

**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**

**DET10103: ELECTRICAL CIRCUIT 1**

**TARIKH : 25 MEI 2025**

**MASA : 8.30 PAGI – 10.30 PAGI (2 JAM)**

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

Bahagian A: Struktur (4 soalan)

Bahagian B: Esei (1 soalan)

Dokumen sokongan yang disertakan : Formula

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**JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN**

(CLO yang tertera hanya sebagai rujukan)

**SULIT**

**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 | <p>(a) Identify <b>TWO (2)</b> main effects of electric current and its practical examples.</p> <p><i>Kenalpasti <b>DUA (2)</b> kesan utama arus elektrik dan contoh praktikalnya.</i></p> <p style="text-align: right;">[4marks]</p> <p style="text-align: right;">[4 markah]</p>                                                                                                                   |
| CLO1 | <p>(b) With the aid of suitable diagram, state the formula required to transform from Delta to Star connection and Star to Delta connection.</p> <p><i>Dengan bantuan gambarajah yang sesuai, nyatakan formula yang diperlukan untuk menukarkan sambungan Delta ke Star dan sambungan Star ke Delta.</i></p> <p style="text-align: right;">[6marks]</p> <p style="text-align: right;">[6 markah]</p> |
| CLO1 | <p>(c) Based on Figure A1 below, calculate voltage for <math>R_1</math>, <math>R_2</math>, current <math>I_1</math>, <math>I_2</math> and the value of resistor <math>R</math>.</p> <p><i>Berdasarkan Rajah A1 di bawah, kira voltan pada <math>R_1</math>, <math>R_2</math>, arus <math>I_1</math>, <math>I_2</math> dan nilai perintang <math>R</math>.</i></p>                                    |

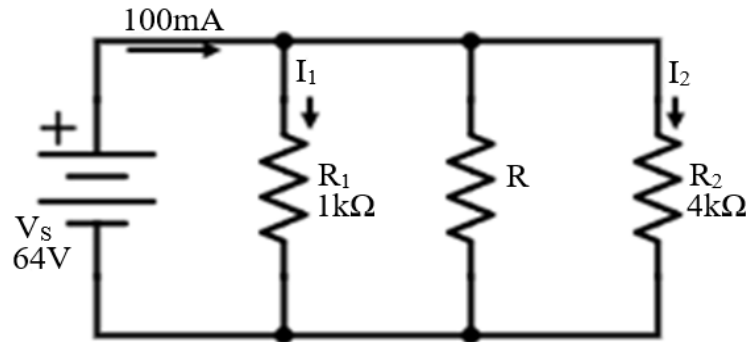


Figure A1 / Rajah A1

[10 marks]

[10 markah]

**QUESTION 2****SOALAN 2**

CLO1

- (a) Define electrical power and energy.  
*Takrifkan istilah kuasa elektrik dan tenaga.*

[4 marks]

[4 markah]

CLO1

- (b) Explain Kirchhoff's Current Law (**KCL**) and Kirchhoff's Voltage law (**KVL**).  
*Terangkan Hukum Kirchhoff Arus (**KCL**) dan Hukum Kirchhoff Voltan (**KVL**).*

[6marks]

[6 markah]

- CLO1 (c) Calculate the value of  $I_4$ ,  $V_3$  and the power dissipated from the circuit in Figure A2 below.

*Kira nilai  $I_4$ ,  $V_3$  dan kuasa yang terlesap daripada litar seperti dalam Rajah A2 di bawah.*

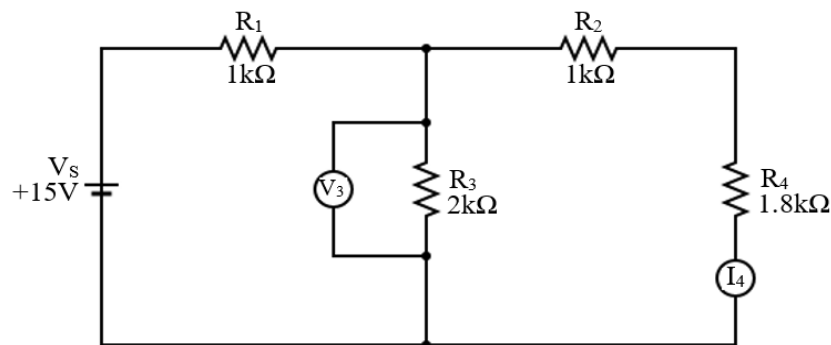


Figure A2 / Rajah A2

[10 marks]

[10 markah]

### QUESTION 3

#### SOALAN 3

- CLO1 (a) Identify **TWO (2)** types of fixed capacitor and variable capacitor.  
*Kenalpasti **DUA (2)** jenis kapasitor tetap dan kapasitor boleh ubah.*

[4 marks]

[4 markah]

- CLO1 (b) With the aid of suitable graph, explain the rise and the fall of the current that flow through an inductor in DC circuit.

