

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN MALAYSIA**

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI JUN 2018

DET1013: ELECTRICAL TECHNOLOGY

TARIKH : 14 NOVEMBER 2018

MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **TIGA BELAS (13)** halaman bercetak.

Bahagian A: Objektif (10 soalan)

Bahagian B: Struktur (4 soalan)

Bahagian C: Esei (2 soalan)

Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SECTION A : 10 MARKS
BAHAGIAN A : 10 MARKAH

INSTRUCTION:

This section consists of **TEN (10)** objective questions. Mark your answers in the OMR form provided.

ARAHAN :

Bahagian ini mengandungi SEPULUH (10) soalan objektif. Tandakan jawapan anda di dalam borang OMR yang disediakan.

CLO1
C1

1. Identify the unit of electrical voltage.
Tentukan unit bagi voltan elektrik.

- A. Ohm, Ω
- B. Farad, F
- C. Volt, V
- D. Ampere, A

CLO1
C2

2. Calculate the e.m.f of the batteries which consist of twelve cells that are connected in parallel. Each battery has internal resistance of 0.24Ω and e.m.f of 1.5V.

Kirakan d.g.e bateri yang terdiri daripada dua belas sel yang disambungkan secara selari. Setiap sel mempunyai rintangan dalam 0.24Ω dan d.g.e 1.5V.

- A. 10 V
- B. 1.5 V
- C. 0.4 V
- D. 12 V

CLO1
C1

3. Based on Figure A2, point out which of the following statement is **FALSE**.
*Berpandukan Rajah A2, tunjukkan yang manakah pernyataan berikut adalah **TIDAK BENAR**.*

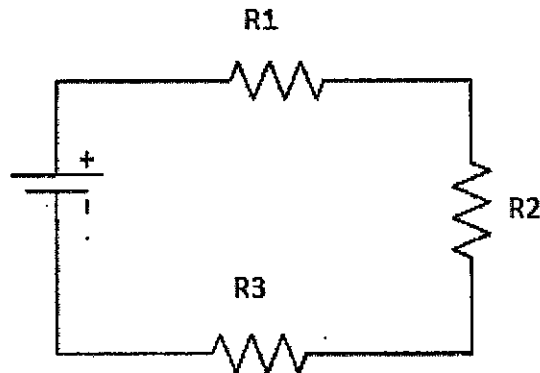


Figure A2 / Rajah A2

- A. The current value that flow through are resistors are same.
Nilai arus yang melalui semua perintang adalah sama.
- B. The total resistances of any series circuit is not equal to the sum of individual resistance.
Jumlah rintangan mana-mana litar siri adalah tidak sama dengan hasil campur setiap rintangan.
- C. Voltage drop at each resistor is different depending on the value of resistor.
Kejatuhan voltan dalam setiap adalah berbeza bergantung kepada nilai perintang.
- D. The total voltage drop across the resistor is equal to the supply voltage.
Jumlah voltan susut merentasi perintang adalah sama dengan sumber bekalan.

CLO2
C2

4. Determine the mesh i_1 equations for the circuit in Figure A4.
Tentukan persamaan mesh i_1 bagi litar dalam Rajah A4.

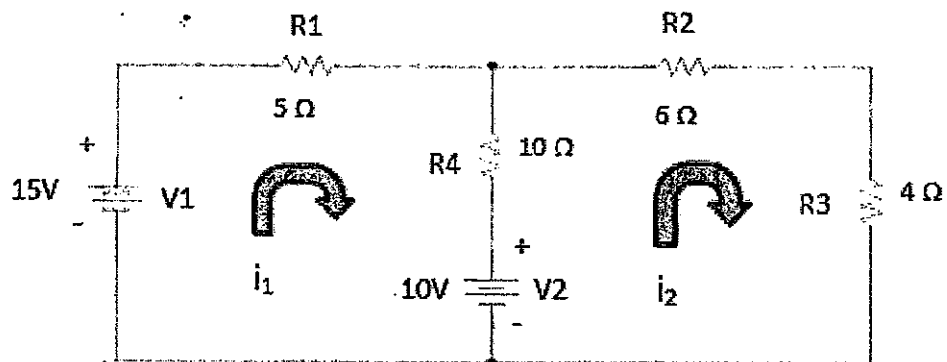


Figure A4 / Rajah A4

- A. $15i_1 + 10i_2 = 25$
 B. $15i_1 + 10i_2 = 5$
 C. $15i_1 - 10i_2 = 5$
 D. $15i_1 + 10i_2 = 5$

