SULIT

POLITEKNIK MALAYSIA

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

JABATAN KEJURUTERAAN PETROKIMIA

PEPERIKSAAN AKHIR

SESI JUN 2019

DGP10013: ELECTRICAL TECHNOLOGY

TARIKH : 19 OKTOBER 2019
MASA : 2.30 PETANG - 4.30 PETANG (2 JAM)

Kertas ini mengandungi **SEPULUH (10)** 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 questions. Answer **ALL** questions.

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO1
C1

(a) Identify the value of resistor in **Figure 1 (a)**.

*Kenalpasti nilai rintangan dalam **Rajah 1 (a)**.*

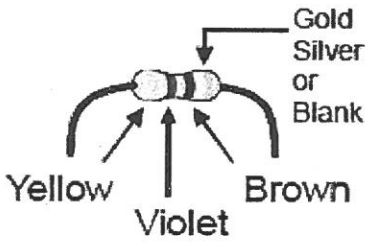

Figure 1 (a)

Rajah 1 (a)

[4 marks]

[*4 markah*]

CLO1
C2

(b) There are many types of Electric Circuit. By using a diagram, explain Open Circuit.

Terdapat banyak jenis Litar Elektrik. Dengan menggunakan gambarajah, huraikan Litar Terbuka.

[8 marks]

[*8 markah*]

CLO1
C3

(c) Calculate I_{R1}, I_{R2} and I_{R3} for the circuit in **Figure 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 menggunakan Hukum Kirchoff.*

$V_1 = 15V$

$V_2 = 7V$

$R_1 = 20\Omega$

$R_2 = 5\Omega$

$R_3 = 10\Omega$

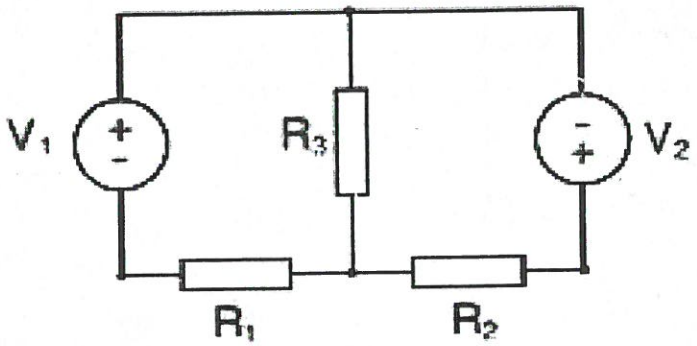

Figure 1 (c)

Rajah 1 (c)

[13 marks]

[*13 markah*]

QUESTION 2
SOALAN 2

CLO1 C1

(a) Inductor is one of the most useful components in electronics. Identify the symbol and unit of inductor.
Pengaruh adalah salah satu komponen paling berguna dalam elektronik. Kenalpasti simbol dan unit bagi pengaruh.

[3 marks]
[*3 markah*]

CLO1 C2

(b) Capacitor is a component that can be used as an energy store. Explain the principles of capacitor when charging.
Pemuat adalah komponen yang boleh digunakan untuk menyimpan tenaga. Jelaskan prinsip pemuat apabila mengecas.

[10 marks]
[*10 markah*]

CLO1
C3

(c) A 12Ω resistor, 0.15H inductor and 100μF capacitor is connected in series with a 100V, 50 Hz supply.
Perintang 12Ω, peraruh 0.15H dan pemuat 100μF disambung secara sesiri dengan bekalan 100V, 50 Hz.

i. Draw a complete circuit based on the characteristics stated above.
Lukiskan satu litar lengkap berdasarkan ciri-ciri di atas.

[3 marks]
[*3 markah*]

ii. Calculate Inductive Reactance, X_L.
Kira Regangan Induktif, X_L.

[3 marks]
[*3 markah*]

iii. Calculate Capacitive Reactance, X_C.
Kira Regangan Kapasitif, X_C.

[3 marks]
[*3 markah*]

iv. Calculate Circuit Impedance, Z.
Kira Galangan litar, Z.

[3 marks]
[*3 markah*]

QUESTION 3

SOALAN 3

CLO1 C1 (a) Define magnetic substance.

Definisikan bahan magnetik.

[3 marks]

[*3 markah*]

CLO1 C2 (b) There are four main factors that affect electromagnetic strength. Elaborate each factor below:

Terdapat empat faktor yang memberi kesan kepada kekuatan magnet. Huraikan setiap faktor di bawah:

i. Number of Turns.

Bilangan Putaran.

[5 marks]

[*5 markah*]

ii. Current Strength.

Kekuatan Arus.

[5 marks]

[*5 markah*]

CLO1
C3

(c) Part of magnetic circuit is made from steel of length 120mm, cross sectional area 15cm^2 and Relative Permeability 800. Given total magnetic flux is 200 μWb, calculate:

Sebahagian litar magnet dibuat daripada keluli yang panjangnya 120mm, luas keratan rentas 15cm^2 dan Ketelapan Relatif 800. Diberi jumlah fluks magnet ialah 200μWb, kira:

i. Absolute Permeability, μ.
Ketelapan Mutlak, μ.

[4 marks]
[*4 markah*]

ii. Reluctance, S.
Engganan, S.

[4 marks]
[*4 markah*]

iii. Magnetomotive Force, F_m.
Daya gerak magnet, F_m.

[4 marks]
[*4 markah*]

QUESTION 4

SOALAN 4

CLO1 C1 (a) Define Transformer.

Definisikan Pengubah. [5 marks]

[*5 markah*]

CLO1 C2 (b) Compare Step Up Transformer to Isolation Transformer with an aid of a diagram.

Bandingkan Pengubah Langkah Naik dan Pengubah Pengasing dengan bantuan gambarajah.

[10 marks]

[*10 markah*]

CLO1 C3 (c) A Step-Up Transformer with a Primary Coil of 120 turns and Secondary Coil of 1200 turns has 240V connected to its primary.

Satu Pengubah Langkah Naik dengan Gegelung Primer sebanyak 120 pusingan dan Gegelung Sekunder sebanyak 1200 pusingan bersambung dengan 240V pada primernya.

i. Sketch a schematic diagram of this transformer.

Lakarkan rajah skematik bagi pengubah ini. [3 marks]

[*3 markah*]

ii. Calculate $V_{secondary}$.

Kira $V_{sekunder}$. [4 marks]

[*4 markah*]

iii. Calculate Expected Ratio, K.

Kira Nisbah Terjangka, K. [3 marks]

[*3 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 $I_2 = \left(\frac{R_1}{R_1+R_2}\right)I_T$

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 :

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

R-L series :

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

R-L-C series:

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

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

Electromagnetic induction:

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

$\mathrm{F_m} = \mathrm{S}\emptyset$

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

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

Charge on capacitor :

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

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:

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

Transformer:

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

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

$$S = V_1 I_1 = V_2 I_2$$

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