

SULIT



**KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI**

**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN TINGGI**

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI II : 2024/2025

BEU40453: NETWORK ANALYSIS

TARIKH : 19 JUN 2025
MASA : 9.00 PAGI – 12.00 TENGAH HARI (3 JAM)

Kertas soalan ini mengandungi **LAPAN (8)** halaman bercetak.

Bahagian A: Subjektif (3 soalan)

Bahagian B: Esei (2 soalan)

Dokumen sokongan yang disertakan : Ada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SECTION A: 60 MARKS**BAHAGIAN A: 60 MARKAH****INSTRUCTION:**

This section consists of **THREE (3)** subjective questions. Answer **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **TIGA (3)** soalan subjektif. Jawab semua soalan.*

QUESTION 1

CLO1

SOALAN 1

- (a) Referring to the periodic waveform in Figure A1(a) below, outline the value of:

- i) The period, T
- ii) The frequency, f

Berdasarkan gambarajah masa berkala dalam Rajah A1(a) berikan nilai bagi:

- i) Masa, T*
- ii) Frekuensi, f*

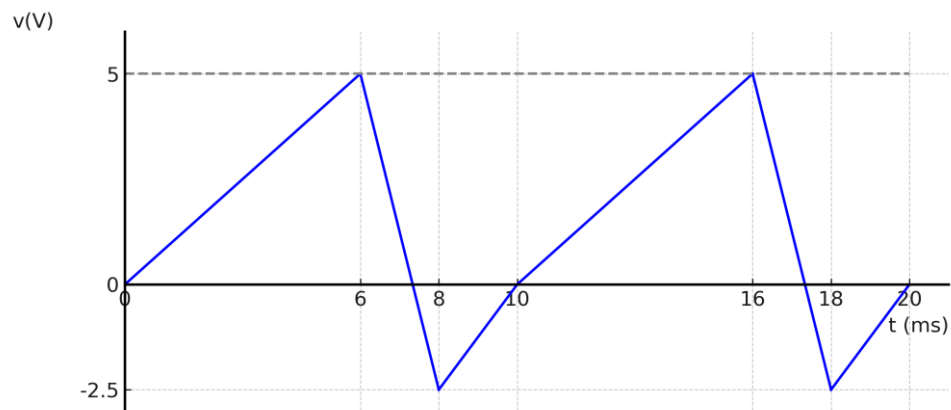


Figure A1(a) / Rajah A1(a)

[4 marks]

[4 markah]

CLO1

- (b) Write the phase relationship between the waveforms below:
Tuliskan hubungan fasa untuk dua gambarajah masa dibawa:

i) $V = 4 \sin (\omega t + 50^\circ)$

$I = 6 \sin (\omega t + 40^\circ)$

ii) $V = 0.2 \sin (\omega t - 60^\circ)$

$I = 0.1 \sin (\omega t + 20^\circ)$

[6 marks]

[6 markah]

CLO1

- (c) Based on Figure A1(c), find the voltage across each element of the circuit:
Berdasarkan rajah A1(c), cari voltan di setiap komponen:

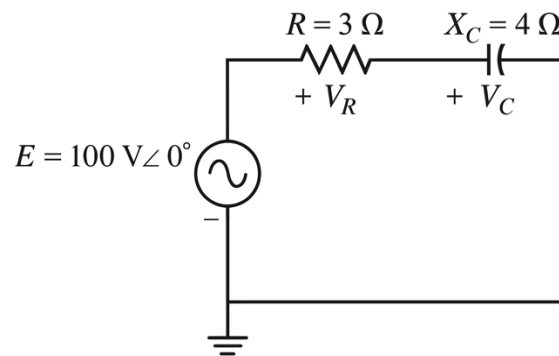


Figure A1(c) / Rajah A1(c)

[10 marks]

[10 markah]

QUESTION 2**SOALAN 2**

CLO1

- (a) For the circuit in Figure A2(a), express V_o using nodal analysis.
Bagi litar dalam Rajah A2(a), dapatkan V_o dengan menggunakan Analisa nodal.

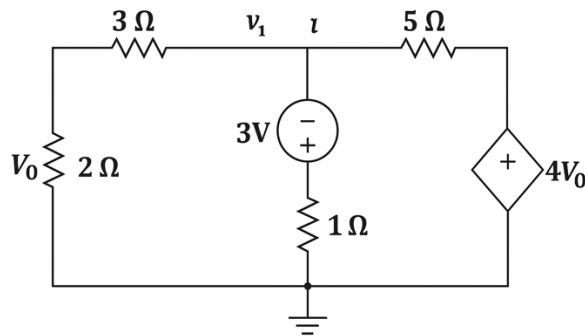


Figure A2(a) / Rajah A2(a)

[4 marks]

[4 markah]

CLO1

- (b) Referring to the circuit in Figure A2(b),
 i. Calculate the Thevenin equivalent resistance (R_{th}) and Thevenin voltage (V_{th}) across terminals 1 and 2 using Thevenin's Theorem.
 ii. Draw the Thevenin equivalent circuit consisting of R_{th} in series with V_{th} across the same terminals

Merujuk kepada litar dalam Rajah A2(b),

- i. Kira rintangan setara Thevenin (R_{th}) dan voltan Thevenin (V_{th}) pada terminal 1 dan 2 menggunakan Teorem Thevenin.
 ii. Lukis litar setara Thevenin yang terdiri daripada R_{th} bersiri dengan V_{th} merentasi terminal yang sama.

