-

-

$\tau_1$ $I_0$ $i(t) = I_0\left(1 - e^{\frac{-t}{\tau_1}}\right)$

$\tau_1$ $I_0$ -

$L = \frac{E \times \tau_1}{I_0}$ -

$t = 0$ $K$ -

-

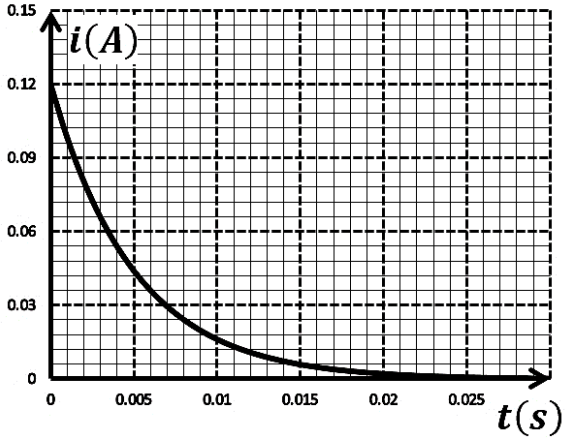
$\tau_2$ -

$\tau_2$ -

$R_2$ -

$R_2 = \frac{E}{I_0}\left(\frac{\tau_1 - \tau_2}{\tau_2}\right)$

$R_1$ $R_2$ -




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$r = 20\Omega$ $L$ $E = 12V$ -

$K$ $R$ -

$u_R(t)$

$u_R(t)$ -3

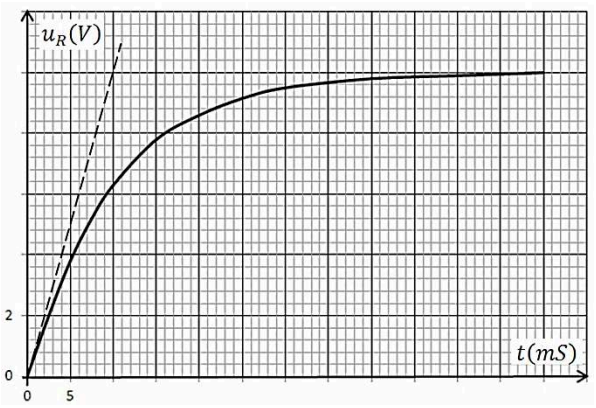
$\tau \frac{du_L(t)}{dt} + u_L(t) = \frac{rE}{R+r}$ -4

$B$ $A$ $u_L(t) = A + Be^{-\frac{t}{\tau}}$ -5

$u_R(t)$ -6

$R$ -7

$\tau$ -8




$L$

14

$E$ $R = 100\Omega$ $r$ $L$

$K$

$K$ $t = 0$ -1

$i$ -

$u_b(t)$ -

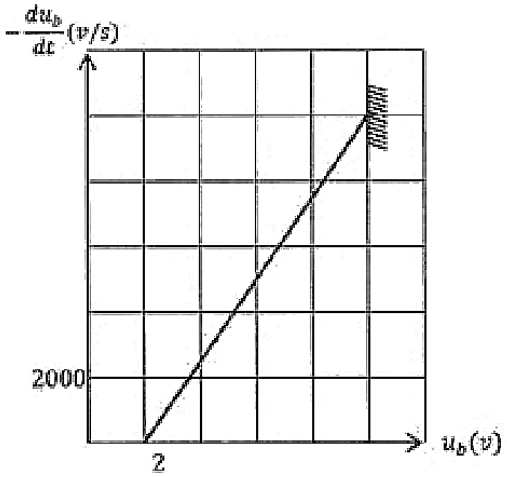
$\frac{du_b(t)}{dt} + \frac{1}{\tau} u_b(t) = \frac{rE}{L}$.

$u_b(t) = A + Be^{-\frac{t}{\tau}}$ حيث $A$ و $B$ ثوابت -

يطلب تعيين عبارتها ومدلولهما الفيزيائي.

$u_b(t)$ -

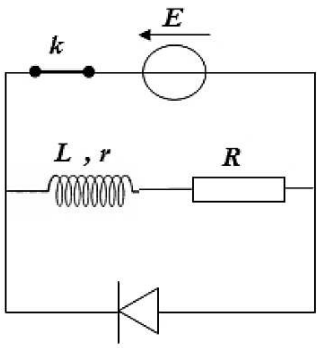
$-\frac{du_b(t)}{dt} = f(u_b)$ -2




$L$ $r$ $E$ -

-

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$E = 6V$ -

$r$ $L$ -

$K$ $R = 50\Omega$ -

$K$ $t = 0$ (

$u_R(t)$ (

α $A$ $u_R(t) = Ae^{-\frac{t}{\alpha}}$ (

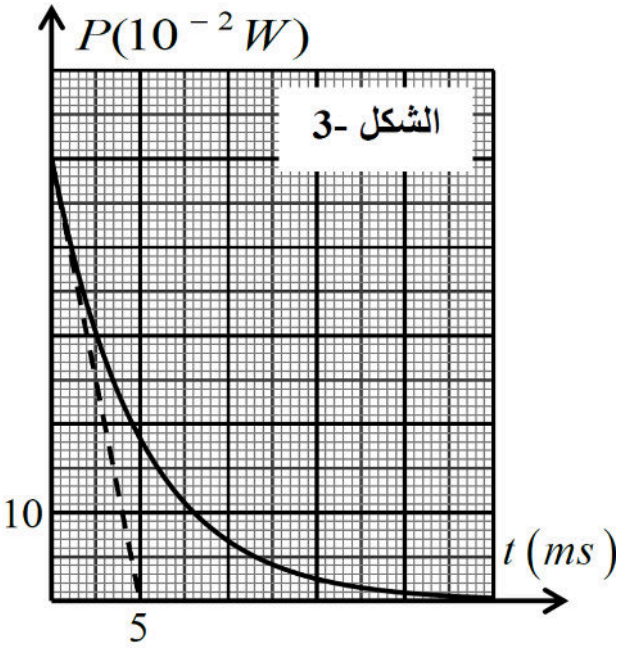
$i(t)$

$I_0$ $R$ $R$ $P(t)$ (4

$t$ $\tau$

$P(t)$ (5

$R$




$t = 0$ -

$t = \frac{\tau}{2}$

$\tau$

-

$L$ $r$ -

(6

$t_{\frac{1}{2}} = \frac{\tau}{2} ln\, 2$ $R$

$P = Ri^2$

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