

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)

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)

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 | (a) Identify TWO (2) main effects of electric current and its practical examples.
<i>Kenalpasti DUA (2) kesan utama arus elektrik dan contoh praktikalnya.</i>

<div style="text-align: right;">[4marks]
[4 markah]</div> |
| CLO1 | (b) With the aid of suitable diagram, state the formula required to transform from Delta to Star connection and Star to Delta connection.
<i>Dengan bantuan gambarajah yang sesuai, nyatakan formula yang diperlukan untuk menukarkan sambungan Delta ke Star dan sambungan Star ke Delta.</i>

<div style="text-align: right;">[6marks]
[6 markah]</div> |
| CLO1 | (c) Based on Figure A1 below, calculate voltage for R_1 , R_2 , current I_1 , I_2 and the value of resistor R .
<i>Berdasarkan Rajah A1 di bawah, kira voltan pada R_1, R_2, arus I_1, I_2 dan nilai perintang R.</i> |

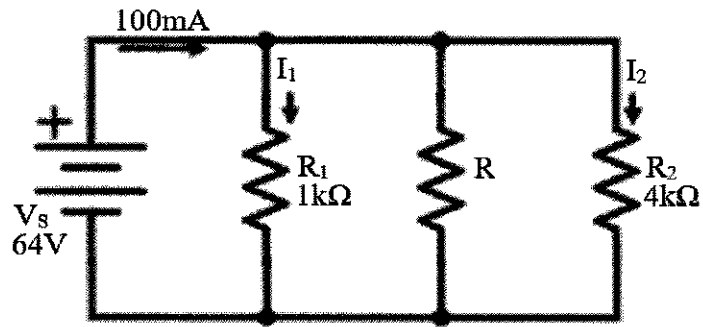


Figure A1 / Rajah A1

[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.

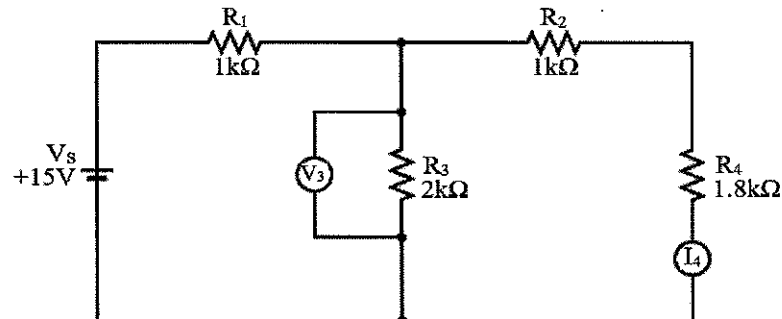


Figure A2 / Rajah A2

[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 300V 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 4s 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 300V . 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 0.5A current. If the length of magnetic circuit is 40cm , express the value of magnetomotive force (F_m) and magnetic field strength (H).

Satu gegelung mempunyai 350 lilitan dengan arus 0.5A . Jika panjang litar magnetik ialah 40cm , 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, τ , 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, τ , arus aruhan maksima, masa untuk arus mencapai maksima dan masa untuk arus seketika dalam pearuh naik selepas 25ms suis ditutup.

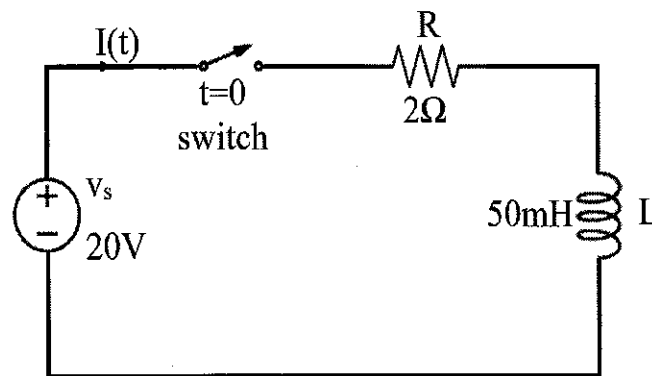


Figure A4 / Rajah A4

[10 marks]

[10 markah]

SECTION B: 20 MARKS**BAHAGIAN B: 20 MARKAH****INSTRUCTION:**

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

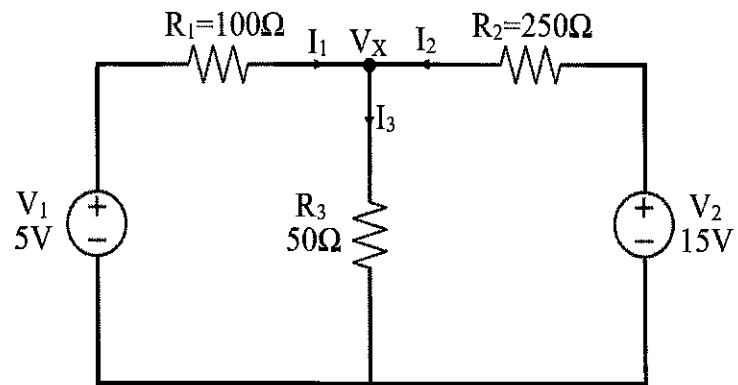
ARAHAN:

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

$$Q = It$$

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

$$V = IR$$

$$P = IV$$

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

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

$$W = Pt$$

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

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

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

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

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

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

$$\tau = RC$$

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

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

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

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

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

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

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

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

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

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

$$\mu = \mu_0 \mu_r$$

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

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

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

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

$$F_m = IN$$

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

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

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

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

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