

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI**

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI JUN 2016

DET2033: ELECTRICAL CIRCUITS

TARIKH : 03 NOVEMBER 2016

MASA : 8.30 AM - 10.30 AM (2 JAM)

Kertas ini mengandungi **DUA BELAS (12)** 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

INSTRUCTIONS:

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. Select the source of alternating current (AC)

Pilih sumber bagi arus ulangalik (AU)

- A. Battery cell
Sel Bateri
- B. Solar cell
Sel solar
- C. AC generator
Penjana AU
- D. AC motor
Motor AU

CLO1
C2

2. Identify the voltage across the inductance in an RL series circuit

Kenal pasti voltan merintang aruhan dalam litar siri RL

- A. Current in phase with the source voltage.
Arus sefasa dengan Voltan bekalan
- B. Current lagging the source voltage by 90° .
Arus mengekor 90° Voltan bekalan
- C. Current leading the source voltage by 90° .
Arus mendulu voltan bekalan sebanyak 90° .
- D. Voltage leading the current by 90° .
Voltan mendulu Arus sebanyak 90° .

CLO1
C2

3. In a series resonant circuit, $V_C = 125\text{ V}$, $V_L = 125\text{ V}$, and $V_R = 40\text{ V}$. Calculate the value of the source voltage.

Dalam satu litar salunan siri, $V_C = 125\text{ V}$, $V_L = 125\text{ V}$, dan $V_R = 40\text{ V}$. Kira nilai voltan sumber.

- A. 200V
- B. 125V
- C. 250V
- D. 40V

CLO1
C2

4. Identify the neutral current in a three-phase system, when the loads are perfectly balanced.

Kenalpasti arus neutral dalam sistem tiga fasa bila beban dalam keadaan seimbang.

- A. 0 A
- B. 2 A
- C. $\sqrt{3}$ A
- D. 9 A

CLO1
C1

5. Following are the types of transformers **EXCEPT**;
*Berikut adalah jenis-jenis pengubah **KECUALI**;*

- A. Center tapped transformer
Pengubah tap tengah.
- B. Multiple winding transformer
Pengubah berbilang lilitan.
- C. Auto transformer
Pengubah Auto.
- D. Manual transformer
Pengubah manual

CLO1
C2

6. A 440V/110V transformer has 1000 turns on the primary winding. Calculate the number of turns on the secondary.

Sebuah transformer 440V/110V mempunyai 1000 belitan pada bahagian primer. Kira bilangan belitan pada bahagian sekunder.

- A. 550
- B. 250
- C. 4000
- D. 25

CLO2
C3

7. Calculate the peak current through the $15\text{k}\Omega$ resistor if the rms voltage drop is 16V.

Kirakan nilai arus puncak melalui perintang $15\text{k}\Omega$ sekiranya voltan susut ppgd adalah 16V.

- A. 1.5mA
- B. 7.5mA
- C. 1.07mA
- D. 2.0mA

CLO2
C3

8. Calculate the capacitive reactance of a $10\mu\text{F}$ capacitor when connected to a circuit of 50Hz frequency.

Kira regangan kapasitif bagi kapasitor $10\mu\text{F}$ apabila disambungkan kepada litar frekuensi 50Hz.

- A. $200.5\ \Omega$
- B. $318.3\ \Omega$
- C. $3.183\ \Omega$
- D. $250.3\ \Omega$

CLO2
C3

9. A series circuit comprises an inductor of 2mH, a resistor of 50 ohms and a capacitor of 2 mF. Calculate the frequency at which this circuit will be at resonant.

Satu litar sesiri terdiri dari 2mH peraruh, 50 ohms resistor dan 2 mF pemuat. Kira nilai frekuensi bagi litar ini jika ianya dalam keadaan salun.

- A. 65.58 Hz
B. 79.58 Hz
C. 85.58kHz
D. 82.58Hz

CLO2
C3

10. A supply three-phase system delivers power to a load delta connection consisting of three 12 Ω resistors. If the current 8 A is supplied to each load, calculate the total power supplied by the system.

Satu bekalan sistem tiga fasa telah mengagihkan kuasa kepada beban sambungan delta yang terdiri dari tiga perintang 12 Ω . Jika arus 8A mengalir pada setiap perintang, kira kuasa yang dibekalkan dari bekalan tersebut.

- A. 768 VA
B. 900 VA
C. 3.2 kVA
D. 3.5 kVA

SECTION B : 60 MARKS

BAHAGIAN B :60 MARKAH

INSTRUCTIONS:

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) List **TWO (2)** laws related in generating of alternating current.

Senaraikan DUA (2) hukum yang berkaitan dengan penjanaan arus.

