KOLEJ YAYASAN PELAJARAN JOHOR
ONLINE FINAL EXAMINATION

COURSE NAME	**:**	**CIRCUIT ANALYZE**
COURSE CODE	**:**	**DKE 2093**
SESSION	**:**	**DECEMBER 2021**
DURATION	**:**	**2 HOURS 30 MINUTES**

INSTRUCTION TO CANDIDATES/
ARAHAN KEPADA CALON

1. This examination paper consists of **SIX (6)** questions. /
   *Kertas soalan ini mengandungi **ENAM (6)** soalan.*

2. Students are allowed to refer to resources such as lecture notes, books, internet or any other relevant resources. /
   Pelajar dibenarkan merujuk kepada sumber seperti nota kuliah, buku, internet atau mana-mana sumber yang berkaitan.

3. Answer **ALL** questions in the answer sheet which is **A4** size paper (or other paper with the consent of the relevant lecturer). /
   *Jawab **SEMUA** soalan di dalam kertas jawapan iaitu kertas bersaiz **A4** (atau lain-lain kertas dengan persetujuan pensyarah berkaitan)**.***

4. Write your details as follows in the upper left conner for each answer sheet: /
   Tulis butiran anda sepertimana berikut di penjuru atas kiri bagi setiap kertas jawapan:
   i. Student Full Name / *Nama Penuh Pelajar*
   ii. Identification Card (I/C) No. / *No. Kad Pengenalan*
   iii. Class Section / *Seksyen Kelas*
   iv. *Course Code* / *Kod Kursus*
   v. *Course Name* / *Nama Kursus*
   vi. *Lecturer Name* / *Nama Pensyarah*

5. Each answer sheet must have a page number written at the bottom right corner. /
   Setiap helai kertas jawapan mesti ditulis nombor muka surat di penjuru bawah kanan.

6. Answers should be **neat and clear in handwritten form**. /
   Jawapan hendaklah ditulis tangan, kemas dan jelas.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO /
JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

This examination paper consists of **SIX (6)** questions. Answer **ALL** the questions in an Answering Booklet.
*Kertas soalan ini mengandungi **ENAM (6)** soalan. Jawab **SEMUA** soalan dalam Buku Jawapan.*

QUESTION 1/ *SOALAN 1*

Referring to **Figure 1**. Find:

a) the value of inductor,L_1 if the equivalent inductance, L_{eq} at terminal A-B is 20mH.

(*5 marks / *markah)

b) the total voltage, V_T.

(*2 marks / *markah)

c) the total energy stored in circuit, w_T.

(*2 marks / *markah)

d) the voltage across inductors L_2 and L_3.

(*6 marks / *markah)

*Merujuk kepada **Rajah 1**. Dapatkan:*

a) *nilai pearuh, L_1 jika kearuhan setara, L_{eq} pada terminal A-B adalah 20mH.*

