SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENGAJIAN POLITEKNIK
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI JUN 2014

EE602: CIRCUIT ANALYSIS

TARIKH : 30 OKTOBER 2014
TEMPOH : 8.30 AM – 10.30 AM (2 JAM)

Kertas ini mengandungi **SEMBILAN (9)** halaman bercetak.
Bahagian A: Struktur (10 soalan)
Bahagian B: Esei (3 soalan)
Dokumen sokongan yang disertakan : *Laplace Transform Table*

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SECTION A : 40 MARKS
BAHAGIAN A : 40 MARKAH

INSTRUCTION:
This section consists of **TEN (10)** structured questions. Answer **ALL** questions.

ARAHAN :
*Bahagian ini mengandungi **SEPULUH (10)** soalan berstruktur. Jawab **semua soalan**.*

CLO1
C3

QUESTION 1

Referring to Figure A1, write the Mesh equations for I_1 and I_2.

SOALAN 1
Merujuk kepada Rajah A1, tuliskan persamaan Mesh bagi I_1 dan I_2.

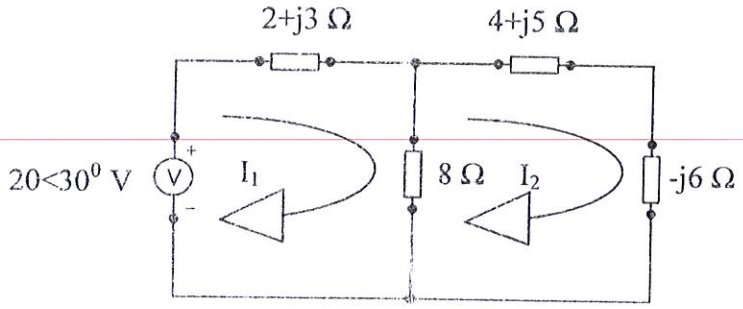

Figure A1/*Rajah A1*

[4 marks]
[*4 markah*]

CLO1
C3

QUESTION 2

Calculate the value of I_S from Figure A2 using the method of source transformation.

SOALAN 2

Kirakan nilai I_S berdasarkan Rajah A2 dengan menggunakan kaedah penukaran punca bekalan.

[4 marks]
[*4 markah*]

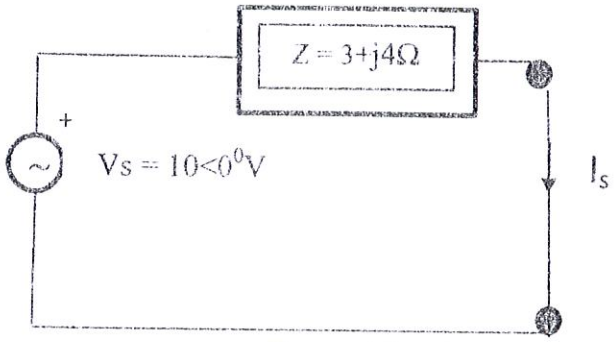

Figure A2\ Rajah A2

CLO1
C1

QUESTION 3

A Norton equivalent circuit is related to the Thevenin equivalent by the following:

$$R_{\mathrm{Th}} = R_{\mathrm{No}}$$
$$V_{\mathrm{Th}} = I_{\mathrm{No}} R_{\mathrm{No}}$$
$$I_{\mathrm{No}} = V_{\mathrm{Th}} / R_{\mathrm{Th}}.$$

Draw the circuit diagram for Thevenin and Norton equivalent.

SOALAN 3

Litar setara Norton dikaitkan dengan litar setara Thevenin adalah seperti berikut:

$$R_{\mathrm{Th}} = R_{\mathrm{No}}$$
$$V_{\mathrm{Th}} = I_{\mathrm{No}} R_{\mathrm{No}}$$
$$I_{\mathrm{No}} = V_{\mathrm{Th}} / R_{\mathrm{Th}}.$$

Lukis gambarajah litar setara Thevenin dan Norton.

