



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

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI JUN 2019

DEE50122: CIRCUIT ANALYSIS

TARIKH : 5 NOVEMBER 2019

MASA : 8:30 PAGI – 10:30 PAGI

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

Bahagian A: Struktur (4 soalan)

Bahagian B: Esei (1 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SECTION A : 80 MARKS
BAHAGIAN A : 80 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
C2

- (a) Elaborate the expression of the voltage at point A and B (V_{AB}) as shown in Figure A1(a) by using a Nodal Analysis.

Huraikan ungkapan voltan pada titik A dan B (V_{AB}) seperti pada Rajah A1(a) dengan menggunakan Analisa Nodal.

[4 marks]
[4 markah]

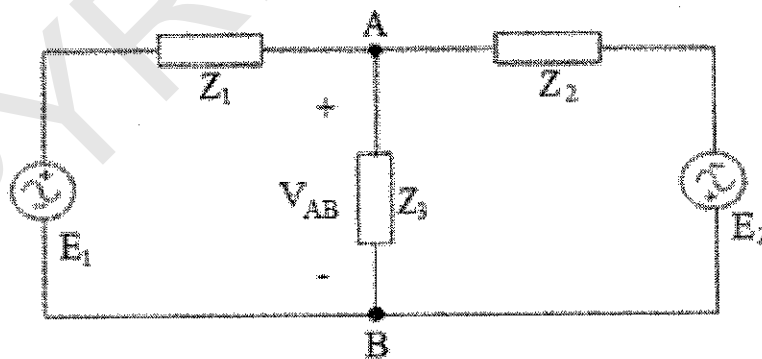


Figure A1(a)/Rajah A1(a)

CLO1
C3

- (b) Calculate the current flow at impedance Z_3 as shown in Figure A1(b) by using a mesh analysis.

Kirakan arus yang mengalir pada galangan Z_3 merujuk pada Rajah A1(b) dengan menggunakan analisis gelung.

[8 marks]
[8 markah]

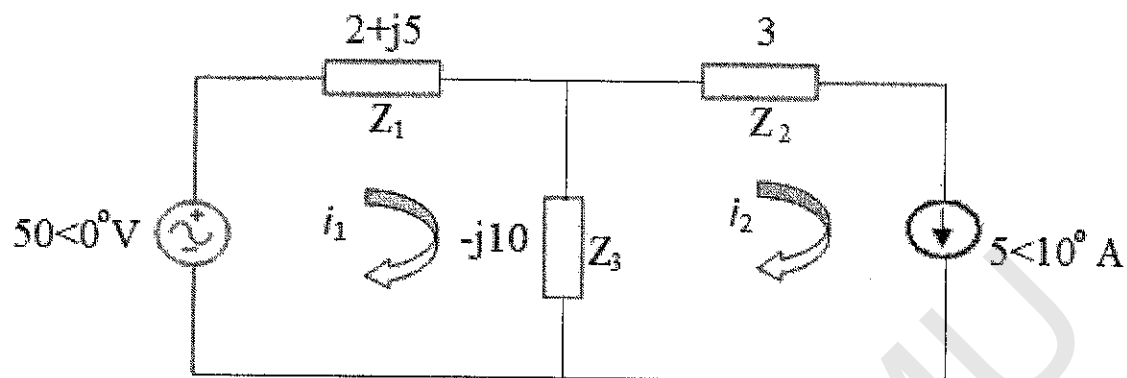


Figure A1(b)/Rajah A1(b)

CLO1
C3

- (c) Calculate the current flow, i at impedance Z_3 as shown in Figure A1(c) by using a superposition theorem.

Kirakan arus yang mengalir, i pada galangan Z_3 merujuk pada Rajah A1(c) dengan menggunakan teorem tindihan.

[8 marks]
[8markah]

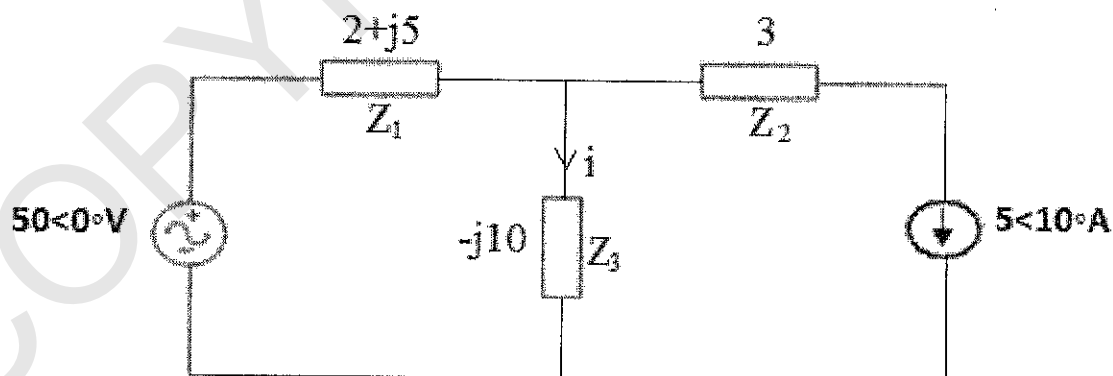


Figure A1(c)/Rajah A1(c)

QUESTION 2
SOALAN 2

CLO1
C2

- (a) Visualize the circuit in Figure A2(a) from delta (Δ) configuration to wye (Y) configuration.

