

SULIT



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

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI JUN 2018

DET2033: ELECTRICAL CIRCUITS

TARIKH : 16 NOVEMBER 2018

MASA : 3.00 PETANG - 5.00 PETANG (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. Choose the source for Alternating Current (AC) from the list of sources below:
Pilih bekalan untuk Arus Ulang-alik (AU) daripada senarai bekalan di bawah:

- A. Generator
- B. Solar
- C. Battery
- D. Turbine

CLO1
C2

2. Identify the power drawn by a pure capacitor.
Kenal pasti kuasa yang diserap oleh kapasitor tulen.

- A. 0
- B. 1
- C. Infinite
- D. Can't determined

CLO1
C2

3. Describe resonance in series RLC circuit.
Terangkan salun dalam litar sesiri RLC.

- A. The inductive reactance equals the resistance
Regangan induktif sama dengan rintangan
- B. The capacitive reactance plus the inductive reactance equals the resistance
Regangan kapasitif dengan regangan induktif bersamaan dengan rintangan
- C. The capacitive reactance equals the resistance
Regangan kapasitif sama dengan rintangan
- D. The inductive reactance equals to capacitive reactance
Regangan induktif sama dengan regangan kapasiti

CLO1
C2

4. Select the **CORRECT** explanation for 'three phase supply'.
*Pilih keterangan yang **BETUL** untuk 'bekalan tiga fasa'.*
- A. Three phase supply is generated when three coils are placed 180° apart and the whole coil is rotated in a uniform magnetic field.
Bekalan tiga fasa dihasilkan apabila tiga gegelung diletakkan 180° dan seluruh gegelung diputar dalam medan magnet seragam.
 - B. Three phase supply is generated when three coils are placed 60° apart and the whole coil is rotated in a uniform magnetic field.
Bekalan tiga fasa dihasilkan apabila tiga gegelung diletakkan 60° dan seluruh gegelung diputar dalam medan magnet seragam.
 - C. Three phase supply is generated when two coils are placed 120° apart the whole coil is rotated in a uniform magnetic field.
Bekalan tiga fasa dihasilkan apabila dua gegelung diletakkan 120° dan seluruh gegelung diputar dalam medan magnet seragam.
 - D. Three phase supply is generated when three coils are placed 120° apart and the whole coil is rotated in a uniform electromagnetic field.
Bekalan tiga fasa dihasilkan apabila tiga gegelung diletakkan 120° dan seluruh gegelung diputar dalam medan magnet seragam.

CLO1
C1

5. Describe the causes of Eddy Current in a transformer.
Terangkan penyebab berlakunya Arus Pusaran di dalam sebuah transformer.
- A. an increase in efficiency.
peningkatan dalam kecekapan.
 - B. an increase in coupling between windings.
peningkatan dalam gandingan diantara belitan.
 - C. an increase in core loss.
peningkatan dalam kehilangan teras.
 - D. an increase in usable frequency range.
peningkatan dalam julat frekuensi berguna

- | | |
|------------|--|
| CLO1
C2 | <p>6. Calculate the secondary voltage if the turns ratio of a transformer is 12 and the primary AC voltage is 6V.
 <i>Kira voltan sekunder sekiranya nisbah lilitan pengubah ialah 12 dan voltan AC primer adalah 6V.</i></p> <p>A. 0.5 V</p> <p>B. 50 V</p> <p>C. 72 V</p> <p>D. D. 2 V</p> |
| CLO2
C3 | <p>7. Calculate the rms value of a sinusoidal current of maximum value 30 A.
 <i>Kira nilai arus rms apabila diberi nilai arus maksima sinusoidal sebanyak 30 A.</i></p> <p>A. 12.12 Ma</p> <p>B. 15.15 mA</p> <p>C. 21.21 A</p> <p>D. 1 A</p> |
| CLO2
C3 | <p>8. Calculate the inductance of the coil if the coil has a reactance of 120Ω in a circuit with a supply frequency of 4 kHz.
 <i>Kirakan nilai induktan bagi gegelung tersebut jika satu gegelung yang mempunyai nilai reaktans 120Ω disambungkan dengan bekalan frekuensi 4 kHz dalam satu litar.</i></p> <p>A. 6.3 mH</p> <p>B. 4.77 mH</p> <p>C. 3.27 mH</p> <p>D. 5.51 mH</p> |