[4 marks]

[*4 markah*]

CLO1
C3

QUESTION 4

Referring to Figure 4A, calculate the value of voltage at node A by applying Nodal Analysis method.

SOALAN 2

Merujuk kepada Rajah 4A, kirakan nilai voltan pada titik A menggunakan kaedah Analisis Nodal.

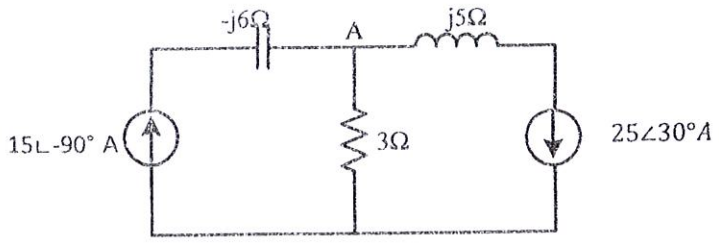

Figure 4A/Rajah 4A

[4 marks]

[4*markah*]

CLO1
C3

QUESTION 5

Produce Laplace Transform $Y(s)$ of first derivatives for the function :

$$y' - 2y = 4, \quad y(0) = 1.$$

SOALAN 5

Hasilkan pembezaan pertama Jelmaan Laplace $Y(s)$ bagi fungsi:

$$y' - 2y = 4, \quad y(0) = 1.$$

[4 marks]
[4 *markah*]

CLO1
C3

QUESTION 6

Define the Laplace Transform of *f(t)* using the definition of the Laplace Transform:

$f(t) = 5e^{-3t} \sin 4t$

SOALAN 6

Tentukan Laplace Transform f(t) menggunakan takrif Jelmaan Laplace:

$f(t) = 5e^{-3t} \sin 4t$

[4marks]
[4 *markah*]

CLO1
C3

QUESTION 7

Calculate the circuit impedance in the s-domain, Z(s) in Figure A7.

SOALAN 7

Kirakan galangan di dalam domain-s, Z(s) untuk litar dalam Rajah A7.

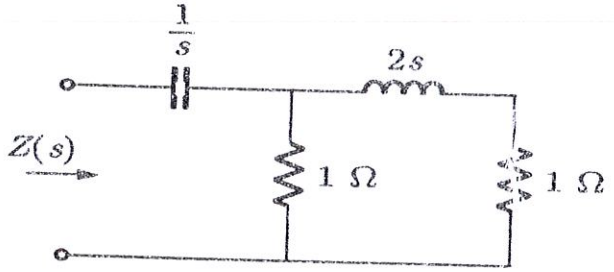

Figure A7/ Rajah A7

[4marks]
[4 *markah*]

CLO2
C1

QUESTION 8

List TWO (2) differences between even and odd waveform.

SOALAN 8

Senaraikan DUA (2) perbezaan antara gelombang genap dan gelombang ganjil.

[4 marks]
[*4 markah*]

CLO2
C3

QUESTION 9

Produce Analytic equation for the waveform in Figure A9.

SOALAN 9

Hasilkan persamaan analitikal bagi gelombang di Rajah A9.

[4 marks]
[*4 markah*]

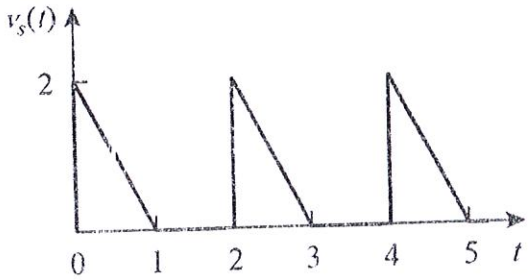

Figure A9/ Rajah A9

CLO2
C3

QUESTION 10

Construct the Fourier Series equation f(t) for fourth harmonics if given;

$$a_o = 0$$

$$a_n = 0$$

$$b_n = \frac{2}{\pi n}\left[1 - \cos n\pi\right]$$

SOALAN 10

Bina persamaan Siri Fourier f(t) hingga harmonic keempat jika diberi;

$$a_o = 0$$

$$a_n = 0$$

$$b_n = \frac{2}{\pi n}\left[1 - \cos n\pi\right]$$

[4 marks]

[*4 markah*]

SECTION B : 60 MARKS
BAHAGIAN B : 60 MARKAH

INSTRUCTION:
This section consists of **THREE (3)** essay questions. Answer **ALL** questions.

