SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI JUN 2018

DEE6142: CIRCUIT ANALYSIS

TARIKH : 08 NOVEMBER 2018
MASA : 11.15 PAGI - 1.15 TENGAHARI (2 JAM)

Kertas ini mengandungi **SEPULUH (10)** halaman bercetak.
Bahagian A: Objektif (20 soalan)
Bahagian B: Struktur (10 soalan)
Bahagian C: Esei (3 soalan)
Dokumen sokongan yang disertakan : Formula dan Laplace Table

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

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) Mesh and Nodal Analysis are the methods used to solve the alternating current (AC) circuit. List **TWO (2)** differences between Mesh and Nodal Analysis.

*Analisa Mesh dan Nodal adalah dua kaedah yang digunakan bagi menyelesaikan litar arus ulangalik (AU). Senaraikan **DUA (2)** perbezaan antara Analisa Mesh dan Nodal.*

[3 marks]
[*3 markah*]

CLO1
C3

(b) Calculate the value of the current I_2 by using Mesh Analysis by referring to Figure A1(b)

Kirakan nilai I_2 dengan menggunakan Analisa Mesh dengan merujuk kepada Rajah A1(b).

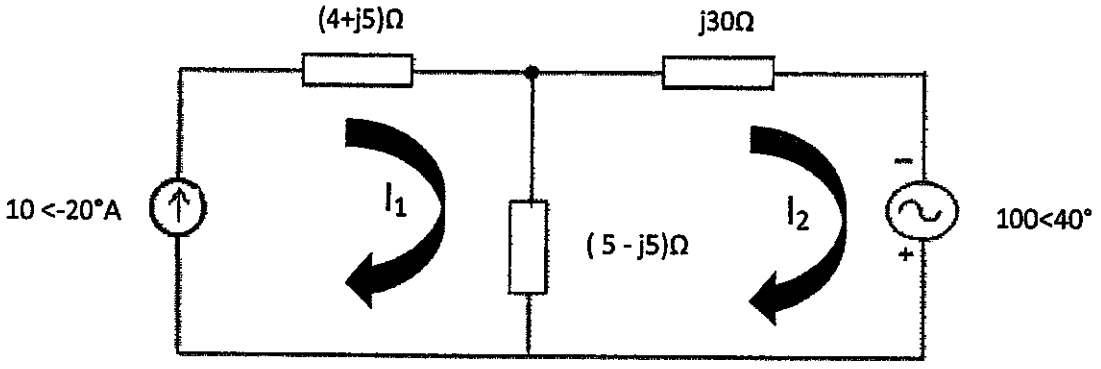

Figure A1(b) / *Rajah A1(b)*

[6 marks]
[*6 markah*]

CLO1
C3

(c) Calculate the voltage V_1 and current I_2 by applying Nodal Analysis Method referring to the Figure A1 (c).

Kirakan voltan V_1 dan arus I_2 dengan menggunakan Kaedah Analisa Nodal merujuk kepada Rajah A1 (c).

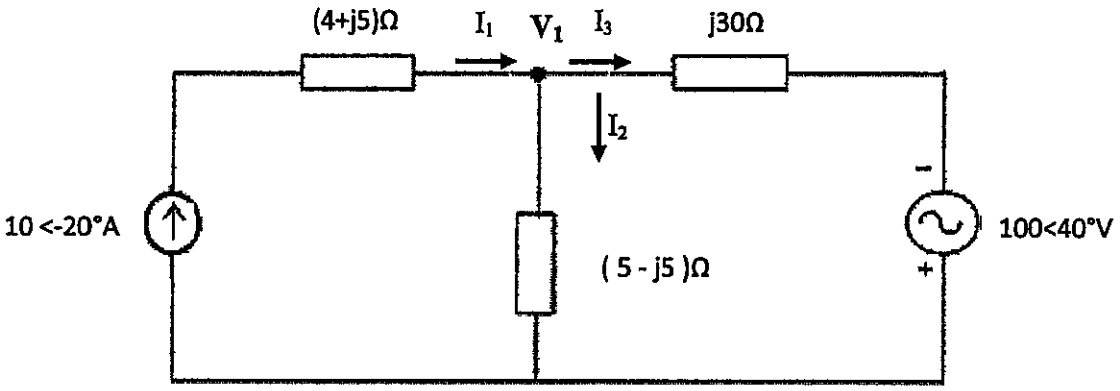

Figure A1(c) / *Rajah A1(c)*

[6 marks]
[*6 markah*]

QUESTION 2
SOALAN 2

CLO1 C1

(a) Draw the Norton Equivalent Circuit with $I_N = 1.50\angle 45°A$ and $Z_{th} = (18 + j60)\ \Omega$.

