

SULIT



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

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI DISEMBER 2017

DEE6142 : CIRCUIT ANALYSIS

TARIKH : 08 APRIL 2018

MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **LAPAN (8)** 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 struktur. Jawab **SEMUA** soalan

QUESTION 1

SOALAN 1

CLO1
C1

- a) Define Kirchoff Current Law with an appropriate circuit.

Takrifkan Hukum Arus Kirchoff dengan litar yang bersesuaian.

[3 marks]

[3 markah]

CLO1
C3

- b) Derive nodal voltage equations at node B and node C in **Figure A1(b)**.

*Terbitkan persamaan voltan nodal pada nod B dan nod C di dalam **Rajah A1(b)**.*

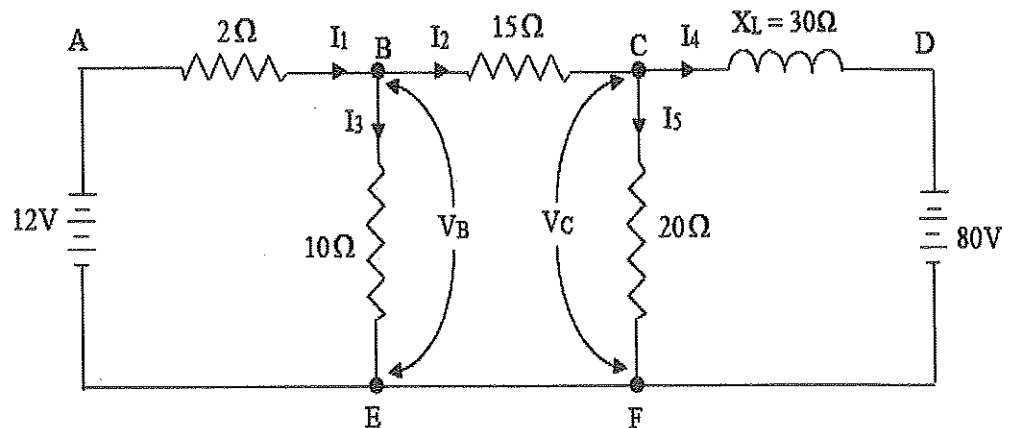


Figure A1(b)/ *Rajah A1(b)*.

[6 marks]

[6 markah]

CLO1
C3

- c) Calculate current I_1 using Mesh Analysis for the circuit in Figure A1(c) if the current of I_2 is $0.9 \angle -5.20$ A.

Kira arus I_1 menggunakan Analisis Mesh bagi litar di dalam Rajah A1(c) jika arus I_2 ialah $0.9 \angle -5.20$ A.

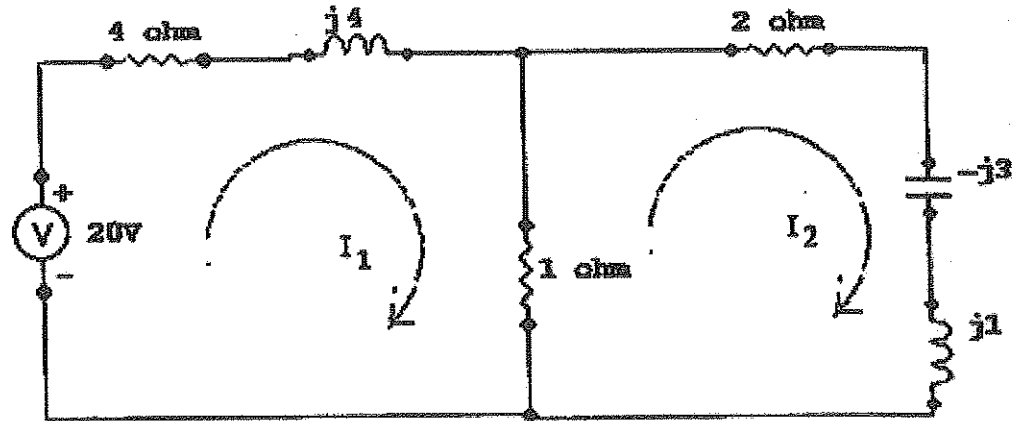


Figure A1 (c) / Rajah A1(c)

[6 marks]

[6 markah]

QUESTION 2

SOALAN 2

CLO1
C1

- a) Draw the basic Thevenin Equivalent circuit with $E_{TH} = (60 - j120)$ V and $Z_{TH} = (0.8 - j1.6)\Omega$.

Lukis litar setara Thevenin asas dengan $E_{TH} = (60 - j120)V$ dan $Z_{TH} = (0.8 - j1.6)\Omega$.

[4 marks]

[4 markah]

CLO1
C2

- b) By referring to QUESTION 2 (a), identify a Norton equivalent circuit with calculated Norton current I_N .