CLO1
C2

5. Determine the equivalent voltage source in Figure A5 by using Kirchhoff's Voltage Law method.
Tentukan jumlah voltan setara dalam Rajah A5 dengan menggunakan Hukum Kirchhoff Voltan

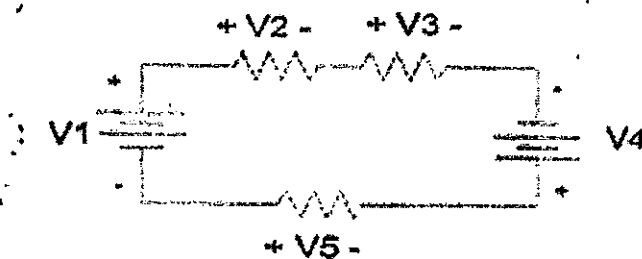


Figure A5 / Rajah A5

- A. $V_2 + V_3 - V_4 - V_5 - V_1 = 0$
 B. $V_2 + V_3 + V_4 + V_5 + V_1 = 0$
 C. $V_2 + V_3 - V_4 + V_5 + V_1 = 0$
 D. $V_2 + V_3 - V_4 + V_5 - V_1 = 0$

CLO1
C1

6. Identify the total capacitance C_T in Figure A6.
Dapatkan formula untuk jumlah kapasitan C_T dalam Rajah A6.

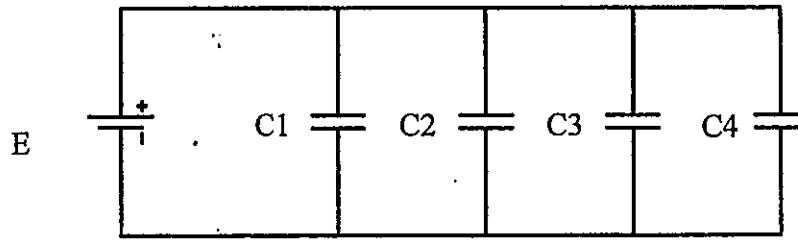


Figure A6 / Rajah A6

- A. $C_T = C1 + C2 + C3 + C4$
 B. $\frac{1}{C_T} = \frac{1}{C1} + \frac{1}{C2} + \frac{1}{C3} + \frac{1}{C4}$
 C. $C_T = C1 \times C2 \times C3 \times C4$
 D. $\frac{1}{C_T} = \frac{1}{C1} \times \frac{1}{C2} \times \frac{1}{C3} \times \frac{1}{C4}$

CLO1
C2

7. Below are the types of fixed capacitor, identify which is polarized capacitor.
Dibawah merupakan kapasitor jenis tetap, kenalpasti yang mana merupakan kapasitor berkutub.