ARAHAN:
*Bahagian ini mengandungi **TIGA (3)** soalan esei. Jawab **SEMUA** soalan.*

QUESTION 1
SOALAN 1

CLO2
C3

(a) Refer to Figure B1(a), calculate the current to Z_3 by using Thevenin's theorem.

Given Z1 = -j0.5Ω, Z2 = j0.75, Z3 = 1kΩ and Vs = 50 < 0°

[8 marks]

Berpandukan kepada Rajah B1(a), kirakan nilai arus pada Z_3 dengan menggunakan Teorem Thevenin.

Jika diberi Z1 = -j0.5Ω, Z2 = j0.75Ω, Z3 = 1kΩ dan Vs = 50 < 0°

[*8 markah*]

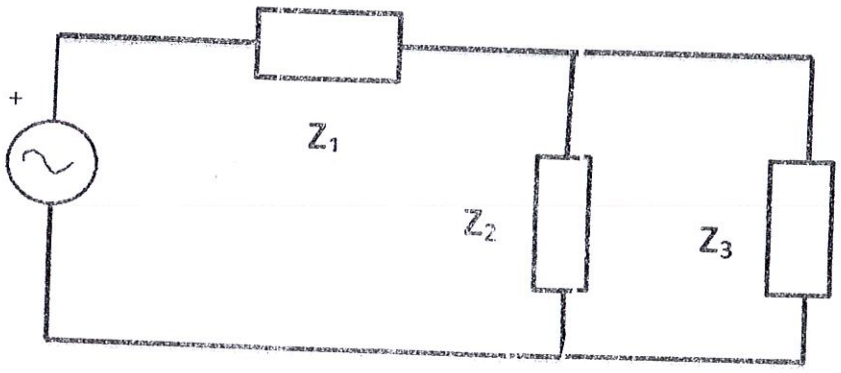

Figure B1 (a) / Rajah B1 (a)

(b) Refer to Figure B1(b), calculate the current flow value at j5Ω by using Mesh Analysis.

CLO2
C3

[12 marks]

Berpandukan kepada Rajah B1(b), kirakan nilai arus yang mengalir pada j5Ω dengan menggunakan Analisa Mesh.

[*12 markah*]

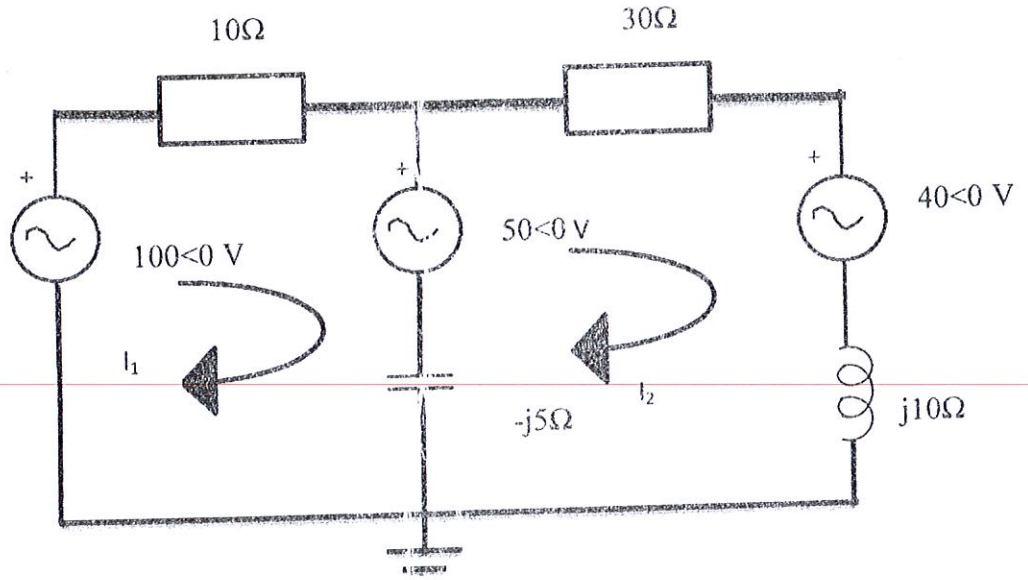

Figure B1(b) / Rajah B1(b)