Berdasarkan SOALAN 2 (a), kenalpasti litar setara Norton dengan kiraan arus Norton I_N .

[5 marks]

[5 markah]

CLO1
C3

- (c) Referring to Figure A2(c), when the current source $15\angle 0^\circ$ A is OFF, the value of $I_x' = (2.35 - j1.66)$ A. Calculate the value of I_x by using Superposition Theorem.

Merujuk kepada Rajah A2(c), bila Bekalan Voltan $15\angle 0^\circ$ A dimatikan, nilai

$I_x' = (2.35 - j1.66)$ A. Kira nilai I_x dengan menggunakan Teorem Superposition.

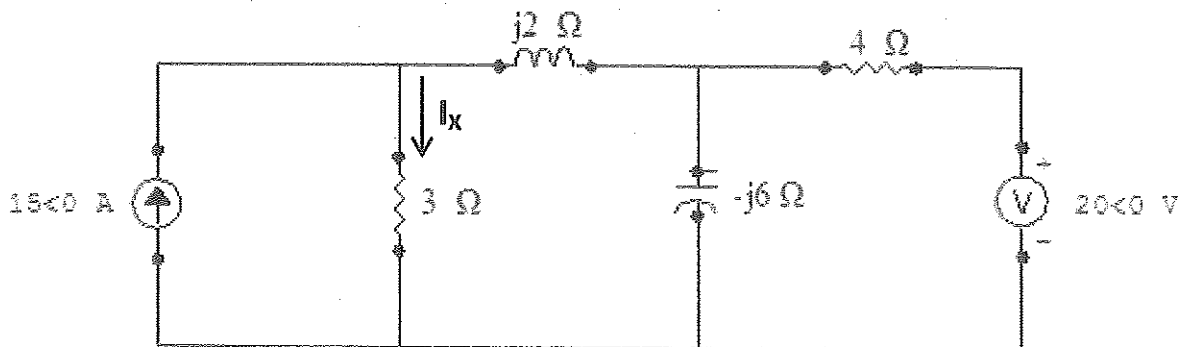


Figure A2(c) / Rajah A2(c)

[6 marks]

[6 markah]

QUESTION 3

SOALAN 3

CLO2
C2

- a) Express the Fourier coefficient expressions of a_n by using the given analytical function.
Ungkapkan pekali Fourier bagi a_n menggunakan fungsi analitik yang diberi.

$$f(t) = \begin{cases} \frac{6t}{T} & \text{for } 0 < t < \frac{T}{3} \\ 2 & \text{for } \frac{T}{3} < t < \frac{2T}{3} \\ \frac{-6t}{T} + 6 & \text{for } \frac{2T}{3} < t < T \end{cases}$$

[3 marks]
[3 markah]

CLO2
C3

- b) Interpret the analytical function and the period for the waveform in Figure A3(b).
Tafsirkan fungsi analitik dan tempoh masa bagi gambarajah gelombang di Rajah A3(b)

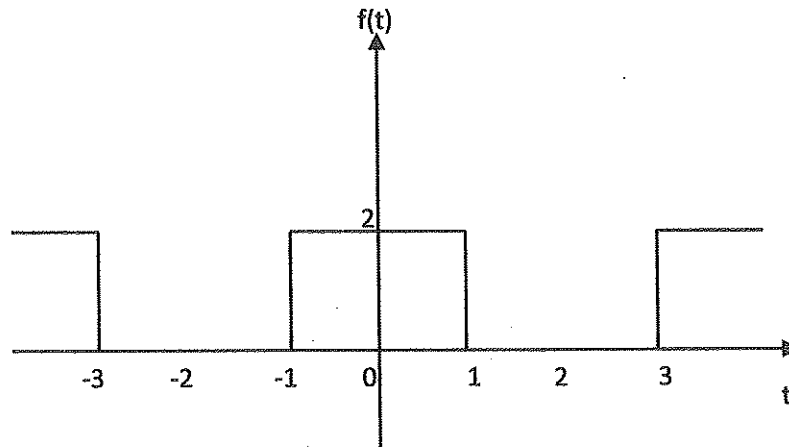


Figure A3(b) / Rajah A3(b)

[5 marks]
[5 markah]

CLO2
C4

- c) Transform the given analytical function into a graph of $f(t)$ in the interval of $\frac{-3T}{4} < t < \frac{3T}{4}$ and identify the coefficient expression of a_0 .