- CLO2
C3
9. Determine the resonant frequency of the circuit if a pure inductance of 150 mH is connected in parallel with a 40 μ F capacitor across a 50 V, variable frequency supply.
Tentukan nilai frekuensi resonan pada litar tersebut jika satu pearuh bernilai 150mH disambungkan secara selari dengan kapasitor 40 μ F dan merentasi bekalan frekuensi bolehubah 50V.
- A. 50 Hz
 - B. 63.77 Hz
 - C. 64.97 Hz
 - D. 120 Hz
- CLO2
C3
10. Calculate the phase voltage and phase current in a star connected three phase system if given the line voltage 415V and the line current 30A.
Kirakan voltan fasa dan arus fasa untuk sambungan bintang sistem tiga fasa jika diberi voltan talian 415V dan arus talian 30A.
- A. $V_{PH} = 415 \text{ V}$, $I_{PH} = 17.32 \text{ A}$
 - B. $V_{PH} = 415 \text{ V}$, $I_{PH} = 30.0 \text{ A}$
 - C. $V_{PH} = 239.6 \text{ V}$, $I_{PH} = 30.0 \text{ A}$
 - D. $V_{PH} = 239.6 \text{ V}$, $I_{PH} = 17.32 \text{ A}$

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

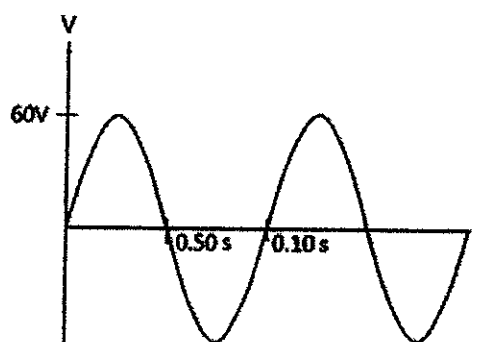


Figure B1(a) / Rajah B1(a)

(a) Based on Figure B1(a);

Berdasarkan rajah B1(a);

i) Define the time period, (T) of a sine waveform.

Berikan definisi tempoh masa, (T) bagi gelombang sinus.

[2 marks]

[2 markah]

ii) Find the value of time period, (T).

Dapatkan nilai tempoh masa, (T).

[1 mark]

[1 markah]

CLO1
C1

CLO1
C2

(b) Based on Figure B1(a);

Berdasarkan rajah B1(a);

i) State the peak voltage, V_p .

Nyatakan nilai voltan puncak, V_p

[2 marks]

[2 markah]

ii) Write the sinusoidal waveform equation.

Tuliskan persamaan gelombang sinusoidal.

[3 marks]

[3 markah]

CLO2
C3

(c) Calculate the following value for an AC voltage circuit given by $v(t) = 100 \sin 314t$ V.

Kirakan nilai berikut untul litar voltan AU yang diberi oleh $v(t) = 100 \sin 314t$ V.

i) The frequency and period time

Frekuensi dan tempoh

[4 marks]

[4 markah]

ii) The value of the voltage at $t = 4\text{ms}$

Nilai voltan pada ketika $t = 4\text{ms}$

[3 marks]

[3 markah]

QUESTION 2

SOALAN 2

CLO1
C1

- (a) State the relation between inductive reactance, X_L and frequency, f . Draw the graph to illustrate this relation.

Nyatakan hubungkait di antara reaktan induktif, X_L dengan frekuensi, f . Lakarkan graf bagi menunjukkan hubungan ini.

[3 marks]

[3 markah]

CLO1
C2

- (b) Calculate the total impedance of a circuit and its circuit current when a RLC series circuit containing a resistance of 12Ω , an inductance of $0.15H$ and a capacitor of $100\mu F$ are connected in series across a $100V$, $50Hz$ supply.

Kirakan nilai galangan bagi suatu litar dan juga arus bagi litar tersebut apabila satu litar siri RLC yang mengandungi perintang 12Ω , induktor $0.15H$ dan kapasitor $100\mu F$ disambung secara siri disambung merentasi bekalan kuasa $100V$, $50Hz$.

[5 marks]

[5 markah]

CLO2
C3

(c)

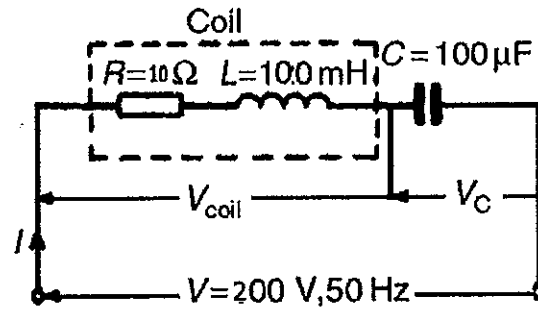


Figure B2(c) / Rajah B2(c)

A coil of resistance 10Ω and inductance 100mH in series with capacitor $100\mu\text{F}$, is connected across 200V , 50 Hz power supply as in Figure B2(c). Calculate :

Suatu gelung dengan rintangan 10Ω dan peraruh 100mH disambungkan secara siri dengan kapasitor $100\mu\text{F}$ disambung kepada bekalan kuasa 200V , 50 Hz seperti dalam Rajah B2(C). Kirakan :

- i) Circuit impedance, Z
Galangan litar, Z
- ii) Circuit current, I
Arus Litar, I
- iii) Phase angle
Sudut fasa
- iv) Voltage across inductor.
Voltan merentas peraruh
- v) Voltage across capacitor
Voltan merentas kapasitor

[7 marks]

[7 markah]

QUESTION 3

SOALAN 3

CLO1
C1

- (a) List **THREE** (3) requirements contained in the three-phase power system.