b) *jumlah voltan, V_T.*

c) *jumlah tenaga yang disimpan dalam litar, w_T.*

d) *voltan merintangi pearuh L_2 dan L_3.*

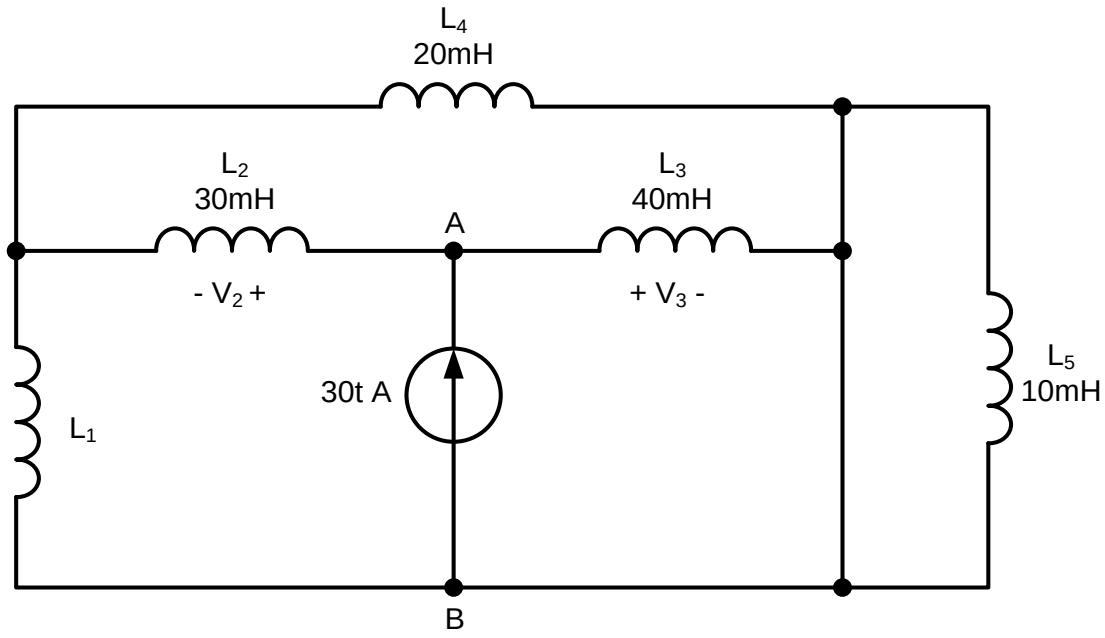

Figure 1/ *Rajah 1*

QUESTION 2/ *SOALAN 2*

Assume that the circuit in **Figure 2** is in its steady state condition at t < 0. Find i(t) for t > 0 using transient analysis method.

(*20 marks / *markah)

*Anggapkan bahawa litar dalam **Rajah 2** telah berada dalam keadaan mantap pada* t < 0. Dapatkan i(t) untuk t > 0 dengan menggunakan analisis ubahtika.

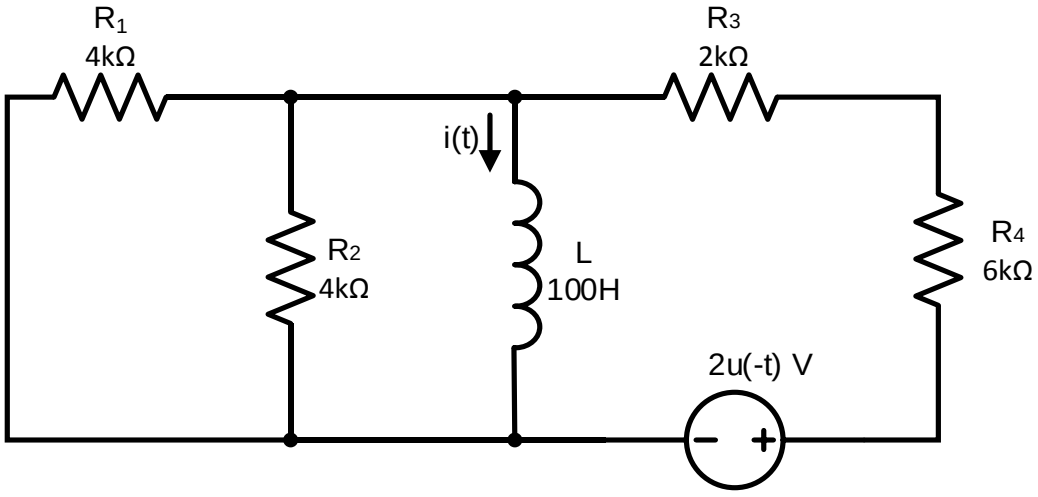

Figure 2/ *Rajah 2*

QUESTION 3/ *SOALAN 3*

The circuit in **Figure 3** has reached steady state at $t = 0^-$. Find i(t) for $t \geq 0$ using transient analysis method.

(*20 marks / *markah)

*Litar dalam **Rajah 3** telah mencapai keadaan mantap pada $t = 0^-$. Dapatkan i(t) untuk $t \geq 0$ menggunakan kaedah analisis ubahtika.*

