



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 DIARAIKAN

(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).

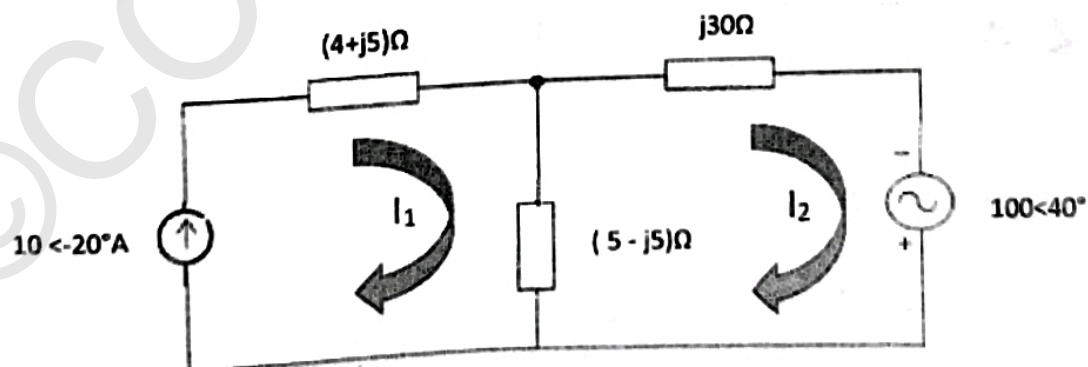


Figure A1(b) / Rajah A1(b)

[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).

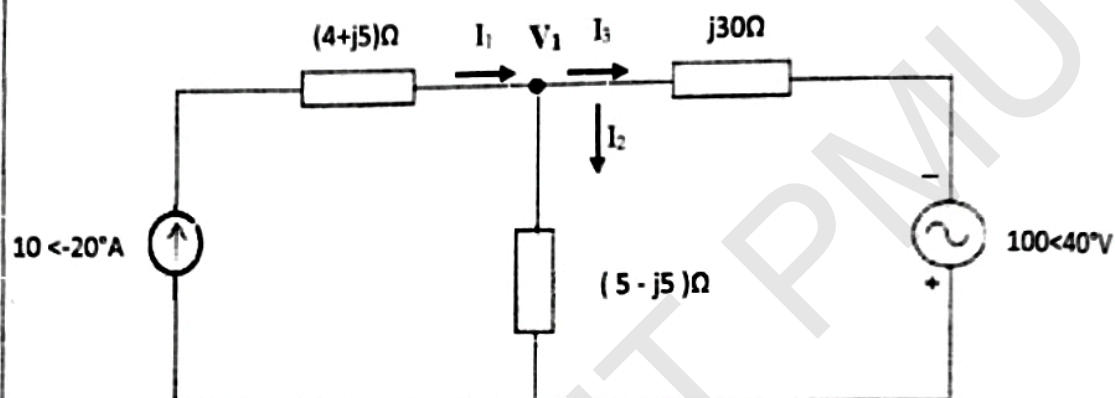


Figure A1(c) / Rajah A1(c)

[6 marks]
[6 markah]

QUESTION 2
SOALAN 2

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

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

[4 marks]

[4 markah]

- (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]

- (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:

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

[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)

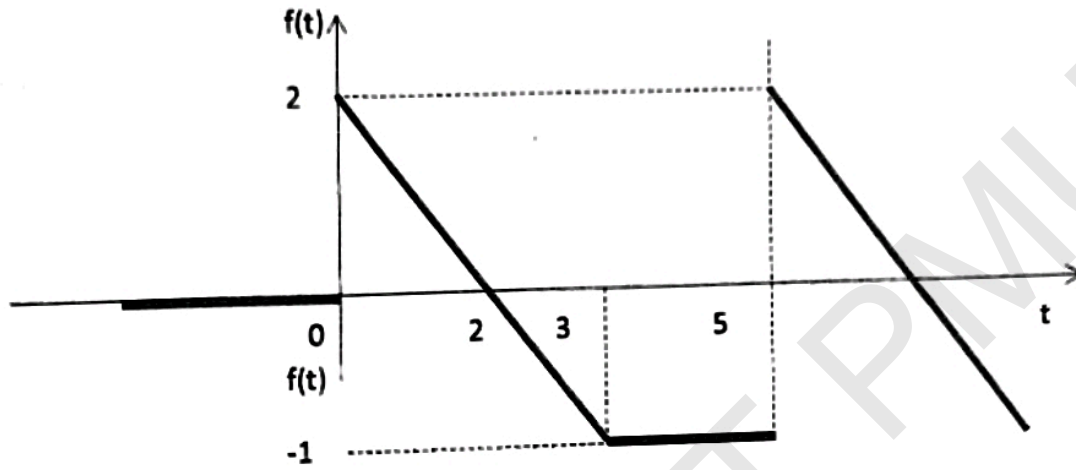
Tafsirkan fungsi analisis dan tempoh bagi gelombang dalam Rajah A3(c)

