SULIT

POLITEKNIK MALAYSIA

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

JABATAN KEJURUTERAAN PETROKIMIA

PEPERIKSAAN AKHIR

SESI I : 2022 / 2023

DGP10013 : ELECTRICAL TECHNOLOGY

TARIKH : 28 DISEMBER 2022
MASA : 8.30 PAGI – 10.30 PAGI (2 JAM)

Kertas ini mengandungi **SEMBILAN (9)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : FORMULA

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

INSTRUCTION:

This section consists of **FOUR (4)** structured/short answer questions. Answer **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur/soalan pendek. Jawab **SEMUA** soalan.*

QUESTION 1

SOALAN 1

(a) State the unit and symbol for Charge and Power.

CLO1 C1 *Nyatakan unit dan simbol bagi Cas dan Kuasa.*

[4 marks]
[*4 markah*]

(b) A circuit is connected as in Diagram 1 (b) below, approximate the value of:

CLO1 C2 *Sebuah litar disambung seperti dalam Rajah 1(b) di bawah,anggarkan.*

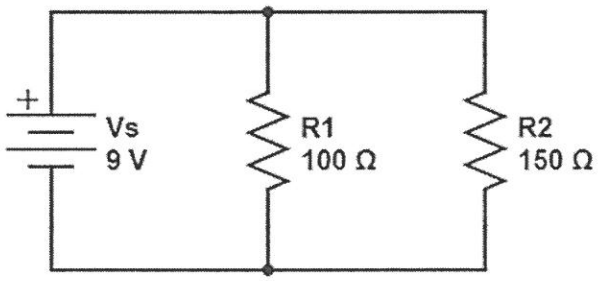


Diagram 1(b)

Rajah 1(b)

i. Voltage on resistor R2 (V_{R2}).

Voltan pada perintang R2 (V_{R2}).

[2 marks]
[2 *markah*]

ii. Total Resistance (R_T).

Jumlah Rintangan (R_T).

[3 marks]
[3 *markah*]

iii. The current value on resistor R1 (I_{R1}), if total current is 150mA.

Nilai arus pada perintang R1 (I_{R1}),jika jumlah arus ialah 150mA.

[3 marks]
[3 *markah*]

CLO1
C3

(c) Calculate I_{R1} , I_{R2} and I_{R3} for the circuit in Diagram 1(c) below with the following parameter using Kirchoff Law:

Kira I_{R1} , I_{R2} dan I_{R3} bagi litar dalam Rajah 1(c) di bawah dengan parameter yang berikut dengan menggunakan Hukum Kirchoff:

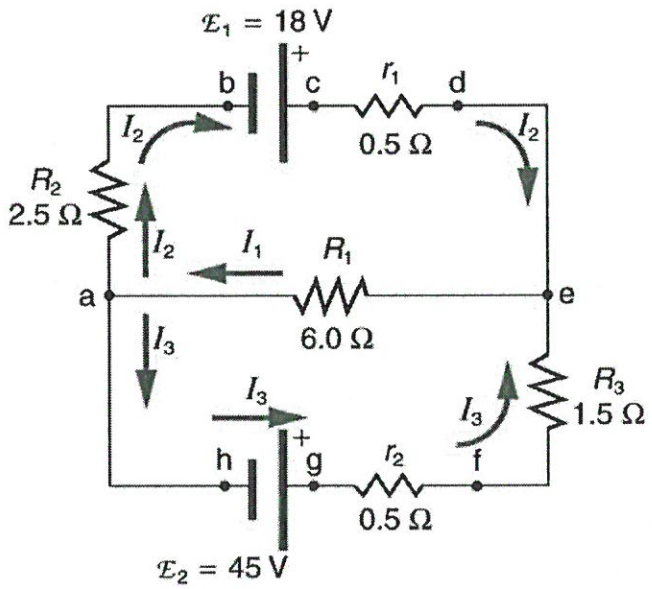


Diagram 1(c)

Rajah 1(c)

[13 marks]
[*13 markah*]

QUESTION 2

SOALAN 2

CLO1
C1

(a) Identify the name and symbol for component in Diagram 2(a).

Kenalpasti nama dan simbol bagi komponen dalam Rajah 2(a).

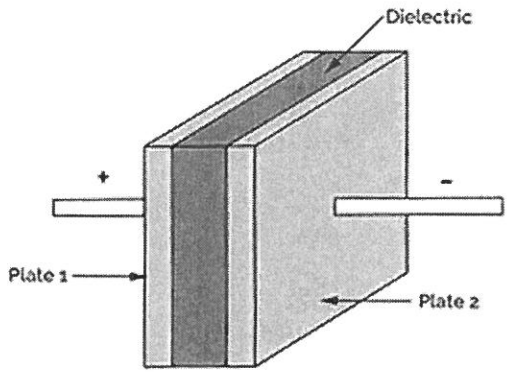


Diagram 2(a)

Rajah 2(a)

[3 marks]
[*3 markah*]

CLO1
C2

(b) Inductor is a passive element designed to store energy in its magnetic field.

