

SULIT



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

JABATAN KEJURUTERAAN ELEKTRIK

**PEPERIKSAAN AKHIR
SESI DISEMBER 2016**

DEE6142: CIRCUIT ANALYSIS

**TARIKH : 11 APRIL 2017
MASA : 2.30 PM – 4.30 PM (2 JAM)**

Kertas ini mengandungi **SEMBILAN (9)** halaman bercetak.
Bahagian A: Struktur (4 soalan)
Bahagian B: Esei (2 soalan)
Dokumen sokongan yang disertakan : Formula

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 **FOUR (4)** structured questions. Answer **ALL** questions.

ARAHAN:

Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **SEMUA** soalan.

QUESTION 1

SOALAN 1

- CLO1
C1 a) State **THREE (3)** main steps to solve a circuit using nodal analysis method.

*Nyatakan **TIGA (3)** langkah utama untuk menyelesaikan litar elektrik menggunakan kaedah Analisis Nodal.*

[3 marks]
[3 markah]

- CLO1
C3 b) Based on figure A1(b), calculate the value of I_1 using Mesh analysis.

Berdasarkan Rajah A1(b), dapatkan nilai I_1 menggunakan Analisis Mesh.

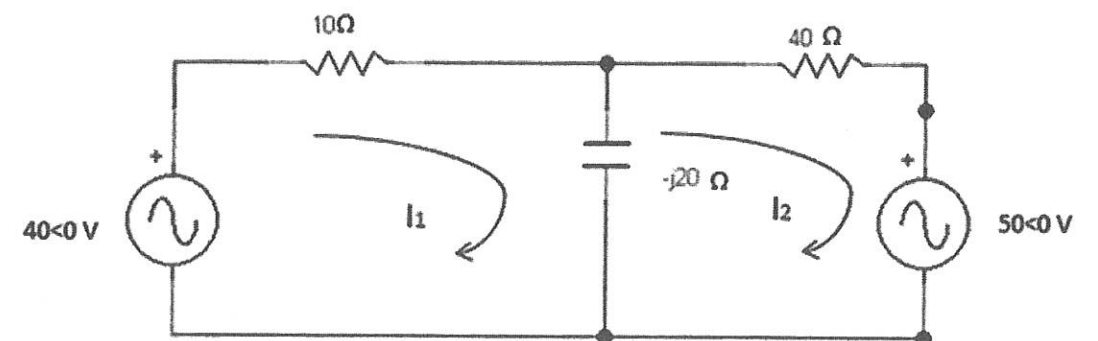


Figure A1(b) / Rajah A1(b)

[6 marks]
[6 markah]

- CLO1 C3 c) Refer to Figure A1(c), derive the equations for node voltages V_1 and V_2 using nodal analysis.

Berdasarkan Rajah A1(c), dapatkan persamaan bagi voltan nod bagi V_1 dan V_2 menggunakan Analisis Nodal.

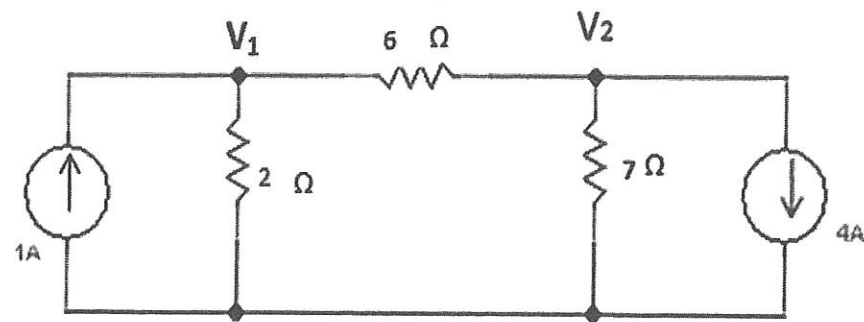


Figure A1(c) / Rajah A1(c)

[6 marks]
[6 markah]

QUESTION 2

SOALAN 2

- CLO1 C1 a) Referring to Figure A2(a), write the equations for the transformation from Δ to Y.

Berdasarkan Rajah A2(a), tuliskan persamaan bagi penukaran daripada Δ kepada Y.

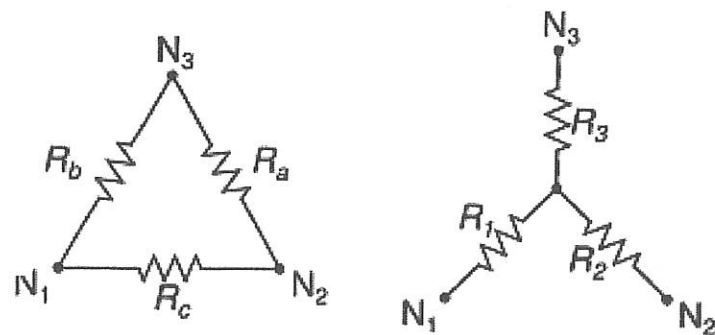


Figure A2(a) / Rajah A2(a)

[4 marks]
[4 markah]

- CLO1 C2 b) Determine the Thevenin voltage, V_{th} , at terminal a-b of the circuit in Figure A2(b).