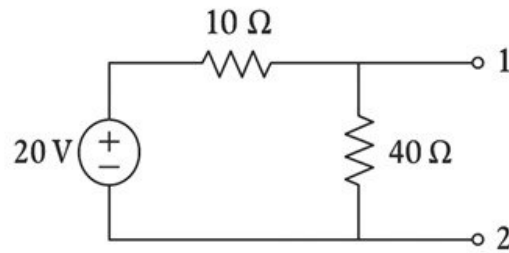


Figure A2(b) / Rajah A2(b)

[6 marks]

[6 markah]

CLO1

- (c) The output of a linear system is $y(t) = 10e^{-t}\cos 4t u(t)$ when the input is $x(t) = e^{-t}u(t)$. Find the transfer function of the system and its impulse response.

Keluaran system linear ialah $y(t) = 10e^{-t}\cos 4t u(t)$ apabila masukan adalah $x(t) = e^{-t}u(t)$. Cari sistem rangkap pindah dan rangkap dedenyut

[10 marks]

[10 markah]

QUESTION 3**SOALAN 3**

CLO1

(a) Express the Inverse Fourier Transform of the following equation:

Tunjukkan Penjelmaan songsang bagi Fourier Transform bagi persamaan dibawah.

$$G(\omega) = \frac{\omega^2 + 21}{\omega^2 + 9}$$

[4 marks]

[4 markah]

CLO1

(b) Referring to Figure A3(b), calculate the Fourier Series coefficients of a_0 , a_n and b_n

Merujuk kepada Figure A3(b), kirakan pekali Siri Fourier a_0 , a_n dan b_n

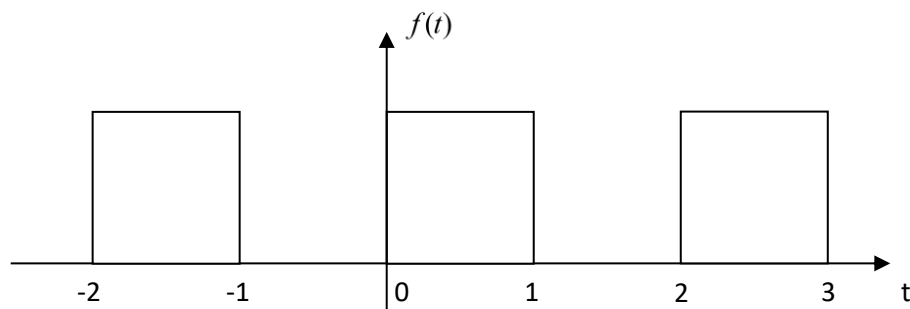


Figure A3(b) / Rajah A3(b)

[6 marks]

[6 markah]

CLO1

(c) Find $V_o(t)$ in the circuit of Figure A3(c) for $V_i(t) = 2e^{-3t}u(t)$ using Fourier Transform.

Cari $V_o(t)$ dalam Figure A3(c) untuk $V_i(t) = 2e^{-3t}u(t)$ dengan menggunakan Fourier Transform.

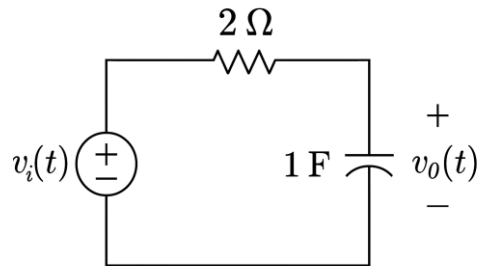


Figure A3(c) / Rajah A3(c)

[10 marks]

[10 markah]

SECTION B: 40 MARKS**BAHAGIAN B: 40 MARKAH****INSTRUCTION:**

This section consists of TWO (2) essay questions. Answer **ALL** questions.

ARAHAN:

Bahagian ini mengandungi **DUA (2)** soalan esei. Jawab **SEMUA** soalan.