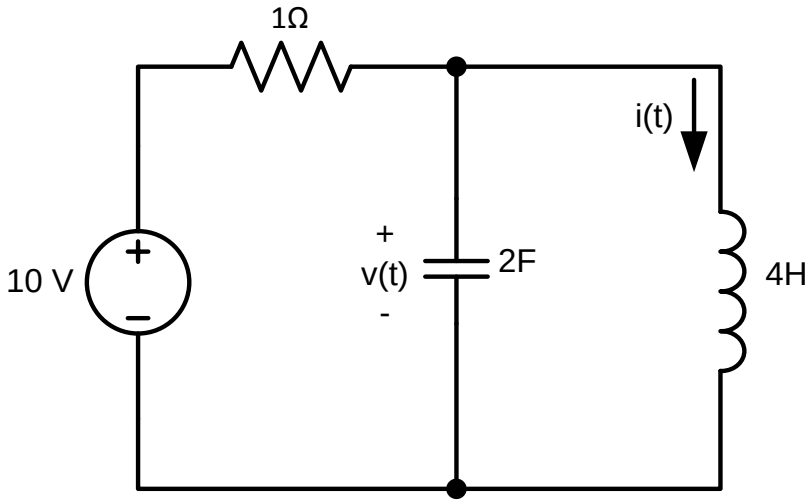

Figure 3/ *Rajah 3*

QUESTION 4/ *SOALAN 4*

The circuit in **Figure 4** is in steady state at t < 0. Find the Laplace function of the voltage across inductor, $V_o(s)$ for t ≥ 0 using Laplace analysis method.

(*15 marks / *markah)

*Litar dalam **Rajah 4** berada dalam keadaan mantap pada t < 0. Dapatkan fungsi Laplace bagi voltan merintangi pearuh, $V_o(s)$ untuk t ≥ 0 menggunakan kaedah analisis Laplace.*

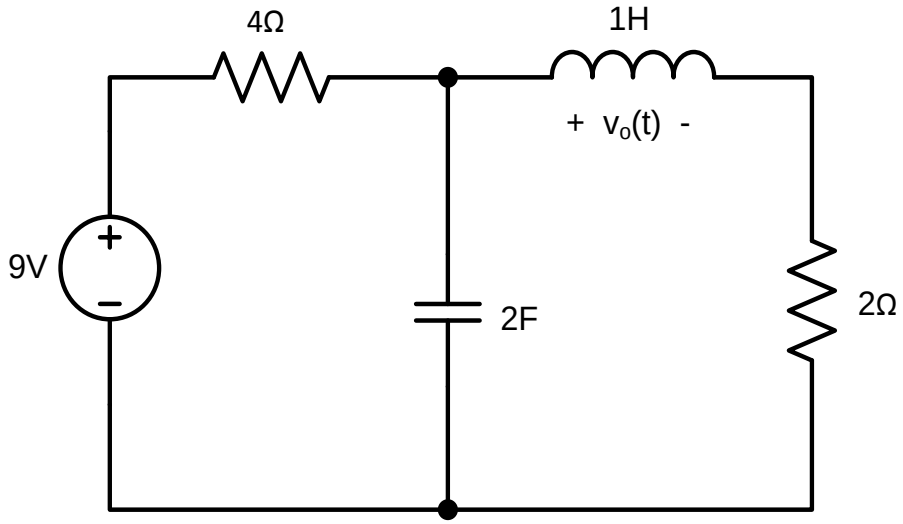

Figure 4/ *Rajah 4*

QUESTION 5/ *SOALAN 5*

Draw the magnitude Bode Plot for the following transfer function:

$$H(s) = \frac{2783s^2(s+10000)}{(s^2+4.2s+900)(s+700)^2}$$

Use minimum frequency, ω = 1 rad/s and maximum frequency,
ω = 100,000 rad/s.

(*15 marks / *markah)

Lukiskan magnitud Rajah Bode untuk rangkap pindah berikut:

$$H(s) = \frac{2783s^2(s+10000)}{(s^2+4.2s+900)(s+700)^2}$$

Guna frekuensi minima, ω = 1 rad/s dan frekuensi maksima, ω = 100,000 rad/s.

QUESTION 6/ *SOALAN 6*

The two-port network is terminated as shown in **Figure Q6**. Find the output voltage, V_2 and the output current, I_2.

$$z = \begin{pmatrix} s+2 & \frac{1}{s} \\ -2 & 2+\frac{1}{s} \end{pmatrix}$$

(*15 marks / *markah)

*Rangkaian dua-liang ditamatkan seperti ditunjukkan dalam **Rajah Q6**. Dapatkan voltan keluaran, V_2 dan arus keluaran, I_2.*