Gambarkan litar pada Rajah A2(a) daripada konfigurasi delta (Δ) kepada konfigurasi wye (Y).

[4 marks]

[4 markah]

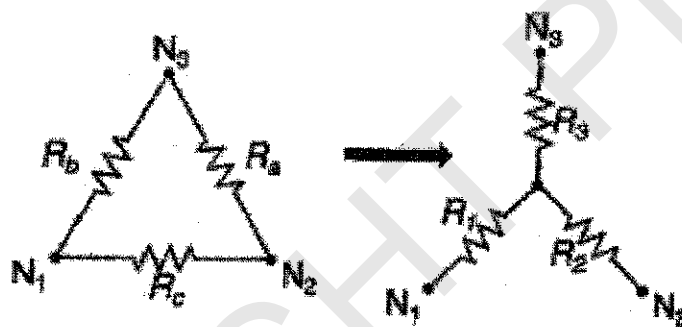


Figure A2(a)/Rajah A2(a)

CLO1
C3

- (b) Calculate the Thevenin's voltage and impedance at point A and B for the circuit in Figure A2(b), then show its Thevenin equivalent circuit.

Kirakan voltan dan galangan Thevenin pada titik A dan B bagi litar dalam Rajah A2(b), seterusnya tunjukkan litar setara Thevenin.

[8 marks]

[8 markah]

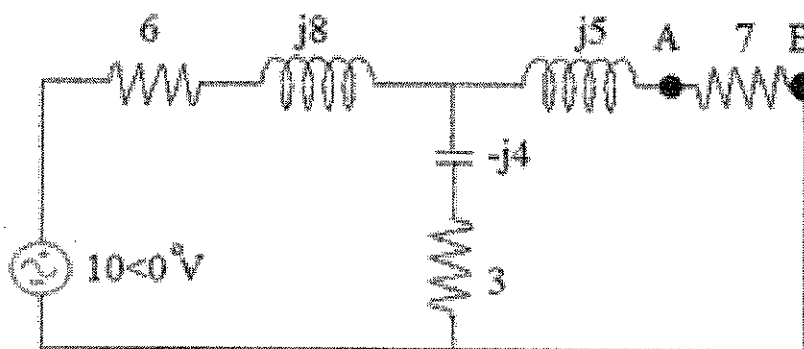


Figure A2(b)/Rajah A2(b)

CLO1
C3

- (c) Calculate the current flow at point A and B by using Norton's theorem based on the answer from Question 2(b).

Kirakan arus yang mengalir pada titik A dan B dengan menggunakan teorem Norton berdasarkan pada jawapan Soalan 2(b).

[8 marks]

[8 markah]

QUESTION 3
SOALAN 3

CLO1
C2

- (a) Interpret the inverse Laplace transform of the given function:

Tafsirkan Jelmaan Laplace Songsang bagi fungsi dibawah:

$$F(s) = \frac{4}{s+1} + \frac{8}{s^2+4}$$

[4 marks]

[4 markah]

CLO1
C3

- (b) Calculate the time domain $y(t)$ for the given function by using Laplace Transform.

Kirakan Jelmaan Laplace bagi fungsi $y(t)$ berikut dengan menggunakan Jadual Jelmaan Laplace.

$$y'' + 4y' + 3y = 0$$

$$\text{given } y(0) = 3 \text{ and } y'(0) = 1$$

[6 marks]

[6 markah]

CLO1
C4

- (c) A series LC circuit with $C = \frac{1}{60} F$ and $L = 10H$ are connected in series with 120 V source. At time $t=0s$, the switch is closed. Assume that the initial current is zero. Analyze the LC circuit by using Laplace Transform to get the steady state of the total current flowing through the circuit, $i(t)$.

Litar Siri LC yang terdiri daripada pemuat $C = \frac{1}{60} F$ dan pearuh $L=10H$ disambungkan secara siri dengan voltan bekalan sebanyak 120 V. Semasa $t = 0s$, suis ditutup. Andaikan arus permulaan ialah sifar. Analisis litar siri LC ini menggunakan Jelmaan Laplace untuk mendapatkan arus yang mengalir di dalam litar $i(t)$ ketika keadaan mantap.

[10 marks]

[10 markah]

QUESTION 4 SOALAN 4

CLO1
C3

- (a) Based on waveform given, write the analytical equation of $f(t)$

Berdasarkan gambarajah gelombang A4(a), tuliskan persamaan analitikal bagi $f(t)$.