Peraruh adalah komponen pasif yang direka untuk menyimpan tenaga dalam medan magnetnya.

i. Approximate Total Inductance in Diagram 2 (b (i)).

Anggarkan Jumlah Peraruh dalam Rajah 2 (b (i)).

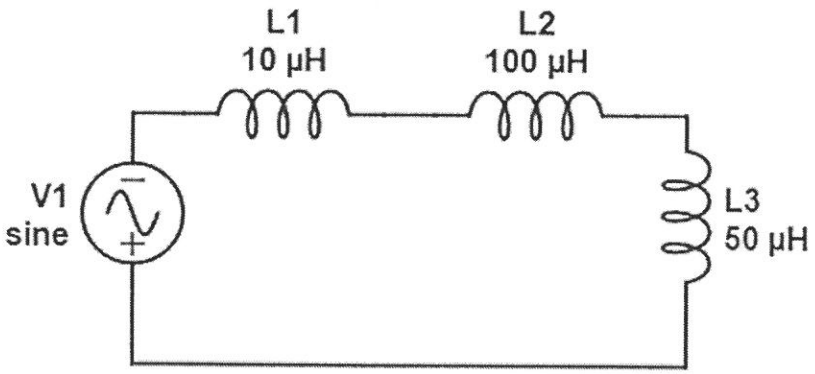


Diagram 2(b (i))

Rajah 2(b (i))

[5 marks]
[*5 markah*]

ii. Approximate Total Inductance in Diagram 2 (b (ii)).

Anggarkan Jumlah Pearuh dalam Rajah 2 (b (ii)).

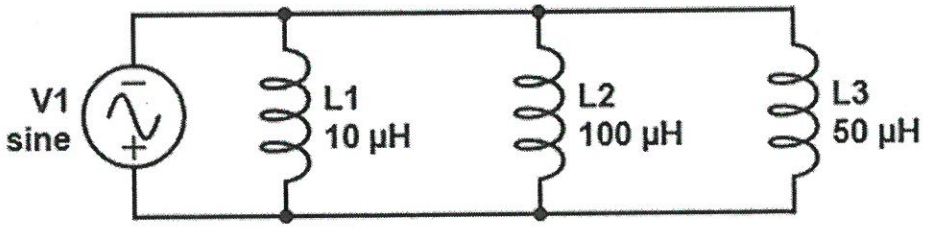


Diagram 2(b (ii))

Rajah 2(b (ii))

[6 marks]
[6 *markah*]

CLO1
C3

(c) Impedance is the opposition in electric circuit.

Galangan adalah halangan dalam litar elektrik.

i. Calculate Impedance (Z) by referring to Diagram 2(c i) below.

Kira Galangan (Z) dengan merujuk kepada Rajah 2(c i) di bawah.

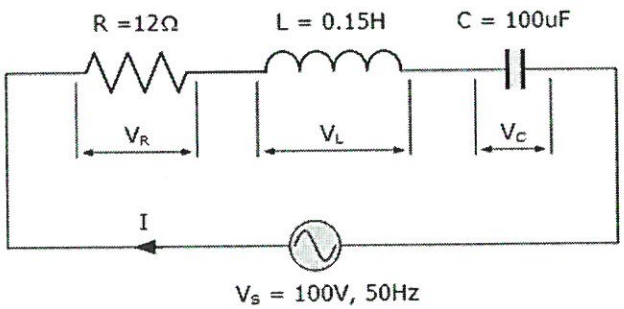


Diagram 2(c i) / *Rajah 2(c i)*

[9 marks]
[*9 markah*]

ii. Draw Impedance Triangle for Diagram 2(c i) above.

Lukis Segitiga Galangan untuk Rajah 2(c i) di atas.

[2 marks]
[2 *markah*]

QUESTION 3

SOALAN 3

CLO1
C1

(a) Identify **FOUR** non-magnetic substances that are not attracted to the magnet in the centre in Diagram 3 (a) below.

*Kenalpasti **EMPAT** bahan bukan magnet yang tak tertarik kepada magnet di tengah Rajah 3(a) di bawah.*

Diagram 3(a)
Rajah 3 (a)

[4 marks]
[4 *markah*]

CLO1
C2

(b) Elaborate how number of turns and current strength affect electromagnetic strength.

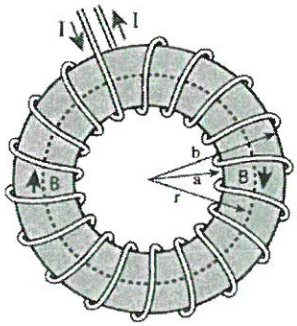
Huraikan bagaimana bilangan putaran dan kekuatan arus memberi kesan kepada kekuatan electromagnet.