$$z = \begin{pmatrix} s+2 & \frac{1}{s} \\ -2 & 2+\frac{1}{s} \end{pmatrix}$$

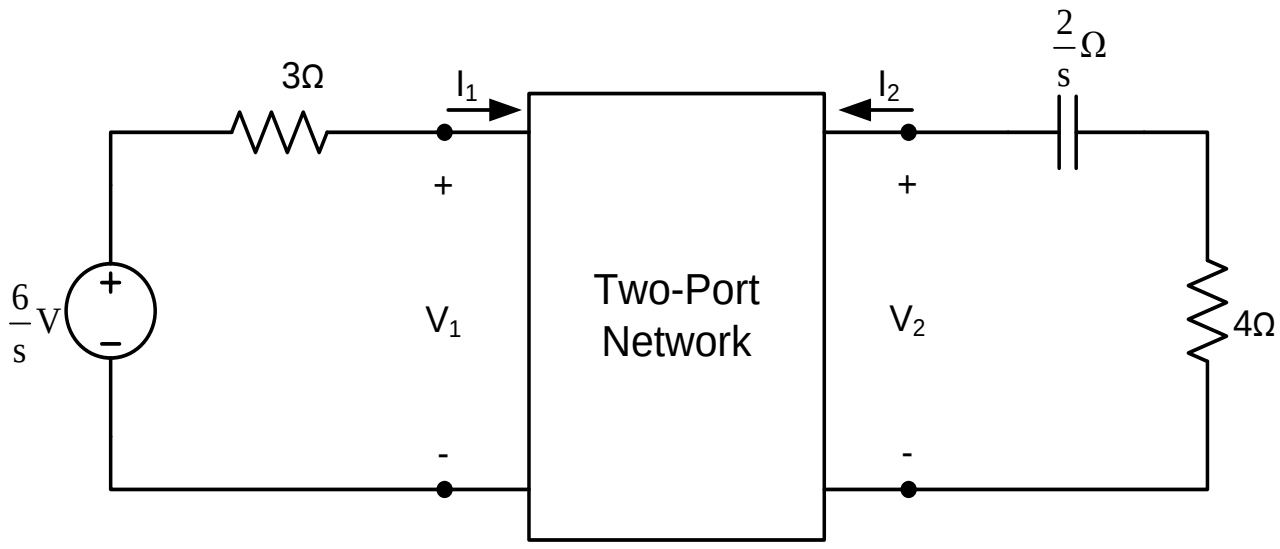

Figure Q6/ *Rajah Q6*

[100 MARKS/ 100 *MARKAH*]

END OF QUESTION PAPER/ *KERTAS SOALAN TAMAT*

Forcing Functions and Their Assumed Solutions
(Fungsi Berdaya dan Penyelesaian Anggapan)

Forcing function (Fungsi Berdaya)			*Assumed Solution (Penyelesaian Anggapan)*
Constan *(Malar)*		$f(t) = A$	$x_f(t) = K_2$
Exponential *(Eksponen)*		$f(t) = M\ e^{-st}$	$x_f(t) = K_2\ e^{-st}$
Variable *(Pembolehubah)*	Ramp *(Tanjak)*	$f(t) = mt$	$x_f(t) = K_2\ t + K_3$
	Parabolic *(Parabola)*	$f(t) = t^2$	$x_f(t) = K_2\ t^2 + K_3\ t + K_4$
Sinusoidal *(Sinus)*		$f(t) = M\ sin(\omega t + \theta)$	$x_f(t) = K_2\ sin\ \omega t + K_3\ cos\ \omega t$
		$f(t) = M\ cos(\omega t + \theta)$	
Exponential Sinusoidal *(Sinus Eksponen)*		$f(t) = M\ e^{-st}\ sin(\omega t + \theta)$	$x_f(t) = e^{-st}(K_2\ sin\ \omega t + K_3\ cos\ \omega t)$

Table of Laplace Transform Pairs
(Jadual Penukaran Pasangan Penjelmaan Laplace)