[3 marks]

[3 markah]

CLO1
C2

- b) Calculate the rms voltage of an average voltage of 24V.

Kirakan voltan ppgd daripada voltan purata 24V.

[5 marks]

[5 markah]

CLO2
C3

- c) The voltage in AC circuit is given by $V = 10 \sin 62.8t$ V. Calculate

Voltan dalam litar AU diberikan oleh $V = 10 \sin 62.8t$ V. Kira

- i) The frequency and period time

Frekuensi dan tempoh

- ii) The value of the voltage at $t=2\text{ms}$

Nilai voltan pada ketika $t=2\text{ms}$

[7 marks]

[7 markah]

QUESTION 2

SOALAN 2

CLO1
C1

- a) Draw the graph showing the relation between frequency and resistance (R), inductive reactance (X_L) and capacitive reactance (X_C)

Lakarkan graf yang menunjukkan hubungan antara frekuensi dengan rintangan (R), kearuhan (X_L) dan kemuatan (X_C).

[3 marks]

[3 markah]

CLO1
C2

- b) Express in a phasor diagram showing the relationship between V_R , V_C , V_T , I_T , I_R and I_C for the following circuit.

Nyatakan dalam bentuk rajah phasor menunjukkan hubungan antara V_R , V_C , V_T , I_T , I_R dan I_C bagi litar berikut:

- Series RC circuit (I_T as reference)
Litar RC siri (I_T sebagai rujukan)
- Parallel RC circuit (V_T as reference)
Litar RC selari (V_T sebagai rujukan)

[5 marks]

[5 markah]

CLO2
C3

- c) Referring to Figure B1, calculate:

Berdasarkan Rajah B1, kirakan:

- total impedance
jumlah galangan
- total current
jumlah arus
- voltage across inductor, L and capacitor, C
voltan merentasi peraruh, L dan pemuat, C

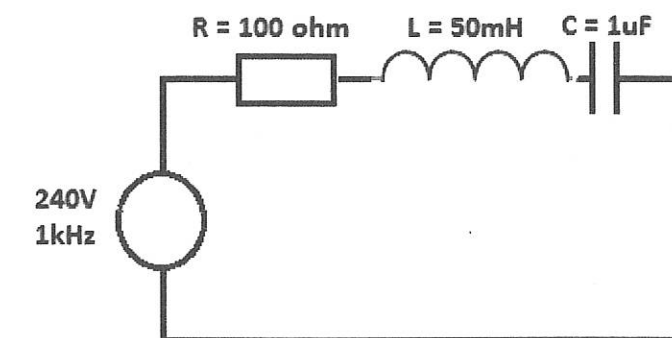


Figure B1 / Rajah B1

[7 marks]

[7 markah]

QUESTION 3

SOALAN 3

CLO1
C1

- a) List **THREE (3)** advantages of three phase system .

Senaraikan TIGA (3) kebaikan bagi sistem tiga fasa .

[3 marks]

[3 markah]

CLO1
C2

- b) Referring to Figure B2, determine the equation for the waveform, V_R , V_Y and V_B .
Merujuk kepada Rajah B2, kenalpasti persamaan bagi gelombang V_R , V_Y and V_B .

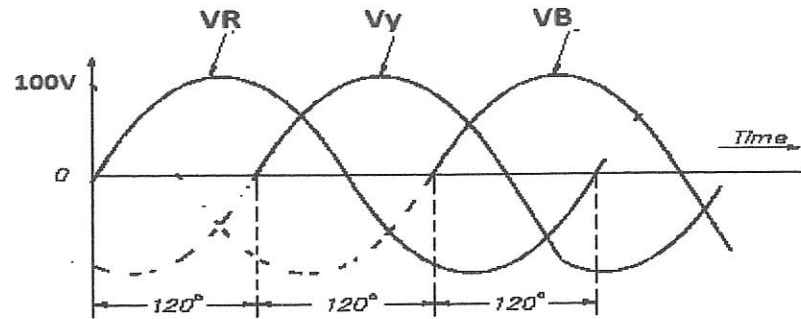


Figure B2 / Rajah B2

[5 marks]
[5 markah]

CLO2
C3

- c) Referring to Figure B3, a three phase supply with 415V, 50Hz was connected to balance load of 40Ω resistance and 0.1H inductance at each phase. If the load is connected in a form of star, calculate the line current (I_L) and the real power (P).

Merujuk kepada Rajah B3, satu bekalan tiga fasa 415V, 50Hz telah disambung kepada beban seimbang dengan perintang 40Ω dan aruhan 0.1 H pada setiap fasa. Jika beban tersebut di sambung secara bintang, kirakan arus talian (I_L) dan kuasa sebenar (P).

