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 I : 2024/2025

DET10103: ELECTRICAL CIRCUITS 1

TARIKH : 08 DISEMBER 2024
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) State the equation for total resistance and total current for the circuit in Figure A1(a).

Nyatakan persamaan bagi jumlah rintangan dan jumlah arus bagi litar pada Rajah A1(a).

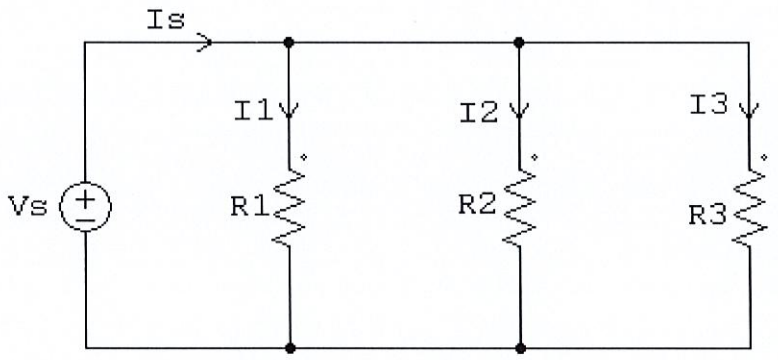

Figure A1(a)/ *Rajah A1(a)*

[4 marks]

[*4 markah*]

CLO1 (b) Based on Figure A1(b), simplify the circuit to obtain the total resistance and total current flowing in the circuit.

Berdasarkan Rajah A1(b), permudahkan litar tersebut untuk mendapatkan jumlah rintangan dan jumlah arus yang mengalir di dalam litar.

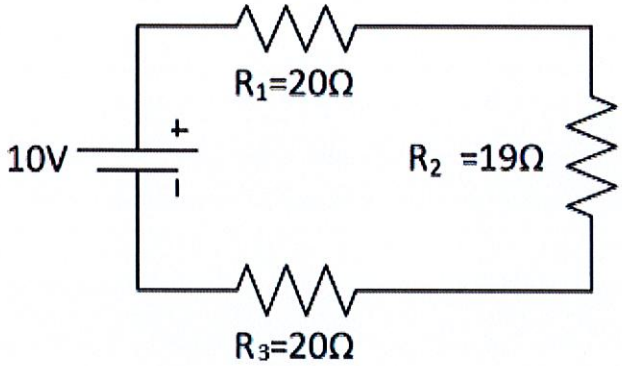

Figure A1(b)/ *Rajah A1(b)*

[6 marks]

[*6 markah*]

CLO1 (c) Figure A1(c) shows three resistors connected in series with voltage supply 45V. Calculate total resistance, total current and voltage drop across R1, R2 and R3 by using Voltage Divider Rule.

Rajah A1(c) menunjukkan tiga perintang disambungkan secara siri dengan bekalan voltan 45V. Kirakan jumlah rintangan, jumlah arus dan kejatuhan voltan pada R1, R2 and R3 dengan menggunakan Peraturan Pembahagi Voltan.

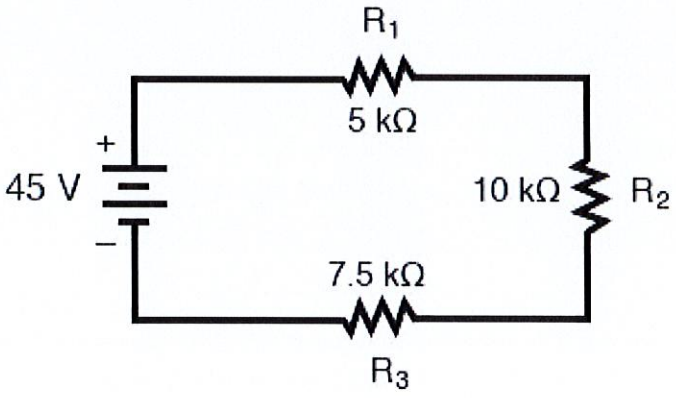

Figure A1(c) /*Rajah A1(c)*

[10 marks]

[*10 markah*]

QUESTION 2

SOALAN 2

CLO1 (a) Give the suitable circuits to show STAR and DELTA connection.