Functions *(Fungsi)*	f(t)	F(s)
Unit Impulse *(Dedenyut)*	™(t)	1
Unit Step *(Unit langkah)* Constant *(Malar)*	u(t) 1	$\frac{1}{s}$
Unit Ramp *(Unit Tanjak)* t function *(Rangkap t)*	t u(t)	$\frac{1}{s^2}$
Unit Parabolic *(Unit Parabola)*	$\frac{1}{2}t^2$ u(t)	$\frac{1}{s^3}$
n^{th} integral of impulse *(Kamiran ke–n dedenyut*)	$\delta^{-n}(t)$	$\frac{1}{s^n}$
n^{th} derivative of impulse *(Kerbezaan ke–n dedenyut)*	$\delta^{n}(t)$	s^n
Power of t *(Kuasa t)*	$\frac{t^{n-1}}{(n-1)!}$	$\frac{1}{s^n}$
Exponential *(Eksponen)*	e^{-at}	$\frac{1}{s+a}$
t–multiplication exponential *(Pendaraban t bagi eksponen)*	te^{-at}	$\frac{1}{(s+a)^2}$
Repeated t–multiplication exponential *(Pendaraban t berulang bagi eksponen)*	$\frac{1}{(n-1)!}t^{n-1}e^{-at}$	$\frac{1}{(s+a)^n}$
Sine *(Sinus)*	sin ωt	$\frac{\omega}{s^2+\omega^2}$
Cosine *(Kosinus)*	cos ωt	$\frac{s}{s^2+\omega^2}$
Damped sine *(Sinus teredam)*	e^{-at} sin ωt	$\frac{\omega}{(s+a)^2+\omega^2}$
Damped cosine *(Kosinus teredam)*	e^{-at} cos ωt	$\frac{s+a}{(s+a)^2+\omega^2}$
t–multiplicated sine *(Pendaraban t bagi sinus)*	t sin ωt	$\frac{2\omega s}{(s^2+\omega^2)^2}$
t–multiplicated cosine *(Pendaraban t bagi kosinus)*	t cos ωt	$\frac{s^2-\omega^2}{(s^2+\omega^2)^2}$

Two–Port Network Parameters
(Parameter Rangkaian Dua Liang)

Impedance parameters
$$V_1 = z_{11} I_1 + z_{12} I_2$$
$$V_2 = z_{21} I_1 + z_{22} I_2$$

Admittance parameters
$$I_1 = y_{11} V_1 + y_{12} V_2$$
$$I_2 = y_{21} V_1 + y_{22} V_2$$

Hybrid parameters
$$V_1 = h_{11} I_1 + h_{12} V_2$$
$$I_2 = h_{21} I_1 + h_{22} V_2$$

Transmission parameters
$$V_1 = A V_2 - B I_2$$
$$I_1 = C V_2 - D I_2$$

Jadual Penukaran Untuk Rangkaian Dua Liang
(Conversion Table for Two–Port Network Parameters)

	z	y	h	ABCD
z	z_{11} z_{12} z_{21} z_{22}	$\frac{y_{22}}{\triangle_y}$ $\frac{-y_{12}}{\triangle_y}$ $\frac{-y_{21}}{\triangle_y}$ $\frac{y_{11}}{\triangle_y}$	$\frac{\triangle_h}{h_{22}}$ $\frac{h_{12}}{h_{22}}$ $\frac{-h_{21}}{h_{22}}$ $\frac{1}{h_{22}}$	$\frac{A}{C}$ $\frac{\triangle_T}{C}$ $\frac{1}{C}$ $\frac{D}{C}$
y	$\frac{z_{22}}{\triangle_z}$ $\frac{-z_{12}}{\triangle_z}$ $\frac{-z_{21}}{\triangle_z}$ $\frac{z_{11}}{\triangle_z}$	y_{11} y_{12} y_{21} y_{22}	$\frac{1}{h_{11}}$ $\frac{-h_{12}}{h_{11}}$ $\frac{h_{21}}{h_{11}}$ $\frac{\triangle_h}{h_{11}}$	$\frac{D}{B}$ $\frac{-\triangle_T}{B}$ $\frac{-1}{B}$ $\frac{A}{B}$
h	$\frac{\triangle_z}{z_{22}}$ $\frac{z_{12}}{z_{22}}$ $\frac{-z_{21}}{z_{22}}$ $\frac{1}{z_{22}}$	$\frac{1}{y_{11}}$ $\frac{-y_{12}}{y_{11}}$ $\frac{y_{21}}{y_{11}}$ $\frac{\triangle_y}{y_{11}}$	h_{11} h_{12} h_{21} h_{22}	$\frac{B}{D}$ $\frac{\triangle_T}{D}$ $\frac{-1}{D}$ $\frac{C}{D}$
ABCD	$\frac{z_{11}}{z_{21}}$ $\frac{\triangle_z}{z_{21}}$ $\frac{1}{z_{21}}$ $\frac{z_{22}}{z_{21}}$	$\frac{-y_{22}}{y_{21}}$ $\frac{-1}{y_{21}}$ $\frac{-\triangle_y}{y_{21}}$ $\frac{-y_{11}}{y_{21}}$	$\frac{-\triangle_h}{h_{21}}$ $\frac{-h_{11}}{h_{21}}$ $\frac{-h_{22}}{h_{21}}$ $\frac{-1}{h_{21}}$	A B C D