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.

$$f(t) = e^{2t} \sin 2t$$

[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),

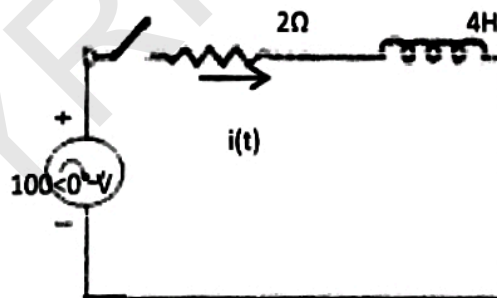


Figure A4 (b) / Rajah A4 (b)

[6 marks]
 [6 markah]

- 3 (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.

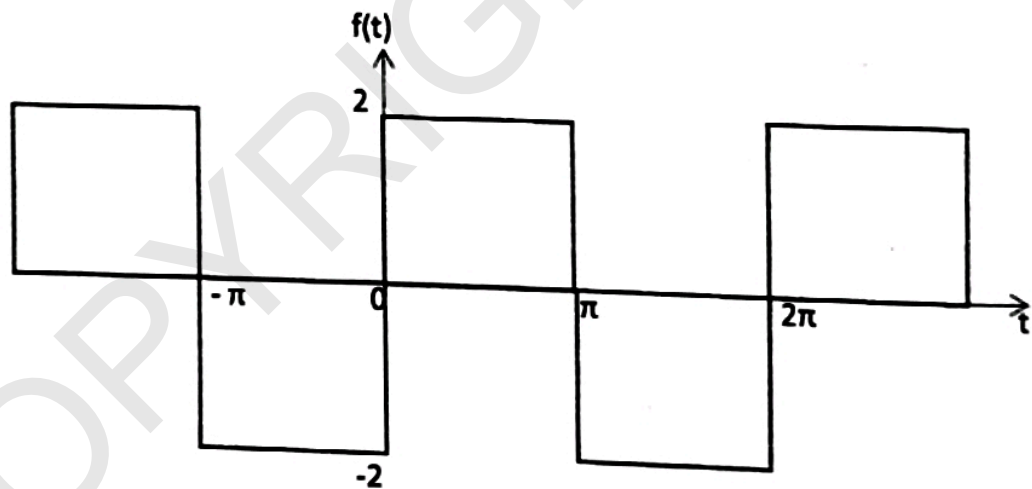


Figure B1 / Rajah B1

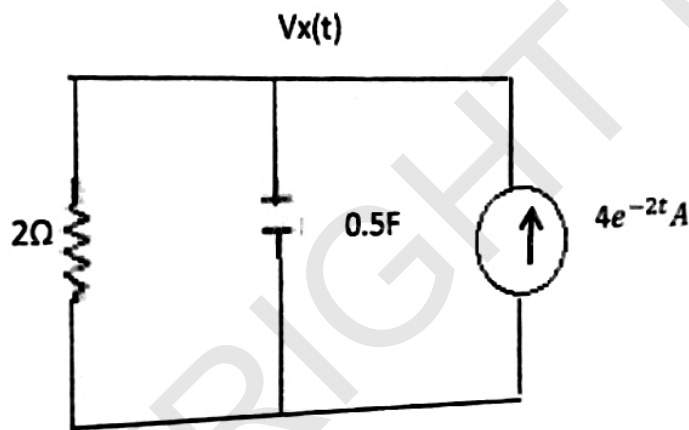
[20 marks]
[20 markah]

QUESTION 2
SOALAN 2

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

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



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

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FORMULA FOR DEE6142 CIRCUIT ANALYSIS

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	$\frac{1}{L} \int_0^t v(t) dt$