Lukiskan Litar Setara Norton dengan $I_N = 1.50\angle 45°A$ *dan* $Z_{th} = (18 + j60)\Omega$.

[4 marks]
[*4 markah*]

CLO1 C2

(b) Describe the steps in analyzing alternating current (AC) circuit by using the Superposition Theorem.

Huraikan langkah-langkah dalam menganalisis litar arus ulangalik (AU) dengan menggunakan Teorem Superposisi.

[5 marks]
[5 *markah*]

CLO1 C3

(c) Referring to Question 2(a), calculate the value of load current I_L if $Z_L = (2+j4)\Omega$ is connected at the open terminal.

Merujuk kepada Soalan 2(a), kirakan nilai arus beban I_L *jika* $Z_L = (2+j4)\Omega$ *disambungkan pada terminal terbuka.*

[6 marks]
[*6 markah*]

QUESTION 3
SOALAN 3

CLO2 C2 (a) Express the Fourier Series equation f(t) if given:
Ungkapkan persamaan Fourier Series jika diberi:

$$a_0 = 1 \quad , \quad a_n = \frac{2}{n^2 \pi} \quad , \quad b_n = \frac{1}{n} \quad and \; n = 1, 2, 3$$

[3 marks]
[*3 markah*]

CLO2 C3 (b) Sketch the graph for the analytical function below in time interval $-2\pi < t < 2\pi$ and calculate the coefficient expression of a_0.

Lakarkan graf bagi fungsi analisis di bawah dalam julat masa $-2\pi < t < 2\pi$ dan kirakan ungkapan pekali a_0.

$$f(t) = \begin{cases} 4, & 0 < t < \pi \\ -2, & \pi < t < 2\pi \end{cases}$$
$$f(t + 2\pi) = f(t)$$

[5 marks]
[*5 markah*]

CLO2
C4

(c) Interpret the analytical function and the period for the waveform in Figure A3(c)

Tafsirkan fungsi analisis dan tempoh bagi gelombang dalam Rajah A3(c)

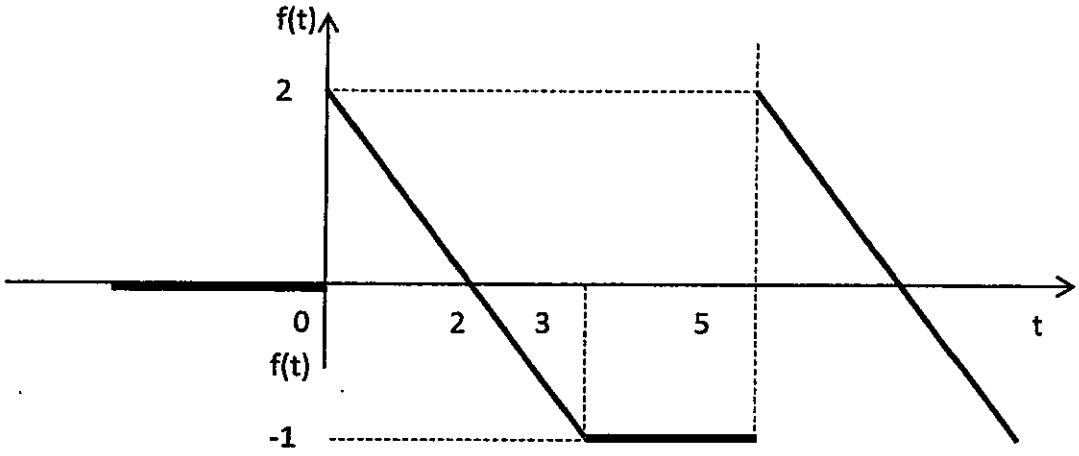

Figure A3(c) / Rajah A3(c)

[7 marks]
[7 *markah*]

QUESTION 4
SOALAN 4

CLO3 C1 (a) Write the Laplace Transform of the given function by using Laplace Transform Table.

Tuliskan Jelmaan Laplace bagi fungsi diberikan dengan menggunakan Jadual Jelmaan Laplace.

$$f(t) = e^{2t}sin2t$$

[3 marks]
[*3 markah*]

CLO3 C2 (b) Express i(t), the total current flowing in the circuit by using Laplace Transform method by referring to Figure A4(b),

Nyatakan i(t), jumlah arus yang mengalir dalam litar dengan menggunakan kaedah Jelmaan Laplace.Merujuk kepada Rajah A4(b),

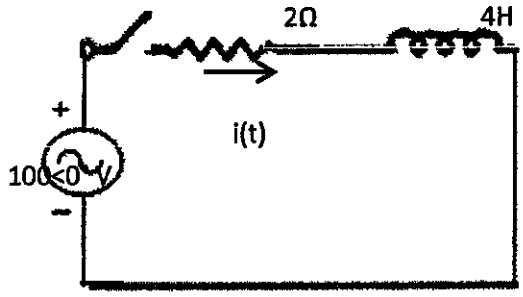

Figure A4 (b) / Rajah A4 (b)

[6 marks]
[*6 markah*]

CLO3
C2

(c) Determine the Inverse Laplace Transform for function F(s) and calculate the value of f(t) when t = 0.1 second.