[5 marks]

[5 markah]

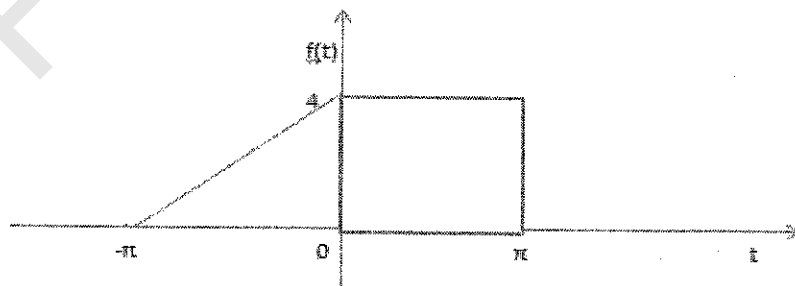


Figure A4(a)/Rajah A4(a)

CLO1
C3

- (b) Sketch the graph for the analytical function below and determine whether the function is Odd or Even.

Lakar graf bagi fungsi analitikal berikut dan tentukan samada fungsi tersebut Genap atau Ganjil.

$$f(t) = \begin{cases} -2, & -2 < t < 2 \\ 2, & 2 < t < 6 \end{cases}$$

$$f(t) = f(t + 8)$$

[5 marks]

[5 markah]

- (c) Determine the analytical equation for the waveform in Figure A4(c) and then find its Fourier coefficient a_0 .

CLO1
C4

Tentukan persamaan analitikal bagi gelombang di dalam Rajah A4(c) dan seterusnya dapatkan pekali Fourier a_0 .

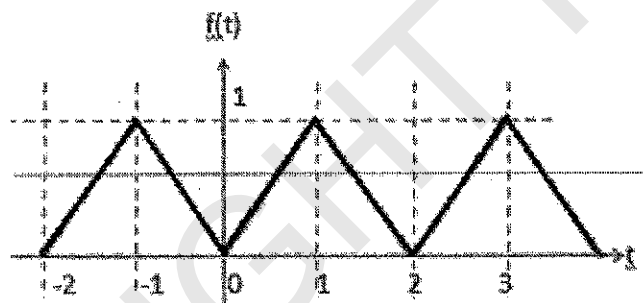


Figure A4(c)/Rajah A4(c)

[10 marks]

[10 markah]

SECTION B : 20 MARKS
BAHAGIAN B : 20 MARKAH

INSTRUCTION:

This section consists of **ONE (1)** essay question. Answer the question.

ARAHAN:

Bahagian ini mengandungi SATU (1) soalan esei. Jawab soalan tersebut.

CLO1
C5

QUESTION 1

Evaluate the trigonometric Fourier series of the waveform in Figure B1 and set up the line spectrum up to 3rd harmonics.

SOALAN 1

Nilaikan siri Fourier trigonometri isyarat pada Rajah B1 dan binakan spektrum garis harmonik sehingga harmonik ke-3.

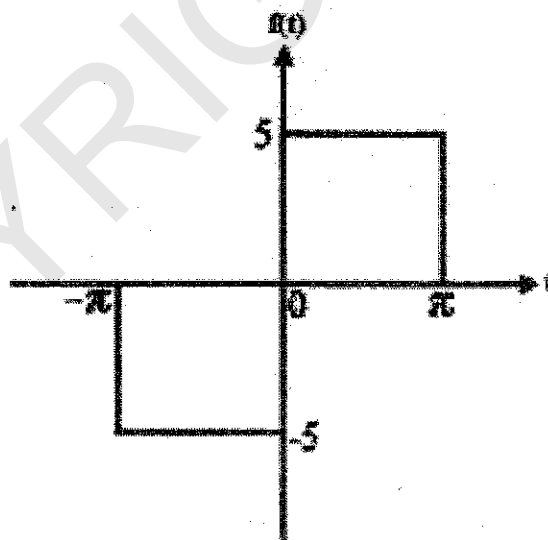


Figure B1/Rajah B1

[20 marks]
[20 markah]

SOALAN TAMAT

FORMULA FOR DEE50122 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}	$\frac{1}{s-a}$
$\sin at$	$\frac{a}{s^2 + a^2}$
$\cos at$	$\frac{s}{s^2 + a^2}$
$\sinh at$	$\frac{a}{s^2 - a^2}$
$\cosh at$	$\frac{s}{s^2 - a^2}$
$e^{at} \sin bt$	$\frac{b}{(s-a)^2 + b^2}$
$e^{at} \cos bt$	$\frac{s-a}{(s-a)^2 + b^2}$
$t^n e^{at}$	$\frac{n!}{(s-a)^{n+1}}$
$t^n f(t)$	$(-1)^n \frac{d^n}{ds^n} [F(s)]$
$e^{at} f(t)$	$F(s-a)$
$y'(t)$	$sY(s) - y(0)$
$y''(t)$	$s^2 Y(s) - sy(0) - y'(0)$
$\int_0^t f(t) dt$	$\frac{F(s)}{s}$

FORMULA FOR DEE50122 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	$\frac{1}{L} \int_0^t v(t) dt$