Dapatkan nilai voltan Thevenin, V_{th} pada terminal a-b bagi litar di Rajah A2(b).

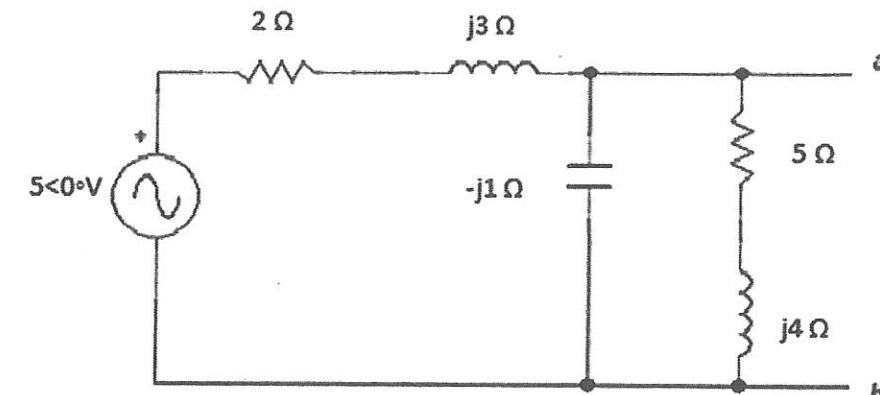


Figure A2(b) / Rajah A2(b)

[5marks]
[5 markah]

- CLO1 C2 c) Using the Norton Theorem, calculate Z_N and I_N at terminal a-b in Figure A2(c).

Dengan menggunakan Teorem Norton, kirakan nilai Z_N dan I_N pada terminal a-b dalam Rajah A2(c).

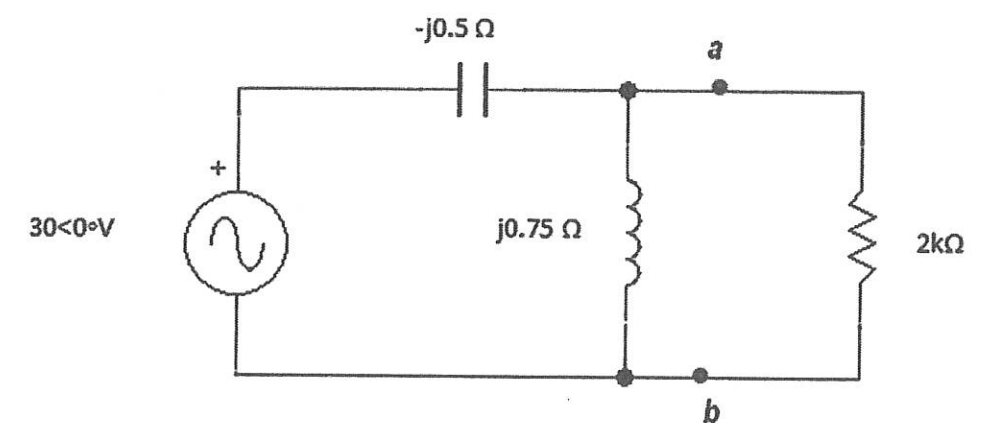


Figure A2(c) / Rajah A2(c)

[6 marks]
[6 markah]

QUESTION 3

SOALAN 3

- CLO2 C2 a) Determine the analytical equation for the function $f(t)$ in Figure A3(a).

Kenalpasti persamaan analitik bagi fungsi $f(t)$ pada Rajah A3(a)

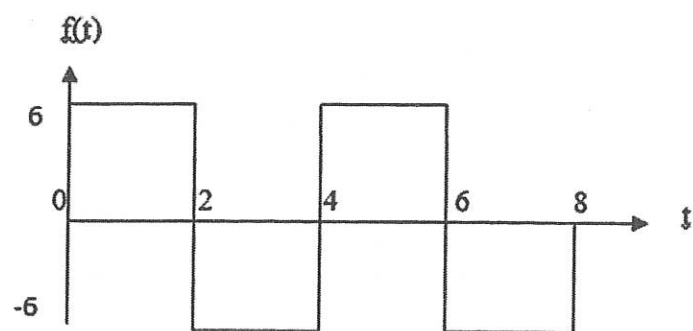


Figure A3(a) / Rajah A3(a)

[3 marks]
[3 markah]

- CLO2 C3 b) Sketch the function of $f(t)$ and calculate the Fourier Series of Co-efficient : a_0

Lakarkan fungsi $f(t)$ dan kirakan pekali Siri Fourier : a_0

$$f(t) = \begin{cases} 4 & -5 < t < 5 \\ 0 & 5 < t < 10 \end{cases}$$

$$f(t+15)$$

[5 marks]
[5 markah]

- CLO2 C4 c) Analyze the Fourier Series equation $f(t)$ up to 3th harmonic.