Berikan litar yang sesuai untuk menunjukkan sambungan STAR dan DELTA.

[4 marks]

[*4 markah*]

CLO1 (b) By using suitable diagrams, explain Kirchhoff's Current Law and Kirchhoff's Voltage Law.

Dengan menggunakan gambar rajah, terangkan Hukum Kirchhoff Arus dan Hukum Kirchhoff Voltan.

[6 marks]

[*6 markah*]

CLO1 (c) By referring to the circuit in Figure A2(c), calculate the energy supplied by the battery and energy absorbed by the 15Ω resistor after two hours.

Dengan merujuk kepada litar dalam Rajah A2(c), kirakan tenaga yang dibekalkan oleh bateri dan tenaga yang diserap oleh perintang 15Ω selepas 2 jam.

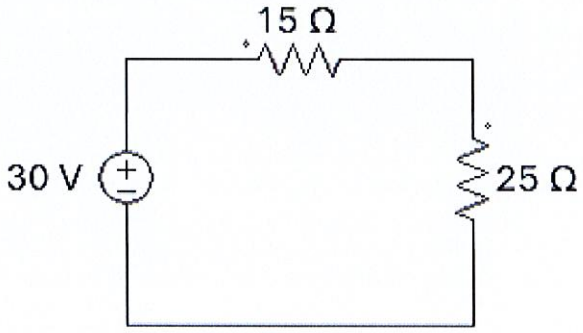

Figure A2(c)/*Rajah A2(c)*

[10 marks]

[*10 markah*]

QUESTION 3

SOALAN 3

CLO1 (a) Describe the construction of a capacitor with a suitable diagram.

Terangkan binaan sebuah pemuat dengan gambar rajah yang sesuai.

[4 marks]

[*4 markah*]

CLO1 (b) With the aid of a suitable diagram, explain how electromagnetic induction is generated.

Dengan bantuan gambar rajah yang sesuai, terangkan bagaimana aruhan elektrogmagnet terhasil

[6 marks]

[*6 markah*]

CLO1 (c) A capacitor with a capacitance of 20μF which is connected in series to a 200kΩ resistor is being placed with a 250V DC voltage supply. Calculate the initial current, initial potential difference across capacitor, the time constant during charging and the energy stored in the capacitor.

Satu pemuat dengan kemuatan 20μF disambungkan secara bersiri kepada perintang 200kΩ dengan bekalan voltan AT 250V. Kirakan arus permulaan, beza keupayaan permulaan merentasi pemuat, pemalar masa semasa mengecas dan tenaga yang disimpan dalam pemuat.

[10 marks]

[*10 markah*]

QUESTION 4

SOALAN 4

CLO1 (a) Explain the magnetic field direction using Right Hand Rule and Right-Hand Screw Rule

Terangkan arah medan magnet menggunakan Peraturan Tangan Kanan dan Peraturan Skru Tangan Kanan.

[5 marks]

[5 *markah*]

CLO1 (b) Compare **TWO (2)** differences between electrical and magnetic quantities.

*Bandingkan **DUA (2)** perbezaan antara kuantiti elektrik dan magnet.*

[5 marks]

[5 *markah*]

CLO1 (c) By referring to Figure A4(c), calculate total inductance of the circuit between point A and B.

Merujuk kepada Rajah A4(c), kirakan jumlah kearuhan antara titik A dan B.

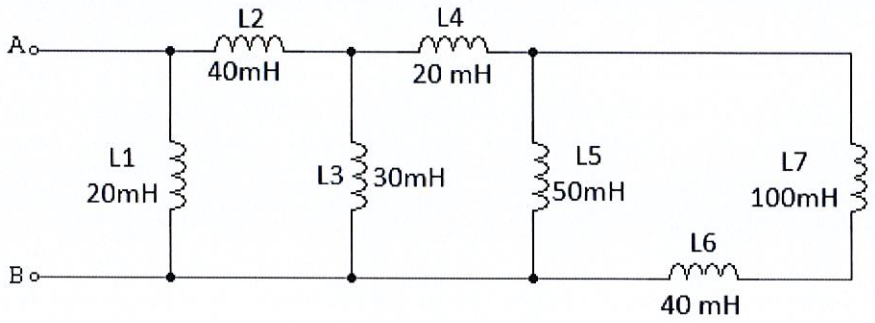

Figure A4(c)/ *Rajah A4(c)*

[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 state that a two linear terminal can be replaced by an equivalent circuit consisting of a Thevenin voltage (V_{TH}) connected in series with Thevenin resistor (R_{TH}). By applying Thevenin's Theorem, calculate the current (I_{RL}) that flows through the load resistor (RL) as shown in Figure B1.