Senaraikan TIGA (3) keperluan yang terdapat dalam sistem kuasa tiga fasa.

[3 marks]

[3 markah]

CLO1
C2

- (b) Describe and label clearly the delta connection in a three phase system using a circuit diagram.

Terangkan dan label dengan jelas sambungan delta di dalam sistem tiga fasa menggunakan gambarajah litar.

[5 marks]

[5 markah]

CLO2
C3

- (c) A three coil balanced load has 10Ω resistor and 100mH inductor, connected in star connection with a three phase supply system with 415V , 50 Hz . Calculate the phase current (I_{PH}), the line current (I_{L}) and the power in three phase.

Tiga gelung yang seimbang mempunyai rintangan 10Ω dan pearuh 100mH , disambung dalam bentuk bintang kepada system bekalan tiga fasa 415V , 50 Hz .

Kirakan arus fasa (I_{PH}), arus talian (I_{L}) dan kuasa dalam tiga fasa.

[7 marks]

[7 markah]

QUESTION 4

SOALAN 4

CLO1
C1

- (a) State THREE (3) characteristics of a non-ideal transformer.

Nyatakan TIGA(3) ciri bagi pengubah tak ungggul.

[3 marks]

[3 markah]

CLO1
C2

- (b) A step-down transformer has a turn ratio of 20:1, a primary voltage of 4 kV and a load of 10 kW. Neglecting losses, calculate the value of the secondary current.

Sebuah pengubah langkah turun mempunyai nisbah lilitan 20:1, voltan primer 4kV dan 10kW beban. Dengan mengabaikan nilai kehilangan, kirakan nilai arus sekunder.

[5 marks]

[5 markah]

CLO2
C3

- (c) Referring to Figure B4(c), calculate:

Berdasarkan Rajah B4(c), kirakan:

- (i) the voltage induced in the primary
voltan teraruh pada bahagian utama
- (ii) the secondary current
arus sekunder
- (iii) the primary current
arus primer

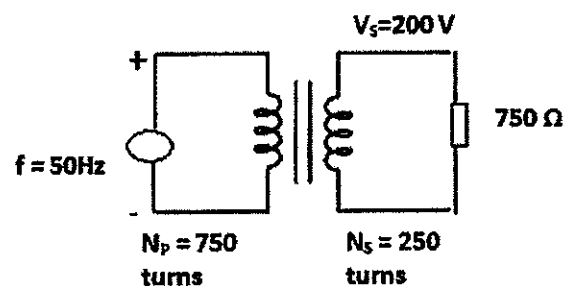


Figure B4(c) / Rajah B4(c)

[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.

QUESTION 1

SOALAN 1

CLO2
C3

A circuit consists of a resistor 15Ω , an inductor $0.1H$ and capacitor $80\mu F$ are connected in series to supply $100V$, $50Hz$. Calculate:

Satu litar mengandungi perintang 15Ω , pearuh $0.1H$ dan pemuat $80\mu F$ yang disambungkan secara sesiri dengan voltan masukan $100V$, $50Hz$. Kirakan:

- i) Total impedance
Jumlah galangan
- ii) Total circuit current
Jumlah arus litar
- iii) Voltage across each components
Nilai kejatuhan voltan merentasi setiap komponen
- iv) Sketch the vector diagram
Lakarkan gambarajah vektor litar

[15 marks]

[15 markah]

CLO2
C3**QUESTION 2****SOALAN 2**

A circuit which consists of a 12Ω resistor, 45mH inductor and a $100\mu\text{F}$ capacitor is connected in series across a 220V AC supply. Calculate the upper and lower cut-off frequency. Then sketch and label the resonance graph Current versus Frequency with the obtained value.

Sebuah litar yang mengandungi satu perintang 12Ω , pearuh 45mH dan pemuat $100\mu\text{F}$ disambung secara siri merentasi bekalan AU 220V . Kirakan nilai frekuensi terpotong atas dan bawah. Berdasarkan jawapan yang diperolehi, lakar dan label graf resonan Arus melawan Frekuensi.

[15 marks]

[15 markah]

SOALAN TAMAT