Analisa persamaan Siri Fourier $f(t)$ sehingga harmonik ke 3.

$$f(t) = \sum_{n=1}^{\infty} \left(\frac{10}{n\pi} [1 - \cos n\pi] \sin n\omega t \right)$$

[7 marks]
[7 markah]

QUESTION 4

SOALAN 4

- CLO3 C1 a) Based on the RLC circuit in Figure A4(a), write the expression for the voltage in t-Domain.

Berdasarkan litar RLC pada Rajah A4(a), tuliskan persamaan voltan dalam Domain-t.

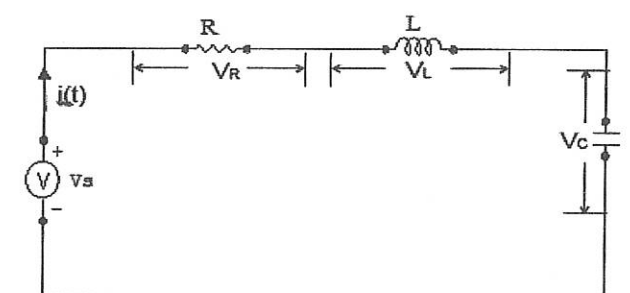


Figure A4(a) / Rajah A4(a)

[3 marks]
[3 markah]

- CLO3 C2 b) Using Laplace Transform, determine $I(s)$ for the circuit in Figure A4(b) when S_1 is closed. Assume that the initial condition is zero.

Dengan menggunakan Jelmaan Laplace, dapatkan persamaan $I(s)$ bagi litar pada Rajah A4(b) bila S_1 ditutup. Anggapkan keadaan awal adalah sifar.

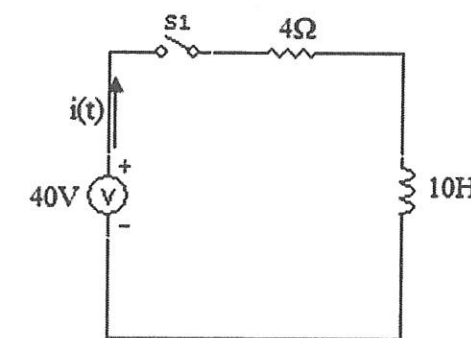


Figure A4(b) / Rajah A4(b)

[6 marks]
[6 markah]

CLO3
C2

- c) By referring to Figure A4(c), calculate the value of current $i(t)$ at $t=4s$ by using Laplace Transformation when S1 switch is closed.
(Assuming that the initial condition is zero).

Dengan merujuk kepada Rajah A4(c), kirakan nilai arus $i(t)$ pada $t=4s$ dengan menggunakan Jelmaan Laplace bila S1 ditutup.

(Anggap nilai permulaan adalah kosong).

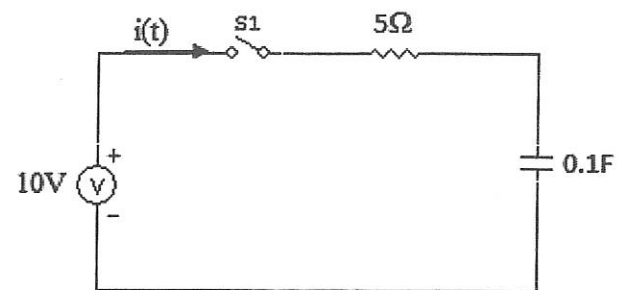


Figure A4(c) / Rajah A4(c)

[6 marks]
[6 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

CLO2
C3

Write the analytical equation for the function $V(t)$ in Figure B1, and then calculate the Trigonometric Fourier Series for the waveform.

Tuliskan persamaan analitik bagi fungsi $V(t)$ dalam Rajah B1, dan seterusnya kirakan siri Fourier trigonomteri bagi fungsi itu.