*Dengan bantuan graf yang sesuai, terangkan kenaikan dan penurunan arus yang melalui induktor dalam litar AT.*

[6marks]

[6 markah]

- CLO1 (c) A capacitor with a capacitance of  $40\mu\text{F}$  which is connected in series to a  $200\text{k}\Omega$  resistor is being placed with  $300\text{V}$  DC voltage supply. Calculate the initial current, initial potential difference across capacitor, the time constant during charging, potential difference ( $V_c$ ) when the capacitor charged for  $4\text{s}$  and the maximum energy stored in the capacitor.
- Suatu pemuat  $40\mu\text{F}$  disambung secara sesiri dengan perintang  $200\text{k}\Omega$  dan ditempatkan merentasi bekalan voltan AT  $300\text{V}$ . Kirakan arus permulaan, beza keupayaan permulaan merentasi pemuat, pemalar masa semasa mengecas, beza keupayaan ( $V_c$ ) bila pemuat dicas 4 saat dan tenaga maksima yang disimpan dalam pemuat.*
- [10 marks]  
[10 markah]

#### QUESTION 4

##### SOALAN 4

- CLO1 (a) With the aid of a diagram, elaborate **FOUR (4)** characteristics of magnetic field/ flux line.
- Dengan bantuan gambarajah, huraikan **EMPAT (4)** ciri medan magnet/ garisan fluk.*
- [5 marks]  
[5 markah]
- CLO1 (b) A coil is having 350 turns with  $0.5\text{A}$  current. If the length of magnetic circuit is  $40\text{cm}$ , express the value of magnetomotive force ( $F_m$ ) and magnetic field strength ( $H$ ).
- Satu gegelung mempunyai 350 lilitan dengan arus  $0.5\text{A}$ . Jika panjang litar magnetik ialah  $40\text{cm}$ , nyatakan nilai bagi daya gerak magnet, ( $F_m$ ) dan kekuatan medan magnet, ( $H$ ).*
- [5 marks]  
[5 markah]

CLO1

- (c) A coil which has an inductance and resistance is connected to form RL series circuit as in Figure A4. If the switch is closed, calculate time constant,  $\tau$ , maximum current of inductance, time for current rising to maximum and instantaneous rise current in inductor after the switch is closed for 25ms.

*Sebuah gegelung yang mempunyai kearuhan dan rintangan disambungkan untuk membentuk litar siri RL seperti Rajah A4. Jika suis ditutup, hitung Pemalar masa,  $\tau$ , arus aruhan maksima, masa untuk arus mencapai maksima dan masa untuk arus seketika dalam pearuh naik selepas 25ms suis ditutup.*

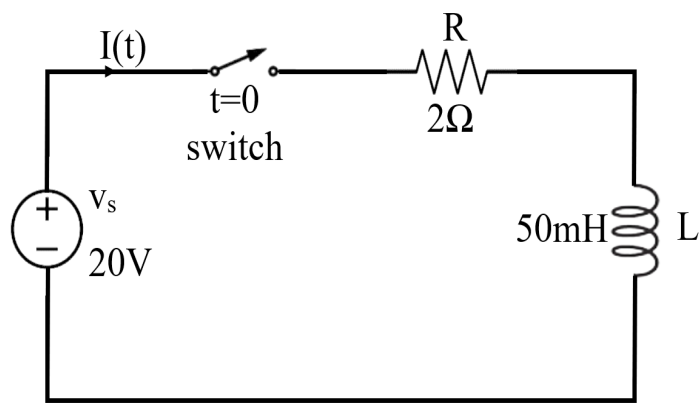


Figure A4 / Rajah A4

[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:**

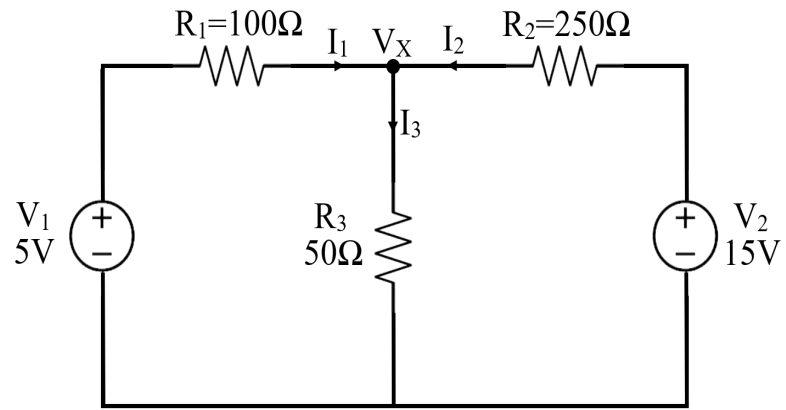
*Bahagian ini mengandungi **SATU (1)** soalan esei. Jawab soalan tersebut.*

**QUESTION 1****SOALAN 1**

CLO1

Kirchhoff's Law quantify how current flows through a circuit and how voltage drops around a loop in a circuit. Kirchhoff's Current Law (KCL) state that total current entering a node is equal to the total current leaving that node. By using Kirchhoff's Current Law and Nodal analysis, calculate  $V_x$ ,  $I_1$ ,  $I_2$  and  $I_3$  through the circuit shown in Figure B1.

*Hukum Kirchhoff menunjukkan bagaimana mengukur arus yang mengalir dalam litar dan cara voltan susut di sekeliling gelung dalam litar. Hukum Arus Kirchhoff (KCL) menyatakan bahawa jumlah arus yang memasuki nod adalah sama dengan jumlah arus yang meninggalkan nod tersebut. Dengan menggunakan Hukum Kirchhoff, hitung nilai  $V_x$ , arus  $I_1$ ,  $I_2$  dan  $I_3$  melalui litar yang ditunjukkan dalam Rajah B1.*

Figure B1 / *Rajah B1*

[20 marks]

[20 markah]

**SOALAN TAMAT**

## APPENDIX – Related Formulas

$$Q = It$$

$$V = IR$$

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

$$W = Pt$$

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

$$C = \frac{\epsilon_r \epsilon_0 A}{d}$$

$$\tau = RC$$

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

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

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

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

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

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

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

$$F_m = IN$$

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

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

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

$$P = IV$$

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

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

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

$$\epsilon = \epsilon_0 \epsilon_r = \frac{D}{E}$$

$$\epsilon_0 = 8.854 \times 10^{-12}$$

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

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

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

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

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

$$\mu = \mu_0 \mu_r$$

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

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

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

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

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