SULIT

KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

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

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI II : 2024/2025

DET10013: ELECTRICAL TECHNOLOGY

TARIKH : 25 MEI 2025
MASA : 8.30 PAGI – 10.30 PAGI (2 JAM)

Kertas ini mengandungi **TUJUH (7)** 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)** subjective questions. Answer **ALL** questions.

ARAHAN :
*Bahagian ini mengandungi **EMPAT (4)** soalan subjektif. Jawab **SEMUA** soalan.*

QUESTION 1

SOALAN 1

CLO1 (a) Define Ohm's Law with the aid of a suitable formula.
Takrifkan Hukum Ohm dengan bantuan formula yang sesuai.

[4 marks]
[4 *markah*]

CLO1 (b) Based on the circuit below, simplify the circuit to obtain the total resistance (Rt) and total current (It) flowing in this circuit.
Berdasarkan litar di bawah, permudahkan litar untuk mendapatkan jumlah rintangan (Rt) dan jumlah arus (It) yang mengalir dalam litar ini.

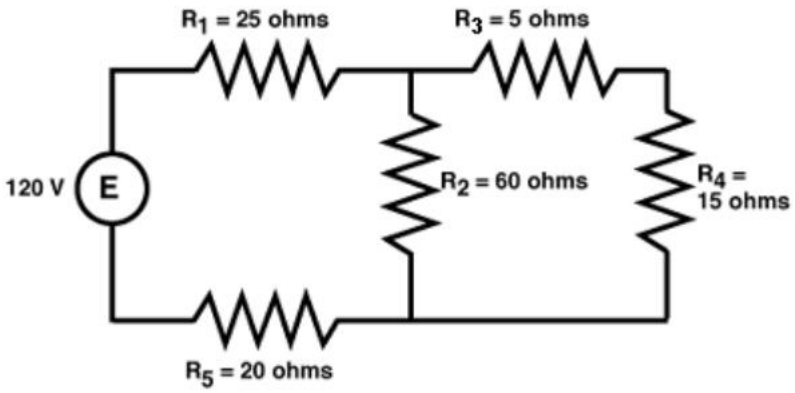

Figure A1(b)/ *Rajah A1(b)*

[6 marks]
[6 *markah*]

CLO1

(c) A prime application for Δ-Y conversion is in the solution of unbalanced bridge circuits such as the one below. Based on Figure A1(c), calculate the total resistance.

Aplikasi utama untuk penukaran Δ-Y adalah dalam penyelesaian litar jambatan tidak seimbang seperti litar di bawah. Berdasarkan Rajah A1(c), hitung jumlah rintangan.

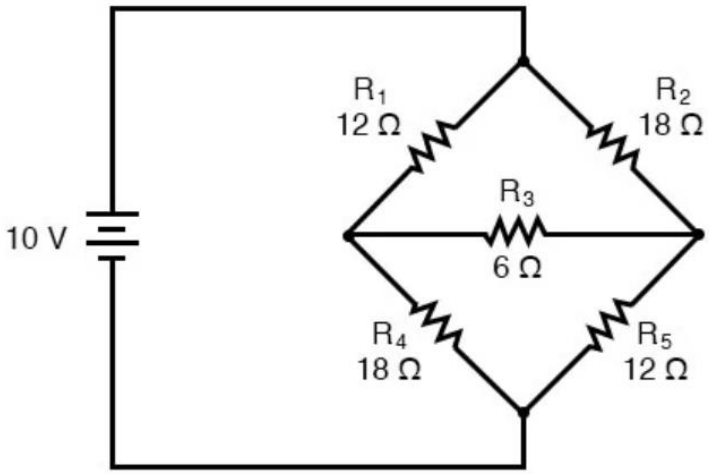

Figure A1(c)/ *Rajah A1(c)*

[10 marks]

[10 *markah*]

QUESTION 2

SOALAN 2

CLO1

(a) List **TWO (2)** types of polarity capacitor and **TWO (2)** types of non-polarity capacitor.

*Senaraikan **DUA (2)** jenis pemuat berkutub dan **DUA (2)** jenis pemuat tidak berkutub.*

[4 marks]

[4 *markah*]

CLO1 (b) With the aid of related formula, explain the factors affecting capacitance.
Dengan bantuan formula berkaitan, terangkan faktor yang mempengaruhi kemuatan.

[6 marks]
[6 *markah*]

CLO1 (c) Based on Figure A2(c), when switch is closed, calculate the time constant, current and potential difference through the capacitor after 6 seconds and energy stored in capacitor.
Berdasarkan Rajah A2(c), apabila suis ditutup, kirakan pemalar masa, arus dan beza keupayaan melalui pemuat selepas 6 saat dan tenaga disimpan dalam pemuat.