QUESTION 2

a. Solve the Laplace Transform of the following function by using Direct Integration Method.

C LO3
C3

$$f(t) = e^{-5t}$$

[6 marks]

b. Produce the Inverse Laplace Transform of F(s) given below by using partial fraction.

$$F(s) = \frac{s^3+2s+6}{s(s+1)^2(s+3)}$$

[14 marks]

SOALAN 2

a. *Selesaikan Jelmaan Laplace bagi rangkap berikut dengan menggunakan Kaedah Kamilan Terus*

$$f(t) = e^{-5t}$$

[*6 markah*]

b. *Hasilkan Jelmaan Laplace Songsang bagi fungsi F(s) dengan menggunakan Kaedah pecahan separa.*

[*14 markah*]

$$F(s) = \frac{s^3+2s+6}{s(s+1)^2(s+3)}$$

QUESTION 3

Referring to Figure B3 (c) below :

Merujuk kepada Rajah B3(c) di bawah :

CLO3 C1

a. Write an analytical equation for the waveform f(t)

Tuliskan persamaan analitik bagi fungsi f(t)

[3 Marks]

[*3 Markah*]

CLO3 C3

b. Calculate the Fourier Series coefficients of a_o, a_n and b_n.

Kirakan pekali Siri Fourier a_o, a_n dan b_n.

[12 Marks]

[*12 Markah*]

CLO3 C3

c. Produce the Fourier Series equation f(t) for n = 1 to 3

Dapatkan persamaan Siri Fourier f(t) bagi n = 1 hingga 3

[5 Marks]

[*5Markah*]

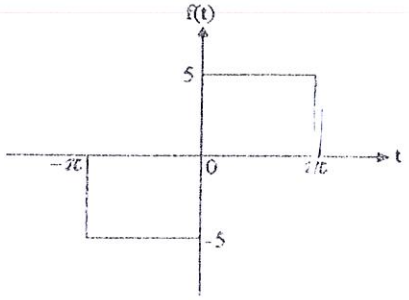

Figure B3(c) / *Rajah B3(c)*

SOALAN TAMAT

	$\mathcal{L}^{-1}\{F(s)\} = f(t)$	$F(s) = \mathcal{L}\{f(t)\}$
i.	1	$\frac{1}{s}$
ii.	k	$\frac{k}{s}$
iii.	e^{at}	$\frac{1}{s-a}$
iv.	$\sin at$	$\frac{a}{s^2+a^2}$
v.	$\cos at$	$\frac{s}{s^2+a^2}$
vi.	t	$\frac{1}{s^2}$
vii.	t^2	$\frac{2!}{s^3}$
viii.	t^n	$\frac{n!}{s^{n+1}}$
ix.	$\sinh at$	$\frac{a}{s^2-a^2}$
x.	$\cosh at$	$\frac{s}{s^2-a^2}$
xi.	$e^{at}t^n$	$\frac{n!}{(s-a)^{n+1}}$
xii.	$e^{at}\sin \omega t$	$\frac{\omega}{(s-a)^2+\omega^2}$
xiii.	$e^{at}\cos \omega t$	$\frac{s-a}{(s-a)^2+\omega^2}$
xiv.	$e^{at}\sinh \omega t$	$\frac{\omega}{(s-a)^2-\omega^2}$
xv.	$e^{at}\cosh \omega t$	$\frac{s-a}{(s-a)^2-\omega^2}$