Tentukan Jelmaan Laplace Songsang bagi fungsi F(s) dan kirakan nilai f(t) apabila t = 0.1 saat.

$$F(s) = \frac{5s + 10}{s^2 - 4s - 12}$$

[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

Referring to Figure B1 below, interpret the analytical function for the waveform f(t) and calculate the Fourier Series equation f(t) for n=1 to 3.

Merujuk kepada Rajah B1 di bawah, tafsirkan fungsi analisis bagi gelombang f(t) dan kirakan persamaan Siri Fourier pada n=1 hingga 3.

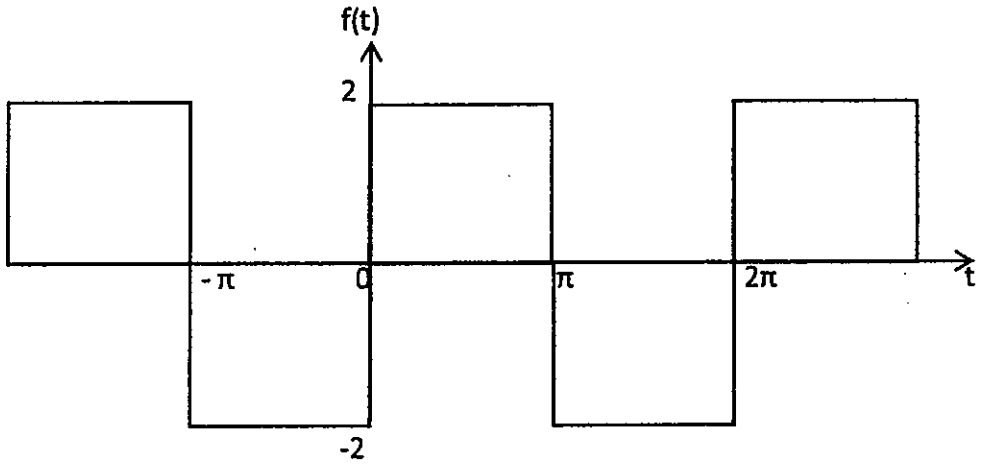

Figure B1 / *Rajah B1*

[20 marks]
[*20 markah*]

QUESTION 2
SOALAN 2

CLO3
C4

Based on Figure B2, transform the circuit in s-domain, solve for Vx(t) by using Laplace Transform and determine i(t) when t = 0.1second. Assume the initial condition is zero.

Berdasarkan Rajah B2, jelmakan litar dalam domain s, selesaikan bagi Vx(t) dengan menggunakan Jelmaan Laplace dan tentukan i(t) apabila t=0.1 saat. Andaikan keadaan awal adalah sifar.

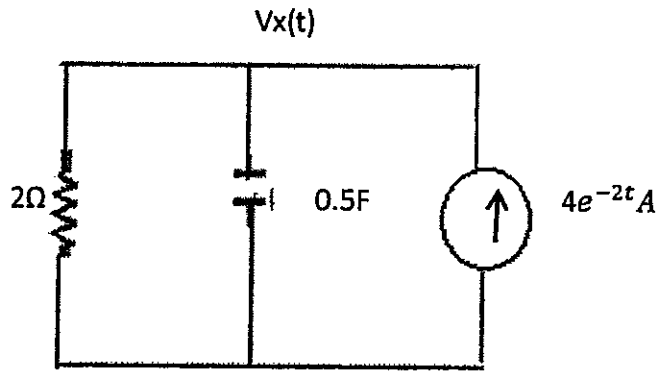

Figure B2 / *Rajah B2*

[20 marks]
[20 *markah*]

SOALAN TAMAT

FORMULA FOR DEE6142 CIRCUIT ANALYSIS

LAPLACE TRANSFORMS AND THE INVERSES

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

FORMULA FOR DEE6142 CIRCUIT ANALYSIS

OTHER RELATED FORMULA

Integration by Parts $\int_a^b udv$	$uv-\int_a^b vdu$
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	$\frac{1}{L}\int_0^t v(t)dt$