[9 marks]
[*9 markah*]

CLO1
C3

(c) A coil is wound uniformly on a ring of non-magnetic material and all related information given in Diagram 3 (c) below. Calculate:

Satu gegelung melingkari cincin bukan bahan magnet secara seragam dan semua maklumat berkaitan diberi dalam Rajah 3 (c) dibawah. Kira :



500 turns
mean circumference 80cm
cross sectional area $8cm^2$
Current, I = 10A

Diagram 3 (c)

Rajah 3 (c)

i. The magnetic field strength, H

Kekuatan medan magnet, H

[4 marks]
[4 *markah*]

ii. The flux density,B

Ketumpatan fluks, B

[4 marks]
[4 *markah*]

iii. Total magnetic flux, Φ

Jumlah fluks magnet, Φ

[4 marks]
[4 *markah*]

QUESTION 4

SOALAN 4

CLO1
C1

(a) Define Transfomer.

Definikan Pengubah.

[4 marks]
[4 *markah*]

CLO1
C2

(b) Transformer is not electrically connected between its Primary and Secondary coil, discuss this theory with the aid of a diagram.

Pengubah tidak disambung secara elektrik di antara gegelung Primer dan Sekunder, bincangkan teori ini dengan bantuan rajah.

[10 marks]
[10 *markah*]

CLO1
C3

(c) A transformer is used to provide a 240V output from a 60V A.C supply. It has 10kΩ load and 4000 turns on secondary side an ideal transformer.

Sebuah pengubah yang biasa membekalkan 240V keluaran daripada 60V bekalan AU. Ia mempunyai beban 10kΩ dan 4000 pusingan pada sebelah sekunder sebagai pengubah ideal.

i. Sketch a schematic diagram of the transformer with information given above.

Lakarkan rajah skematik bagi pengubah tersebut dengan maklumat yang diberi di atas.

[5 marks]
[5 *markah*]

ii. Calculate primary turns, Np.

Kira gegelung primer, Np.

[4 marks]
[*4 markah*]

iii. Calculate Expected Ratio, K.

Kira Nisbah Terjangka,K.

[2 marks]
[2 *markah*]

SOALAN TAMAT

FORMULA FOR BASIC ELECTRICAL PRINCIPLES

Ohm's Law:

$$V = IR \; or \; I = \frac{V}{R} \; or \; R = \frac{V}{I}$$

Charge:

$Q = It$

Resistivity:

$$R = \frac{\rho l}{A} \; or \; R = k\frac{1}{A} \; or \; R = kl$$

Power:

$$P = I^2R \; or \; P = IV \; or \; P = \frac{V^2}{R}$$

Electrical Energy: $E = Pt$

Resistance in Series Circuit:

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

Resistance in Parallel Circuit:

$$R_T = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \cdots . + \frac{1}{R_N}}$$

Resistance in Parallel for 2 Branches:

$$R_T = \frac{R_1 R_2}{R_1 + R_2}$$

Voltage Divider Rule (VDR):

$$V_N = \left(\frac{R_N}{R_T}\right) V_T$$

Current Divider Rule (CDR):

$$I_N = \left(\frac{R_T}{R_N}\right) I_T$$

Current Divider Rule for 2 Branches:

$$I_1 = \left(\frac{R_2}{R_1 + R_2}\right) I_T \quad \text{or} \quad I_2 = \left(\frac{R_1}{R_1 + R_2}\right) I_T$$

Charge on Capacitor:

$$Q = CV \; or \; C = \frac{Q}{V} \; or \; V = \frac{Q}{C}$$

$$E = \frac{1}{2} QV$$

Capacitor in Series Circuit:

$$C_T = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \cdots . + \frac{1}{C_N}}$$

Capacitor in Parallel Circuit:

$$C_T = C_1 + C_2 + \cdots + C_N$$

Inductor in Series Circuit:

$$L_T = L_1 + L_2 + \cdots + L_N$$

Inductor in Parallel Circuit:

$$L_T = \frac{1}{\frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3} + \cdots . + \frac{1}{L_N}}$$

Capacitive Reactance:

$$X_C = \frac{1}{2\pi f C}$$

Inductive Reactance:

$$X_L = 2\pi f L$$

R-C Series Circuit:

$$Z = \sqrt{R^2 + {X_C}^2}$$

R-L Series Circuit:

$$Z = \sqrt{R^2 + {X_L}^2}$$

R-L-C Series Circuit:

$$Z = \sqrt{R^2 + (X_C - X_L)^2}$$

Or

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

Electromagnetic Induction:

$$E = Blv\sin\theta$$

$$F_m = Hl \; , \; F_m = IN \; , \; F_m = S\emptyset$$

$$B = \frac{\emptyset}{A} \; , \quad \mu = \mu_o \mu_r \; , \; \mu = \frac{B}{H}$$

$$S = \frac{F_m}{\emptyset} = \frac{Hl}{BA} = \frac{l}{\left(\frac{B}{H}\right)A} = \frac{l}{\mu_o \mu_r A}$$

Transformer:

$$\frac{N_2}{N_1} = \frac{V_2}{V_1} \; or \; \frac{V_1}{V_2} = \frac{N_1}{N_2}$$

$$\frac{V_1}{V_2} = \frac{N_1}{N_2} = \frac{I_2}{I_1}$$

$$S = V_1 I_1 = V_2 I_2$$

$$K = \frac{N_S}{N_P} = \frac{E_S}{E_P} = \frac{V_S}{V_P}$$