- A. Mica
Mika
 B. Paper
Kertas
 C. Ceramic
Seramik
 D. Electrolytic
Electrolit

- CLO1
C1
8. Identify the formula of the time constant when an inductor is fully charged.
Kenalpasti formula pemalar masa bagi suatu pearuh yang tercas sepenuhnya.
- A. $2L/R$
 - B. $5L/R$
 - C. $3L/R$
 - D. L/R
- CLO1
C2
9. If the flux density in a magnetic circuit is 1.5T and the cross sectional area of the circuit is 10 cm^2 , calculate the total flux.
Sekiranya ketumpatan fluks dalam litar magnet adalah 1.5T dan luas keratan rentas adalah 10 cm^2 , kirakan jumlah fluks.
- A. 0.15mWb
 - B. 1.5mWb
 - C. 15.0mWb
 - D. 1.5Wb
- CLO2
C2
10. A coil of wire is placed in a changing magnetic field. If the number of turns of the coils is increased, compare the voltage induced across the coil.
Suatu gelung wayar diletakkan dalam kawasan medan magnet yang berubah-ubah. Jika bilangan gelung ditambah, bandingkan keadaan bagi voltan yang teraruh merintangi gelung tersebut.
- A. remain unchanged
masih tidak berubah
 - B. increase
bertambah
 - C. Decrease
Berkurang
 - D. drop to zero
menjadi kosong

SECTION B : 60 MARKS
BAHAGIAN B : 60 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
C1

- a) Define the Ohm's Law and state formula for Ohm's Law.

Takrifkan Hukum Ohm dan nyatakan formula untuk Hukum Ohm.

[3 marks]

[3 markah]

CLO1
C2

- b) Referring to Figure A1, three resistors are connected in series-parallel connection, across a 10 volts battery. The value are $R_a = 10\ \Omega$, $R_1 = 20\ \Omega$, $R_2 = 30\ \Omega$.

Calculate:

- i) Total resistance, R_T
ii) Current from supply, I_a

Berdasarkan Rajah A1, tiga perintang disambung secara sambungan siri-selari dengan bekalan voltan sebanyak 10 volt. Nilai $R_a = 10\ \Omega$, $R_1 = 20\ \Omega$, $R_2 = 30\ \Omega$.

Kirakan:

- i) *Jumlah rintangan, R_T*
ii) *Arus daripada bekalan, I_a*

[5 marks]

[5 markah]

CLO2
C3

- c) Referring to Figure A1, calculate the current flows to the resistor

- i) Current through R_1
ii) Current through R_2
iii) Voltage at R_1
iv) Voltage at R_2

Berdasarkan Rajah A1, kirakan arus yang melalui perintang

- Arus yang melalui R_1
- Arus yang melalui R_2
- Voltan pada R_1
- Voltan pada R_2

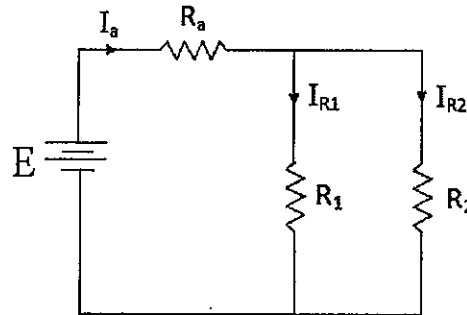


Figure A1/Rajah A1

[7 marks]

[7 markah]

QUESTION 2

SOALAN 2

CLO1
C1

- a) Define Norton Theorem and draw the Norton's equivalent circuit.

Takrifkan Teorem Norton dan lukiskan litar setara Norton.

[3 marks]

[3 markah]

CLO2
C2

- b) Referring to Figure B2(b), calculate the value of current, I at $R=20\Omega$ by using Current Divider Rule.

Merujuk kepada Rajah B2(b), kirakan nilai arus, I pada $R=20\Omega$ dengan menggunakan Hukum Pembahagi Arus.

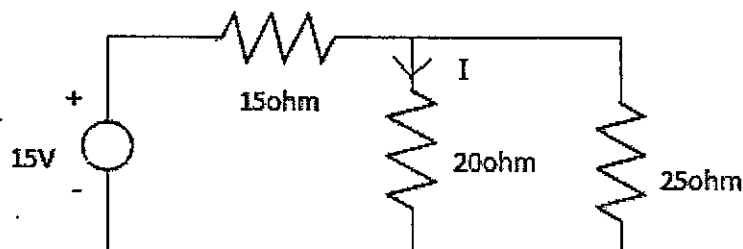


Figure B2(b) /Rajah B2(b)

[5 marks]

[5 markah]

CLO2
C3

- c) Calculate the total resistance for the circuit in Figure B2(c).
Kirakan jumlah rintangan bagi litar dalam Rajah B2(c).