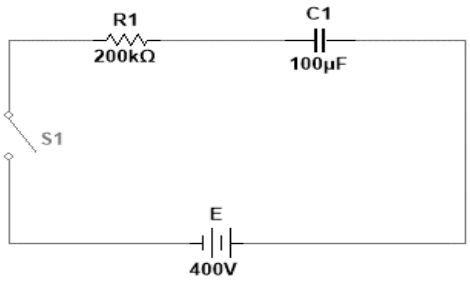

Figure A2(c)/ *Rajah A2(c)*

[10 marks]
[*10 markah*]

QUESTION 3
SOALAN 3

CLO1 (a) State **FOUR (4**) factors that influence inductance.
*Nyatakan **EMPAT (4)** faktor yang mempengaruhi kearuhan.*

[4 marks]
[4 *markah*]

CLO1 (b) Based on the circuit below, simplify the circuit to obtain the total equivalent inductance for a-b terminal.
Berdasarkan litar di bawah, ringkaskan litar untuk mendapatkan jumlah kearuhan setara bagi terminal a-b.

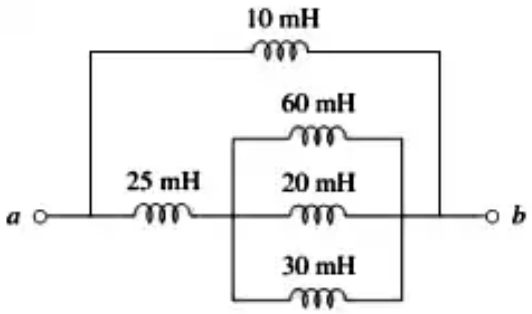

Figure A3(b)/ *Rajah A3(b)*

[6 marks]

[*6 markah*]

CLO1

(c) Figure A3(c) shows a schematic diagram that consists of resistive and inductive load. If the switch SW is switched to node b after connecting with node a initially, calculate the value of R if time constant, τ = 0.35ms, the maximum current rises in inductor, the instantaneous value of current when t = 2.5ms and the maximum energy inside the inductor after decay.

Rajah A3(c) menunjukkan rajah skematik yang terdiri daripada beban rintangan dan aruhan. Jika suis SW ditukar kepada nod b selepas bersambung dengan nod a pada mulanya, kirakan nilai R jika pemalar masa, τ=0.35ms, arus maksimum naik dalam induktor, nilai arus segera apabila t=2.5ms dan tenaga maksimum di dalam induktor selepas penurunan.

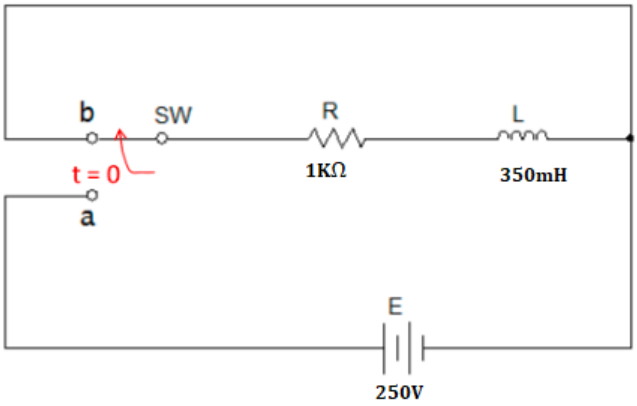

Figure A3(c)/ *Rajah A3(c)*

[10 marks]

[10 *markah*]

QUESTION 4

SOALAN 4

CLO1 (a) List **FOUR (4)** characteristics of magnetic field.
*Senaraikan **EMPAT (4)** ciri medan magnet.*

[4 marks]
[*4 markah*]

CLO1 (b) Explain the magnetic fields due to an electric current with a suitable diagram.
Terangkan medan magnet yang disebabkan oleh arus elektrik dengan gambar rajah yang sesuai.

[6 marks]
[*6 markah*]

CLO1 (c) A voltage supply 30V is connected with four resistors in series-parallel connection as in Figure A4(c). Calculate the current flows at resistor R2 and R4 by using Current Divider Rule (CDR) method.
Bekalan voltan 30V disambungkan dengan empat perintang dalam sambungan siri-selari seperti dalam Rajah A4(c). Kirakan arus yang mengalir pada perintang R2 dan R4 dengan menggunakan kaedah Peraturan Pembahagi Arus (CDR).

