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 PETROKIMIA

PEPERIKSAAN AKHIR

SESI I : 2023/2024

DGP10013 : ELECTRICAL TECHNOLOGY

TARIKH : 02 JANUARI 2024
MASA : 8.30 PAGI – 10.30 PAGI (2 JAM)

Kertas ini mengandungi **TUJUH (7)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Tiada

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

CLO1

(a) State the unit and symbol for Current and Voltage.

Nyatakan unit dan simbol bagi Arus dan Voltan.

[4 marks]
[*4 markah*]

CLO1

(b) Based on Figure 1 (b) ,given $R_1 = 10\Omega$, $R_2 = 20\Omega$ and $R_3 = 15\Omega$. If the supplied power is 120 Volt, approximate :

Berdasarkan Rajah 1(b) diberi $R_1 = 10\ \Omega$, $R_2 = 20\ \Omega$ dan $R3 = 15\ \Omega$. Jika bekalan kuasa yang dibekalkan ialah 120 volt, anggarkan:

i. Total resistance, R_T / *Jumlah rintangan, R_T*

[2 marks]
[2 *markah*]

ii. Total current, I_T / *Jumlah arus, I_T*

[3 marks]
[3 *markah*]

iii. Current value I_2 on R_2 / *Nilai arus I_2 pada R_2*

[3 marks]
[3 *markah*]

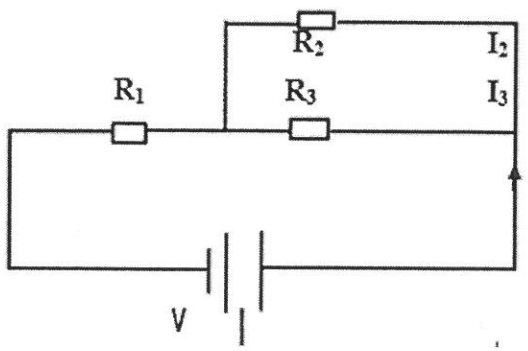

Figure1(b) / *Rajah 1(b)*

(c) Calculate the current I_1, I_2 and I_3 by applying Kirchoff's Current Law (KCL) and Kirchoff's Voltage Law (KVL) in Figure 1(c):
Kirakan arus I1, I2 dan I3 dengan menggunakan Hukum Kirchoff Arus dan Hukum Kirchoff Voltan dalam Rajah 1(c):

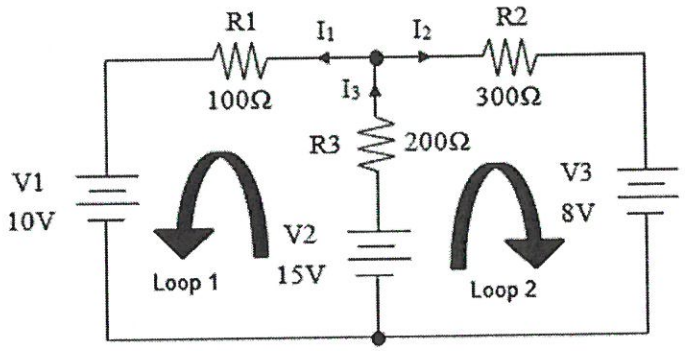

Figure 1(c) / *Rajah 1(c)*

Figure 1(c)/ *Rajah 1(c)*

[13 marks]
[*13 markah*]

QUESTION 2

SOALAN 2

CLO1 (a) Define capacitor with **ONE (1)** example.
*Takrifkan pemuat dengan **SATU (1)** contoh .*

[3 marks]
[*3 markah*]

CLO1 (b) Two capacitors have own their capacites which are 6μF and 10μF connected in series with a 200V power supply. Approximate:
Dua buah pemuat mempunyai kemuatan masing-masing dengan nilai 6μF dan 10μF dihubungkan bersiri dengan satu bekalan kuasa 200V. Anggarkan:

i. Total capacitance and each capacitor charge.
Jumlah kemuatan dan cas setiap pemuat.

[5 marks]
[*5 markah*]

ii. Voltage drop for each capacitor.
Bezaupaya merentasi setiap pemuat.

[6 marks]
[6 *markah*]

CLO1

(c) A series RLC circuit containing a resistance of 20Ω, an inductance of 0.5H and a capacitor of 100μF are connected in series across a 150V, 70Hz supply. Based on this information :

Satu litar RLC yang mengandungi perintang 20Ω, satu pearuh 0.5H dan satu Pemuat berkapasiti 100uF telah disambungkan secara sesiri yang merentasi bekalan 150V, 70Hz. Berdasarkan litar ini:

i. Calculate the total circuit impedance, Z

Kira jumlah Galangan (Z) litar.