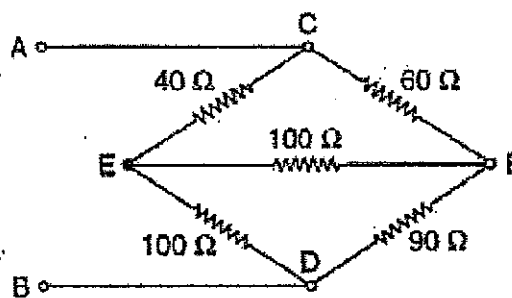


Figure B2(c) / Rajah B2(c)

[7 marks]
[7 markah]

QUESTION 3.

SOALAN 3

CLO 1
C2

- a) Referring to Figure B3(a1) and B3(a2), determine the formula of total inductance.
Merujuk kepada Rajah B3(a1) and B3(a2), tentukan formula bagi jumlah kearuhan (L_T)

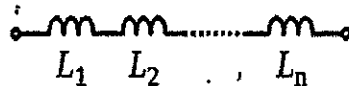


Figure B3(a1) / Rajah B3(a1)

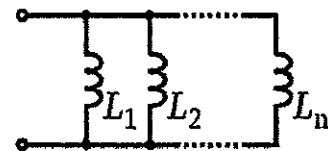


Figure B3(a2) / Rajah B3(a2)

[3 marks]

[3 markah]

CLO 1
C3

- b) By referring to the Figure B3(b), calculate total inductance (L_T) of the circuit between point A and B.

Merujuk Rajah B3(b), kirakan jumlah kearuhan (L_T) antara titik A dan B.

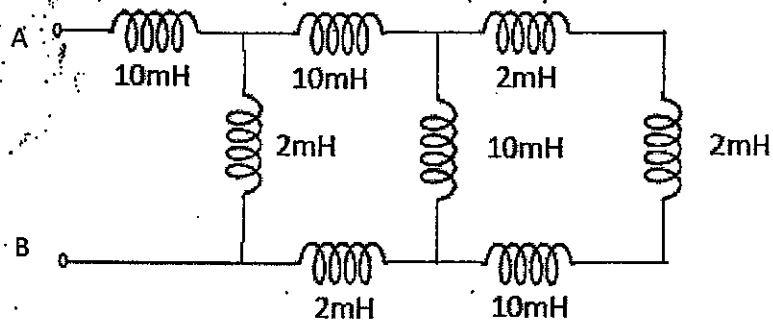


Figure B3(b) / Rajah B3(b)

[6 marks]
[6 markah]

CLO 2
C3

- c) A coil of inductance 20mH and a resistance 10 Ω is connected to a 9V supply. Determine the time constant (τ), the value of current after 5 ms and the energy stored in the inductor after 5ms

Sebuah pearuh 20mH dan perintang 10 Ω disambungkan pada bekalan 9V.

Tentukan pemalar masa (τ), nilai arus selepas masa mencapai 5 ms dan tenaga disimpan dalam induktor selepas 5ms.

[6 marks]
[6 markah]

QUESTION 4

SOALAN 4

CLO1
C1

- (a) Define electromagnetism.

Jelaskan maksud elektromagnet[3 marks]
[3 markah]CLO2
C2

- (b) With a suitable diagram, explain what electromagnetic induction is.

Dengan bantuan gambarajah, terangkan apakah aruhan elektromagnet.[5 marks]
[5 markah]CLO2
C3

- (c) A steel magnetic circuit has a uniform cross-sectional area of
- 5cm^2
- and length of 25cm. A coil of 120 turns is wound uniformly over the magnetic circuit. When the current in the coil is 1.5A, the total flux is 0.3mWb. Based on this condition, Calculate :

- Magnetic field strength
- The relative permeability of steel.

