SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI JUN 2017

DET2033 : ELECTRICAL CIRCUITS

TARIKH : 01 NOVEMBER 2017
MASA : 8.30 PAGI - 10.30 PAGI (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)

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 kapasitif

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 180^0 apart and the whole coil is rotated in a uniform magnetic field.
Bekalan tiga fasa dihasilkan apabila tiga gegelung diletakkan 180^0 dan seluruh gegelung diputarkan dalam medan magnet seragam.

B. Three phase supply is generated when three coils are placed 60^0 apart and the whole coil is rotated in a uniform magnetic field.
Bekalan tiga fasa dihasilkan apabila tiga gegelung diletakkan 60^0 dan seluruh gegelung diputarkan dalam medan magnet seragam.

C. Three phase supply is generated when two coils are placed 120^0 apart the whole coil is rotated in a uniform magnetic field.
Bekalan tiga fasa dihasilkan apabila dua gegelung diletakkan 120^0 dan seluruh gegelung diputarkan dalam medan magnet seragam.

D. Three phase supply is generated when three coils are placed 120^0 apart and the whole coil is rotated in a uniform electromagnetic field.
Bekalan tiga fasa dihasilkan apabila tiga gegelung diletakkan 120^0 dan seluruh gegelung diputarkan 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

6. Calculate the secondary voltage if the turns ratio of a transformer is 12 and the primary AC voltage is 6V.
Kira voltan sekunder sekiranya nisbah lilitan pengubah ialah 12 dan voltan AC primer adalah 6V.

A. 0.5V
B. 50V
C. 72V
D. 2V

CLO2 C3

7. Calculate the rms value of a sinusoidal current of maximum value 30A.
Kira nilai arus rms apabila diberi nilai arus maksima sinusoidal sebanyak 30A.

A. 12.12mA
B. 15.1 mA
C. 21.21A
D. 1A

CLO2 C3

8. Calculate the inductance of the coil if the coil has a reactance of 120Ω in a circuit with a supply frequency of 4kHz.
Kirakan nilai induktan bagi gegelung tersebut jika satu gegelung yang mempunyai nilai reaktans 120Ω disambungkan dengan bekalan frekuensi 4kHz dalam satu litar.

A. 6.3mH
B. 4.77mH
C. 3.27mH
D. 5.51mH

CLO2 C3

9. Determine the resonant frequency of the circuit if a pure inductance of 150mH is connected in parallel with a 40μF capacitor across a 50V, variable frequency supply.
Tentukan nilai frekuensi resonan pada litar tersebut jika satu pearuh bernilai 150mH disambungkan secara selari dengan kapasitor 40μF dan merentasi bekalan frekuenci bolehubah 50V.

A. 50Hz
B. 63.77Hz
C. 64.97Hz
D. 120Hz

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. $V_{PH} = 415V$, $I_{PH} = 17.32A$
B. $V_{PH} = 415V$, $I_{PH} = 30.0A$
C. $V_{PH} = 239.6V$, $I_{PH} = 30.0A$
D. $V_{PH} = 239.6V$, $I_{PH} = 17.32A$

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

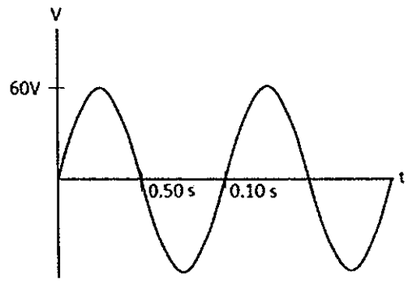

Figure B1(a) / *Rajah B1(a)*

CLO1
C1

(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
C2

(b) Based on **Figure B1(a);**

*Berdasarkan **Rajah B1(a);***

i) State the peak voltage,Vp.

Nyatakan nilai voltan puncak,Vp

[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 314tV.

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

i) The frequency and period time

Frekuensi dan tempoh

[4 marks]

[*4 markah*]

ii) The value of the voltage at t = 4ms

Nilai voltan pada ketika t = 4ms

[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 100uF 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 100uF disambung secara siri disambung merentasi bekalan kuasa 100V, 50Hz.

[5 marks]

[*5 markah*]

CLO2 C3

(c)

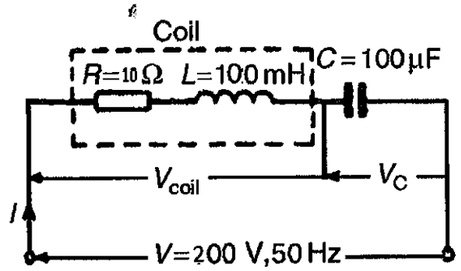

Figure B2(c) / *Rajah B2(c)*

A coil of resistance 10Ω and inductance 100mH in series with capacitor 100uF, is connected across 200V, 50Hz power supply as in **Figure B2(c).** Calculate :

*Suatu gelung dengan rintangan 10Ω dan peraruh 100mH disambungkan secara siri dengan kapasitor 100uF disambung kepada bekalan kuasa 200V, 50Hz 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, 50Hz. 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, 50Hz. 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 4kV and a load of 10kW. 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) Refering 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

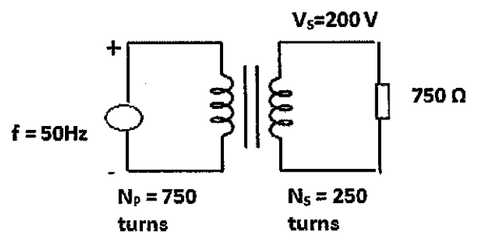

Figure B4(c) / *Rajah B4(c)*

[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 80μF are connected in series to supply 100V, 50Hz. Calculate:

Satu litar mengandungi perintang 15Ω, pearuh 0.1H dan pemuat 80μF 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*]

QUESTION 2

SOALAN 2

CLO2
C3

A circuit which consists of a 12Ω resistor, 45mH inductor and a 100uF 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 100uF 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