Teorem Thevenin menyatakan bahawa dua terminal linear boleh digantikan dengan litar setara yang terdiri daripada voltan Thevenin, (V_{TH}) yang disambungkan secara sesiri dengan perintang Thevenin (R_{TH}). Dengan menggunakan Teorem Thevenin, kira arus, (I_{RL}) yang mengalir melalui beban, (RL) seperti yang ditunjukkan dalam Rajah B1.

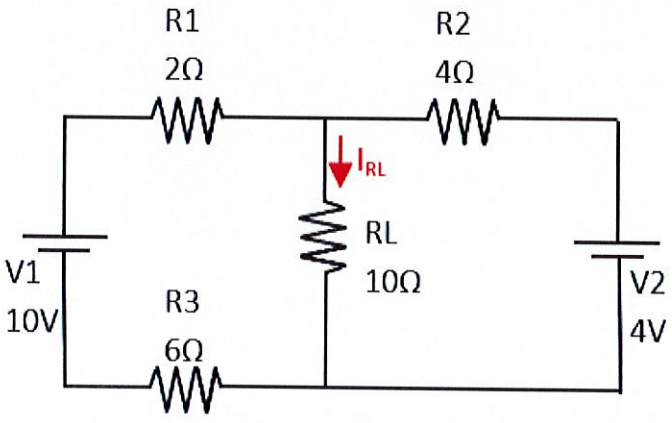

Figure B1/*Rajah B1*

[20 marks]

[*20 markah*]

SOALAN TAMAT

APPENDIX – Related Formulas

$$Q = It$$

$$R = \frac{\rho l}{A}$$

$$V = IR$$

$$P = IV$$

$$R_T = R_1 + R_2 + \cdots + R_n$$

$$R_T = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_n}}$$

$$W = Pt$$

$$C = \frac{Q}{V}$$

$$E = \frac{V}{d}$$

$$D = \frac{Q}{A}$$

$$C = \frac{\varepsilon_r \varepsilon_0 A}{d}$$

$$\varepsilon = \varepsilon_0 \varepsilon_r = \frac{D}{E}$$

$$\varepsilon_0 = 8.854 \times 10^{-12}$$

$$\tau = RC$$

$$E_C = \frac{1}{2} CV^2$$

$$v_c(t) = V_{max}\left(1 - e^{-\frac{t}{\tau}}\right)$$

$$i_c(t) = I_{max}\left(e^{-\frac{t}{\tau}}\right)$$

$$v_c(t) = V_{max}\left(e^{-\frac{t}{\tau}}\right)$$

$$i_c(t) = -I_{max}\left(e^{-\frac{t}{\tau}}\right)$$

$$E = -L\frac{dl}{dt}$$

$$E = -N\frac{d\varphi}{dt}$$

$$L = \frac{N\varphi}{I}$$

$$\tau = \frac{L}{R}$$

$$L = \frac{N^2 \mu_r \mu_0 A}{l}$$

$$\mu = \mu_0 \mu_r$$

$$i_L(t) = I_{max}\left(1 - e^{-\frac{t}{\tau}}\right)$$

$$\mu_0 = 4\pi \times 10^{-7}$$

$$i_L(t) = I_{max}\left(e^{-\frac{t}{\tau}}\right)$$

$$E_L = \frac{1}{2} LI^2$$

$$F_m = IN$$

$$H = \frac{F_m}{l}$$

$$B = \frac{\varphi}{A}$$

$$S = \frac{F_m}{\varphi}$$

$$\mu = \frac{B}{H}$$

$$S = \frac{l}{\mu_0 \mu_r A}$$