Sebuah litar magnet keluli yang panjangnya 25cm mempunyai keratan rentas seragam sebanyak 5cm^2 . Sebanyak 120 lilitan gegelung dililitkan secara seragam pada litar magnet tersebut. Apabila arus sebanyak 1.5A dialirkan pada litar didapati jumlah fluks 0.3mWb telah terhasil. Berdasarkan keadaan ini kirakan;

- Kekuatan medan magnet*
- Kebolehtelapan relatif bagi keluli.*

[7 marks]
[7 markah]

SECTION C : 30 MARKS
BAHAGIAN C : 30 MARKAH

INSTRUCTION:

This section consists of **TWO (2)** essay questions. Answer **ALL** questions.

ARAHAN:

Bahagian ini mengandungi DUA (2) soalan esei. Jawab SEMUA soalan.

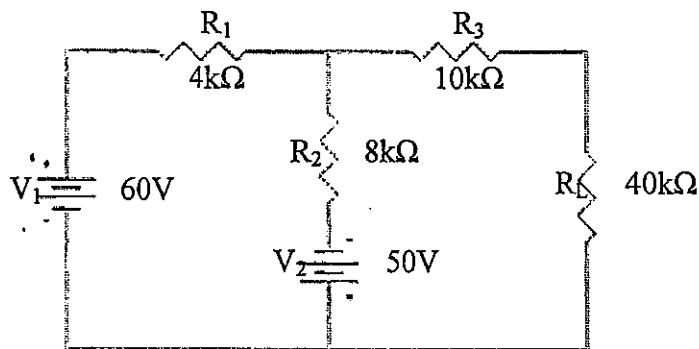
CLO2
C3

QUESTION 1

SOALAN 1

Calculate the current flow through R_L in Figure C1 below by using Thevenin's Theorem.

Kirakan nilai arus yang mengalir melalui perintang R_L dari Rajah C1 di bawah dengan menggunakan kaedah Teorem Thevenin.



Rajah C1/Figure C1

[15 marks]
[15 markah]

CLO2
C3

QUESTION 2

SOALAN 2

By referring to Figure C2, calculate the capacitor voltage at $30\mu\text{s}$ after the switch is closed if the capacitor is initially uncharged. Draw the voltage charging curve of capacitor and include the value of time constant, time for voltage to fully charged and maximum voltage in the curve.

Dengan merujuk Rajah C2, kira voltan kapasitor pada $30\mu\text{s}$ selepas suis ditutup jika kapasitor pada awalnya tidak dicas. Lukiskan lengkung pengecasan voltan kapasitor dan masukkan nilai pemalar masa, masa bagi voltan dicas sepenuhnya dan voltan maksimum di dalam lengkung tersebut.

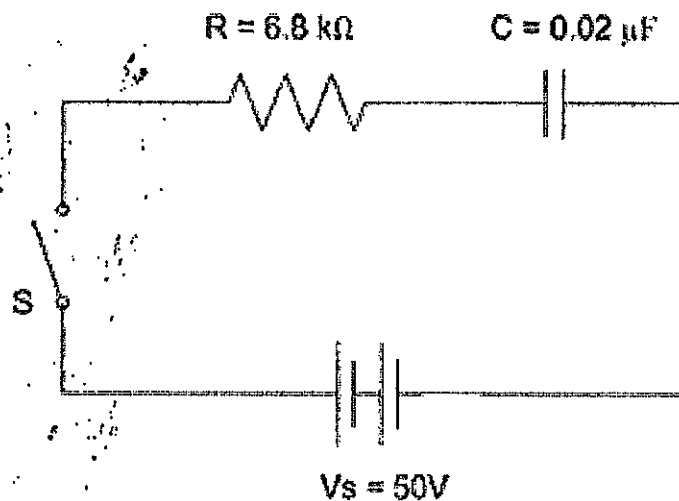


Figure C2 / Rajah C2

[15 marks]
[15 markah]

SOALAN TAMAT