Tukarkan fungsi analitik yang diberi ke dalam bentuk graf $f(t)$ di dalam julat

$\frac{-3T}{4} < t < \frac{3T}{4}$ dan kenalpasti ungkapan pekali a_0 .

$$f(t) = \begin{cases} 2, & \frac{-T}{4} < t < \frac{T}{4} \\ 1, & \frac{T}{4} < t < \frac{3T}{4} \end{cases}$$

[7 marks]

[7 markah]

QUESTION 4

SOALAN 4

CLO3
C1

- a) Show a Laplace Transform for the given function.
Tunjukkan Jelmaan Laplace bagi fungsi yang diberi.

$$f(t) = 4e^{4t} + 2t^2 - 2\sin 2t$$

[3 marks]

[3 markah]

CLO3
C2

- b) Determine the Laplace Transform of $f(t)$ by using Direct Integration Method.
Tentukan Jelmaan Laplace bagi $f(t)$ dengan menggunakan Kaedah Kamilan Terus.

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

[6 marks]

[6 markah]

CLO3
C2

- c) Determine the Inverse Laplace Transform of function $F(s)$ by using partial fraction.
Tentukan Jelmaan Laplace Songsang bagi fungsi $F(s)$ dengan menggunakan pecahan separa.

$$F(s) = \frac{11-3s}{s^2+2s-3}$$

[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

Carry out the Trigonometric Fourier Series for the given waveform in Figure B1 and interpret the types of the function for the waveform.

Laksanakan Trigonometri Siri Fourier bagi gambarajah gelombang di Rajah B1 yang diberi dan kenalpasti jenis fungsi bagi gelombang tersebut.

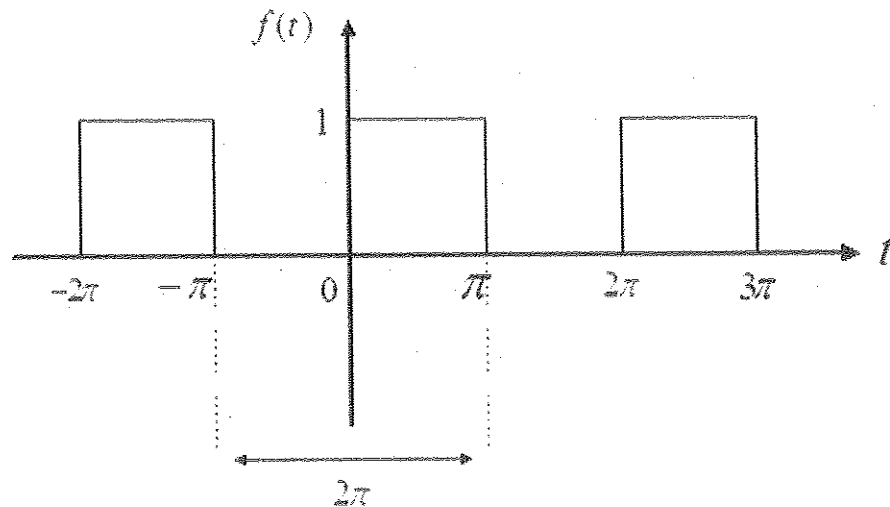


Figure B1/ Rajah B1

[20 marks]

[20 markah]

QUESTION 2

SOALAN 2

CLO3
C4

Transform the circuit in **Figure B2** in s- domain, then calculate the current $i(t)$ using Laplace transform method.

*Tukarkan litar dalam **Rajah B2** ke domain-s dan kemudian kirakan arus $i(t)$ dengan menggunakan kaedah Jelmaan Laplace.*

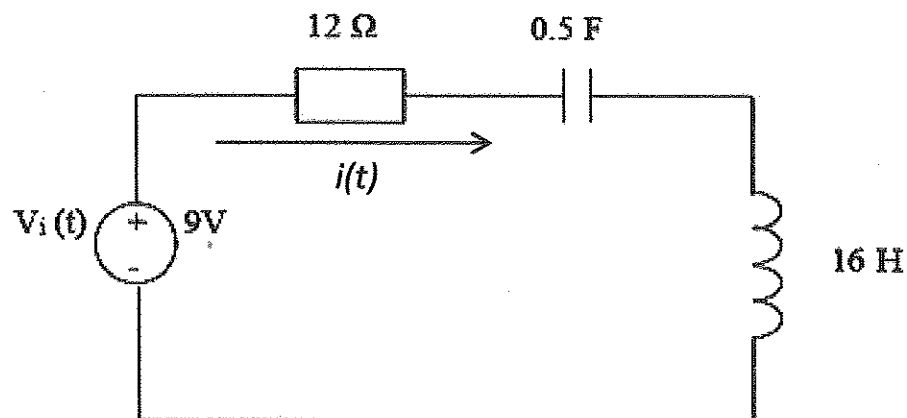


Figure B2/ Rajah B2

[20 marks]

[20 markah]

SOALAN TAMAT

FORMULA FOR DEE6142 CIRCUIT ANALYSIS

Laplace transforms and the inverses

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

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