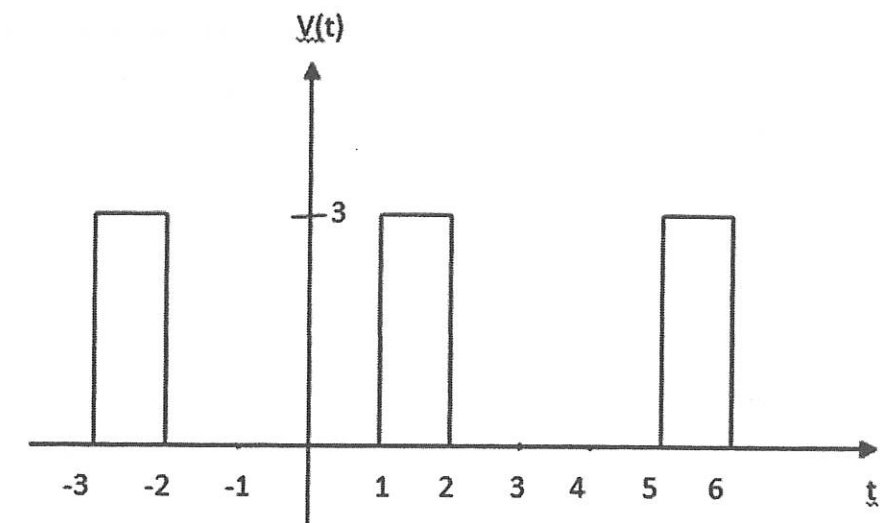


Figure B1 / Rajah B1

[20 marks]
[20 markah]

QUESTION 2

SOALAN 2

CLO3
C4

Based on the circuit in Figure B2, determine the current $i(t)$ for $t > 0$, if $C = 1/3 \text{ F}$, $v_g(t) = 6 \text{ V}$, $i(0) = 1 \text{ A}$, and $v_c(0) = 1 \text{ V}$.

Merujuk kepada litar dalam Rajah B2, tentukan arus $i(t)$ bagi $t > 0$, jika $C = 1/3 \text{ F}$, $v_g(t) = 6 \text{ V}$, $i(0) = 1 \text{ A}$ dan $v_c(0) = 1 \text{ V}$.

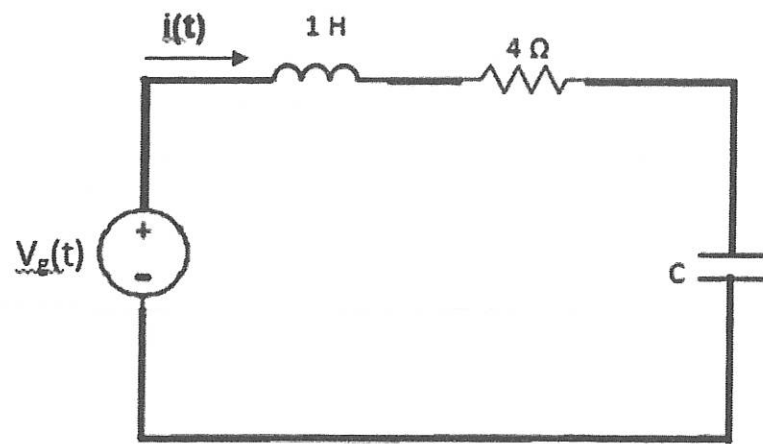


Figure B2 / Rajah B2.

[20 marks]
[20 markah]

SOALAN TAMAT

FORMULA

Laplace transforms and the inverses

$f(t) = L^{-1}\{F(s)\}$	$F(s) = L\{f(t)\}$
a	$\frac{a}{s}$
$t^n, n=1,2,3,\dots$	$\frac{n!}{s^{n+1}}$
e^{at}	$\frac{1}{s-a}$
$\sin at$	$\frac{a}{s^2 + a^2}$
$\cos at$	$\frac{s}{s^2 + a^2}$
$\sinh at$	$\frac{a}{s^2 - a^2}$
$\cosh at$	$\frac{s}{s^2 - a^2}$
$e^{at} \sin bt$	$\frac{b}{(s-a)^2 + b^2}$
$e^{at} \cos at$	$\frac{s-a}{(s-a)^2 + b^2}$
$t^n e^{at}$	$\frac{n!}{(s-a)^{n+1}}$
$t^n f(t)$	$(-1)^n \frac{d^n}{ds^n} [F(s)]$
$e^{at} f(t)$	$F(s-a)$
$y'(t)$	$sY(s) - y(0)$
$y''(t)$	$s^2 Y(s) - sy(0) - y'(0)$
$\int_0^t f(t) dt$	$\frac{F(s)}{s}$

Other Related Formula

Integration by Parts $\int_a^b u dv$	$uv - \int_a^b v du$
V_R	$Ri(t)$
V_L	$L \frac{di(t)}{dt}$
V_C	$\frac{1}{C} \int_0^t i(t) dt + V_C(0)$
I_R	$\frac{v(t)}{R}$
I_C	$C \frac{dv(t)}{dt}$
I_L	$\frac{1}{L} \int_0^t v(t) dt$