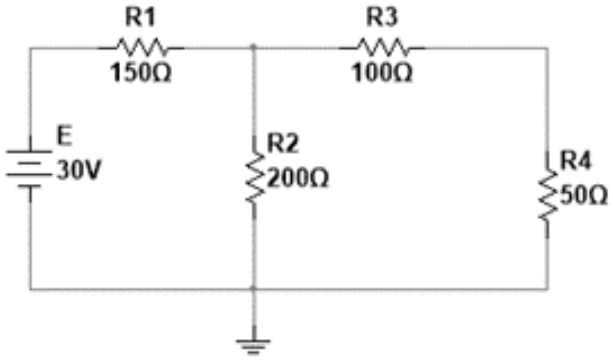

Figure A4(c) / *Rajah A4(c)*

[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.*

QUESTION 1

SOALAN 1

CLO1

Thevenin's Theorem is one of the methods that can be used to solve DC circuits. Based on Figure B1, calculate the current flow through the 20Ω resistor using the Thevenin's Theorem then convert Thevenin's Equivalent circuit to the Norton's Equivalent Circuit.

Teorem Thevenin adalah salah satu kaedah yang boleh digunakan untuk menyelesaikan litar DC. Berdasarkan Rajah B1, hitung aliran arus melalui perintang 20Ω menggunakan Teorem Thevenin kemudian tukarkan litar Setara Thevenin kepada Setara Norton.

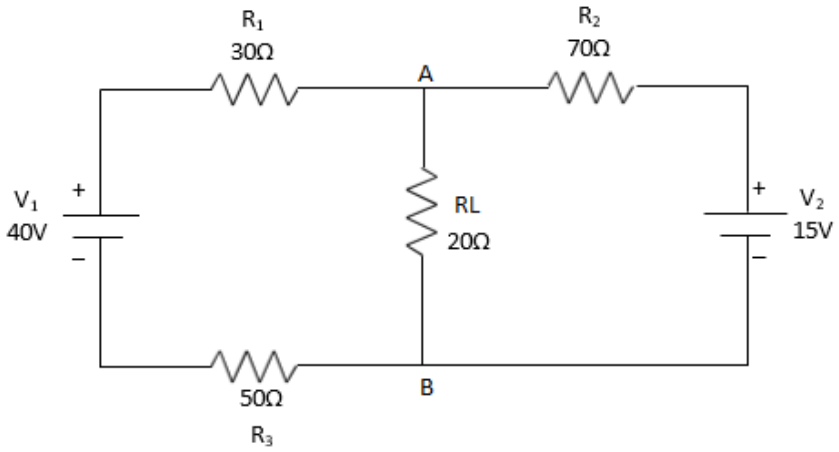

Figure B1 / *Rajah B1*

[20 marks]

[20 *markah*]

SOALAN TAMAT

APPENDIX – Related Formulas

$Q = It$	$R = \frac{\rho l}{A}$	$V = IR$
$P = IV$	$R_T = R_1 + R_2 + \cdots + R_n$	$R_T = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_n}}$
$W = Pt$	$C = \frac{Q}{V}$	$E = \frac{V}{d}$
$I_L = \frac{V_{TH}}{R_L + R_{TH}}$	$I_L = \frac{R_N}{R_N + R_L} \times I_N$	$D = \frac{Q}{A}$
$C = \frac{\varepsilon_r \varepsilon_0 A}{d}$	$\varepsilon = \varepsilon_0 \varepsilon_r = \frac{D}{E}$ $\varepsilon_0 = 8.854 \times 10^{-12}$	$\tau = RC$ $\tau = \frac{L}{R}$
$\mu = \mu_0 \mu_r$ $\mu_0 = 4\pi \times 10^{-7}$	$E_C = \frac{1}{2} CV^2$	$E_L = \frac{1}{2} LI^2$
$v_C(t) = V_{max}(1 - e^{-t/\tau})$ $v_C(t) = V_{max}(e^{-t/\tau})$	$i_C(t) = I_{max}\ (e^{-t/\tau})$ $i_C(t) = -I_{max}\ (e^{-t/\tau})$	$i_L(t) = I_{max}(1 - e^{-t/\tau})$ $i_L(t) = I_{max}(e^{-t/\tau})$
$E = -L\frac{dI}{dt}$	$E = -N\frac{d\phi}{dt}$	$L = \frac{N\phi}{I}$
$H = \frac{F_m}{l}$	$L = \frac{N^2 \mu_r \mu_0 A}{l}$	$F_m = IN$
$\mu = \frac{B}{H}$	$B = \frac{\phi}{A}$	$S = \frac{F_m}{\phi}$
$V_{R1} = \frac{R_1}{R_1 + R_2 + \cdots + R_n} \times E$	$S = \frac{l}{\mu_0 \mu_r A}$	$I_{R1} = \frac{R_2}{R_1 + R_2} \times I$
$R_T = \frac{R_1 \times R_2}{R_1 + R_2}$	$I_{R1} = \frac{\frac{1}{R_1}}{\frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_n}} \times I$	