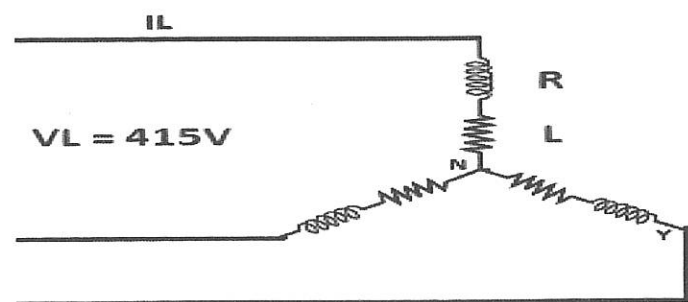


Figure B3 / Rajah B3

[7 marks]
[7 markah]

QUESTION 4

SOALAN 4

CLO1
C1

- a) List **THREE (3)** types of transformer
Senaraikan **TIGA (3)** jenis transformer

[3 marks]
[3 markah]

CLO1
C2

- b) The amount of mutual inductance depends upon several factors. Identify **FIVE (5)** factors that affect mutual inductance.

Jumlah aruhan saling bergantung kepada beberapa faktor. Kenal pasti **LIMA (5)** faktor yang mempengaruhi aruhan saling.

[5 marks]
[5 markah]

CLO2
C3

- c) Referring to Figure B4, calculate V_p , V_s , I_p and I_s .

Merujuk Rajah B4, kirakan V_p , V_s , I_p dan I_s .

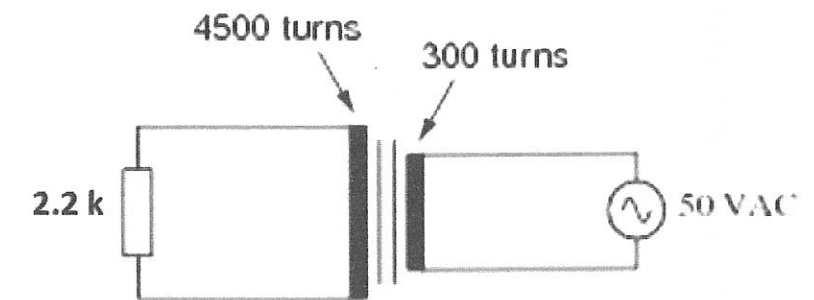


Figure B4
Rajah B4

[7marks]
[7 markah]

SECTION C : 30 MARKS

BAHAGIAN C : 30 MARKAH

INSTRUCTIONS:

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

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO2
C3

Referring to Figure C1, calculate the line current I_1 , I_2 , I_T and draw the phasor diagram of currents. Calculate also the power factor, true power and the apparent power.

Merujuk kepada Rajah C1, kirakan I_1 , I_2 , I_T dan lukiskan rajah 'phasor' bagi arus-arus tersebut. Seterusnya kirakan faktor kuasa, kuasa sebenar dan kuasa ketara bagi litar tersebut.

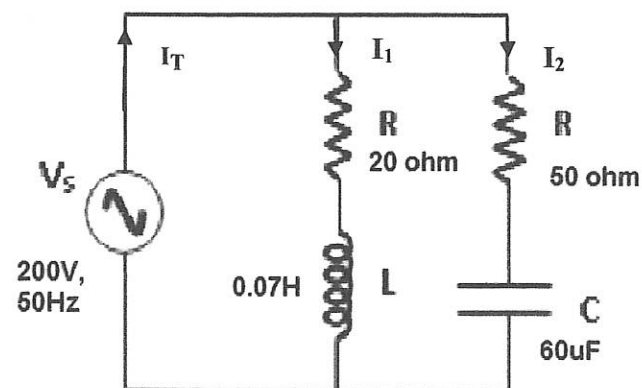


Figure C1 / Rajah C1

[15 marks]

[15 markah]

QUESTION 2

SOALAN 2

CLO2
C3

A coil of 100Ω resistance and 60mH inductance are connected in series with a capacitance of $0.6\mu\text{F}$ across a 240V with the variable frequency supply. Calculate the upper cut-off frequency and lower cut-off frequency during resonance. Illustrate in detail the corresponding current waveform for all frequencies.

Satu gelung dengan rintangan 100Ω dan kearuhan 60mH disambung secara siri dengan kemuatan $0.6\mu\text{F}$ merentasi bekalan 240V , dengan frekuensi boleh laras. Kirakan nilai frekuensi terpotong atas dan frekuensi terpotong bawah ketika resonan. Lakar dengan lengkap gelombang arus untuk semua frekuensi yang berkaitan.

[15 marks]

[15 markah]

SOALAN TAMAT