[9 marks]

[*9 markah*]

ii. Calculate the circuit current, I.

Kirakan arus litar, I.

[2 marks]

[2 *markah*]

QUESTION 3

SOALAN 3

CLO1

(a) List **FOUR (4)** factors that affect electromagnetic strength.

*Senaraikan **EMPAT (4)** faktor yang mempengaruhi kekuatan elektromagnetik.*

[4 marks]

[4 *markah*]

CLO1

(b) Explain Maxwell Screw Law and Flux Cut Conductor method with an aid of diagram.

Terangkan kaedah Hukum Skrew maxwell dan Potongan Fluk Konduktor dengan bantuan rajah.

[9 marks]

[*9 markah*]

CLO1

(c) A core stainless steel of 50 cm length and cross sectional area 4 cm^2 are wounded with 1000 turns coil and 5A current flowing through them. The value of relative permeability is 1200. Calculate:

Satu keluli tahan karat dengan panjang 50 cm dan luas keratan rentas 4 cm^2 dililit dengan gegelung 1000 lilitan dan arus 5A mengalir melaluinya. Nilai relative kebolehtelapan ialah 1200. Kirakan:

i. Magnetomotive force, Fm.
Daya Gerak Magnet, Fm.

[4 marks]
[4 *markah*]

ii. Magnetic Field Strength, H
Kekuatan Medan Magnet, H

[4 marks]
[4 *markah*]

iii. Absolute permeability, μ.
Kebolehtelapan sebenar, μ .

[4 marks]
[4 *markah*]

QUESTION 4

SOALAN 4

CLO1 (a) Define a Transformer.

Takrifkan sebuah Pengubah.

[4 marks]

[4 *markah*]

CLO1 (b) Elaborate basic principle of a transformer with an aid of diagram.

Terangkan prinsip asas pengubah dengan bantuan rajah.

[10 marks]

[10 *markah*]

CLO1 (c) A 50kVA, 800V/200V, 50 Hz single-phase transformer has 60 secondary turns. Calculate:

Sebuah pengubah fasa tunggal 50kVA, 800V/200V, 50 Hz mempunyai 60 lilitan sekunder. Kirakan:

i. Primary Current,Ip and secondary current, Is.

Arus di gegelung primer,Ip dan sekunder, Is.

[5 marks]

[5 *markah*]

ii. Number of primary turns, Np.

Bilangan lilitan gegelung primer, Np.

[4 marks]

[4 *markah*]

iii. Expected Ratio, K.

Kira Nisbah Terjangka,K.

[2 marks]

[2 *markah*]

SOALAN TAMAT

Formula for Basic Electrical Principles

Ohms Law:

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

Charge: Q = It

Resistivity :

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

Power :

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

Electrical Energy: E = Pt

Resistance:

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

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

Parallel 2 branch:

$$R_T = \frac{R_1R_2}{R_1 + R_2}$$

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 branch:

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

Charge on capacitor :

$Q = CV \; or \; C = \frac{Q}{V} \; or \; V = \frac{Q}{C}$, $E = \frac{1}{2}QV$

Capacitor in series:

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

Capacitor in parallel:

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

Inductor in series:

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

Inductor in parallel:

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

Capacitive reactance, Xc:

$$\mathrm{X_C} = \frac{1}{2\pi \mathrm{fC}}$$

Inductive reactance, X_L:

$$\mathrm{X_L} = 2\pi \mathrm{fL}$$

R-C series :

$$\mathrm{Z} = \sqrt{\mathrm{R}^2 + \mathrm{X_C}^2} \quad , \mathrm{V} = \mathrm{IZ}$$

R-L series :

$$\mathrm{Z} = \sqrt{\mathrm{R}^2 + \mathrm{X_L}^2} \; , \; \mathrm{V} = \mathrm{IZ}$$

R-L-C series:

$$\mathrm{Z} = \sqrt{\mathrm{R}^2 + (\mathrm{X_C} - \mathrm{X_L})^2} \; , \; \mathrm{V} = \mathrm{IZ}$$

$$\mathrm{Z} = \sqrt{\mathrm{R}^2 + (\mathrm{X_L} - \mathrm{X_C})^2} \; , \; \mathrm{V} = \mathrm{IZ}$$

Electromagnetic induction:

$\mathrm{E} = \mathrm{Blv}\sin\theta$, $\mathrm{F_m} = \mathrm{H}l$, $\mathrm{F_m} = \mathrm{IN}$, $\mathrm{F_m} = \mathrm{S}\emptyset$

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

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

Transformer:

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

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

$$\mathrm{S} = V_1\mathrm{I}_1 = V_2\mathrm{I}_2$$

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