QUESTION 1**SOALAN 1**

CLO1

Determine the current through 10Ω resistor using superposition theorem for the circuit shown in Figure B1 below:

Tentukan arus yang mengalir melalui perintang 10Ω dengan menggunakan teorem superposisi untuk litar yang ditunjukkan dalam Figure B1 dibawah:

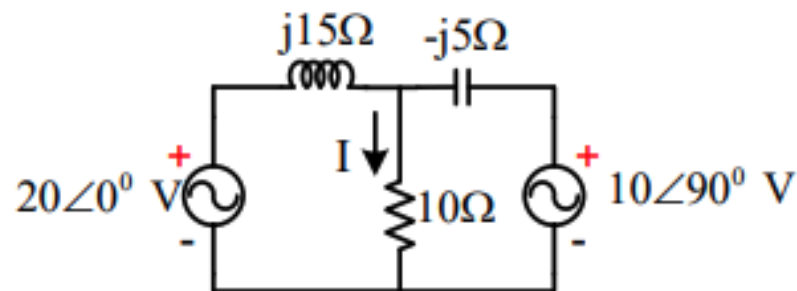


Figure B1/ Rajah B1

[20 marks]

[20 markah]

QUESTION 2**SOALAN 2**

CLO1

Based on Figure B2, find the $V_o(t)$ of the circuit using Laplace Transform and Nodal Analysis.

Berdasarkan Rajah B2, cari $V_o(t)$ dari litar menggunakan Laplace Transform dan Analisa Nodal.

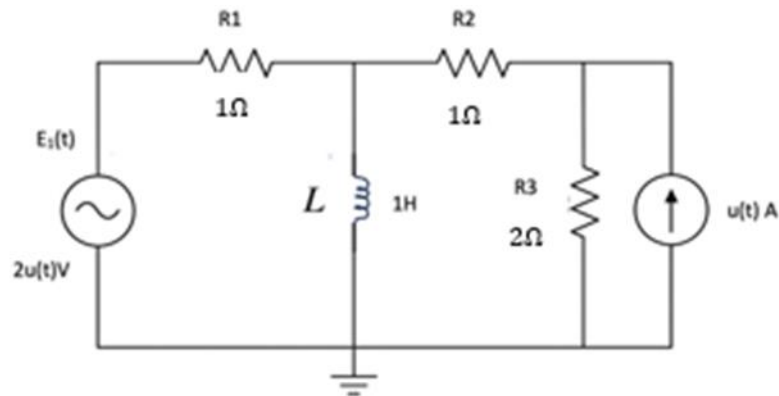


Figure B2/ *Rajah B2*

[20 marks]

[20 markah]

SOALAN TAMAT

Laplace transform pairs.*

$f(t)$	$F(s)$
$\delta(t)$	1
$u(t)$	$\frac{1}{s}$
e^{-at}	$\frac{1}{s + a}$
t	$\frac{1}{s^2}$
t^n	$\frac{n!}{s^{n+1}}$
te^{-at}	$\frac{1}{(s + a)^2}$
$t^n e^{-at}$	$\frac{n!}{(s + a)^{n+1}}$
$\sin \omega t$	$\frac{\omega}{s^2 + \omega^2}$
$\cos \omega t$	$\frac{s}{s^2 + \omega^2}$
$\sin(\omega t + \theta)$	$\frac{s \sin \theta + \omega \cos \theta}{s^2 + \omega^2}$
$\cos(\omega t + \theta)$	$\frac{s \cos \theta - \omega \sin \theta}{s^2 + \omega^2}$
$e^{-at} \sin \omega t$	$\frac{\omega}{(s + a)^2 + \omega^2}$
$e^{-at} \cos \omega t$	$\frac{s + a}{(s + a)^2 + \omega^2}$

*Defined for $t \geq 0$; $f(t) = 0$, for $t < 0$.

Properties of the Laplace transform.

Property	$f(t)$	$F(s)$
Linearity	$a_1 f_1(t) + a_2 f_2(t)$	$a_1 F_1(s) + a_2 F_2(s)$
Scaling	$f(at)$	$\frac{1}{a} F\left(\frac{s}{a}\right)$
Time shift	$f(t - a)u(t - a)$	$e^{-as} F(s)$
Frequency shift	$e^{-at} f(t)$	$F(s + a)$
Time differentiation	$\frac{df}{dt}$	$sF(s) - f(0^-)$
	$\frac{d^2 f}{dt^2}$	$s^2 F(s) - sf(0^-) - f'(0^-)$
	$\frac{d^3 f}{dt^3}$	$s^3 F(s) - s^2 f(0^-) - sf'(0^-) - f''(0^-)$
	$\frac{d^n f}{dt^n}$	$s^n F(s) - s^{n-1} f(0^-) - s^{n-2} f'(0^-) - \dots - f^{(n-1)}(0^-)$
Time integration	$\int_0^t f(t) dt$	$\frac{1}{s} F(s)$
Frequency differentiation	$tf(t)$	$-\frac{d}{ds} F(s)$
Frequency integration	$\frac{f(t)}{t}$	$\int_s^\infty F(s) ds$
Time periodicity	$f(t) = f(t + nT)$	$\frac{F_1(s)}{1 - e^{-sT}}$
Initial value	$f(0)$	$\lim_{s \rightarrow \infty} sF(s)$
Final value	$f(\infty)$	$\lim_{s \rightarrow 0} sF(s)$
Convolution	$f_1(t) * f_2(t)$	$F_1(s)F_2(s)$