

SULIT



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

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI DISEMBER 2015

DET 2033 ELECTRICAL CIRCUITS

TARIKH : 8 APRIL 2016

MASA : 8.30 AM – 10.30 AM (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)

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. Choose the basic equation of a sinusoidal voltage waveform.
Pilih persamaan asas bagi bentuk gelombang sinusoid voltan.

- A. $E_m = e \sin(\omega t \pm \theta)$
- B. $E_m = e \sin(\omega t \times \theta)$
- C. $e = E_m \sin(\omega t \pm \theta)$
- D. $e = E_m \sin$

CLO1
C2

2. Identify what will happen to capacitive reactance when the frequency decreases
Kenalpasti apakah akan berlaku pada regangan kapasitif apabila nilai frekuensi berkurangan

- A. Increase
Meningkat
- B. Remain constant
Tetap
- C. Decrease
Mengurang
- D. Have no changes
Tiada perubahan

CLO1
C1

5. State one characteristic of an ideal transformer.
Nyatakan yang manakah merupakan ciri pengubah ideal.

A. Losses in the core

Kehilangan dalam teras

B. Winding resistance

Rintangan lilitan

C. Winding capacitance

Kemuatan lilitan

D. No magnetic flux leakage

Tiada kebocoran fluk magnet

CLO1
C2

6. Select the value changed by transformer.
Pilih nilai yang ditukar oleh pengubah.

A. Frequency

Frekuensi

B. Voltage

Voltan

C. Reactance

Regangan

D. Power

Kuasa

CLO2
C3

9. A series circuit consists of a resistance of 4Ω , an inductance of 250mH and a variable capacitance connected across a 100V , 50Hz supply. Calculate the capacitance required to produce a state of series resonance.

Satu litar siri dengan rintangan 4Ω , kearuhan 250mH dan kapasitor boleh laras disambung pada bekalan 100V , 50Hz . Kirakan nilai kemuatan yang akan menghasilkan keadaan resonan siri.

- A. $24.9\ \mu\text{F}$
- B. $40.53\ \mu\text{F}$
- C. $94.247\ \mu\text{F}$
- D. $249.9\ \text{mF}$

CLO2
C3

10. A three phase delta connection is connected with a balance load of $Z=200-j300$. The supply voltage given is $V_{\text{Line}} = 415\text{V}$, 50Hz . Calculate the line current.

Sambungan delta tiga fasa disambungkan dengan beban seimbang, $Z=200-j300$. Diberi voltan bekalan $V_{\text{talian}} = 415\text{V}$, 50Hz . Kira arus talian.

- A. 1.15A
- B. 2.05A
- C. 3.47A
- D. 4.53A

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)** methods to generate alternating current.
Senaraikan DUA (2) kaedah untuk menjana arus ulangalik.

[3 marks]

[3 markah]

CLO1
C2

- (b) An alternating current is given by $I = 15 \sin(314t - 0.52) \text{ mA}$. Determine :
Diberi arus ulangalik ialah $I = 15 \sin(314t - 0.52) \text{ mA}$. Tentukan :

- (i) The amplitude value
Nilai amplitude
- (ii) The peak to peak value
Nilai puncak ke puncak
- (iii) The periodic time
Masa yang berkala
- (iv) The phase angle (in degree)
Sudut fasa (dalam darjah)

[5 marks]

[5 markah]

CLO2
C3

- (c) The voltage in an AC circuit at any given time, t , seconds is given by
 $v = 25 \sin(100\pi t + 0.45) \text{ V}$. Calculate:
Voltan yang mengalir melalui litar AU pada mana-mana masa t saat adalah
 $v = 25 \sin(100\pi t + 0.45) \text{ V}$. Kirakan nilai bagi

- (i) The period and frequency
Tempoh dan frekuensi
- (ii) The value of the current when $t=0$
Nilai arus ketika $t=0$

[7 marks]

[7 markah]

QUESTION 2

SOALAN 2

CLO1
C1

- (a) With the aid of a diagram, state the relationship between the voltage and the current for pure inductive circuit.
Dengan bantuan gambarajah, nyatakan hubungan antara voltan dan arus untuk litar kearuhan tulen.

[3 marks]

[3 markah]

CLO1
C2

- (b) Determine the reactive inductance and reactive capacitance for the following series arrangement shown in Figure B1 at a frequency of 50Hz.
Tentukan nilai regangan kearuhan dan regangan kemuatan untuk susunan siri dalam Rajah B1 sekiranya frekuensi adalah 50Hz.

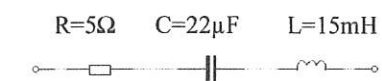


Figure B1 / Rajah B1

[5 marks]

[5 markah]

CLO2
C3

(c) By referring to Figure B2, calculate the total impedance and current at each branch.

Merujuk kepada Rajah B2, kirakan jumlah galangan dan arus pada setiap cabang.

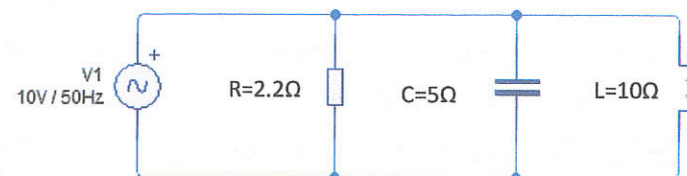


Figure B2 / Rajah B2

[7 marks]
[7 markah]

QUESTION 3
SOALAN 3

CLO1
C1

(a) Identify **THREE (3)** differences between 3 phase system and single phase system.

*Kenalpasti **TIGA (3)** perbezaan di antara sistem 3 fasa dan sistem fasa tunggal.*

[3 marks]
[3 markah]

CLO1
C2

(b) Draw and label the circuit diagram for star connection in a three phase system.

Lukis dan label gambarajah litar sambungan bintang di dalam sistem tiga fasa.

[5 marks]
[5 markah]

CLO2
C3

(c) Referring to Figure B3 , calculate:

Berdasarkan Rajah B3, kirakan:

- (i) phase impedance
Galangan fasa
- (ii) phase and line current
Voltan fasa dan arus talian
- (iii) true power
kuasa sebenar

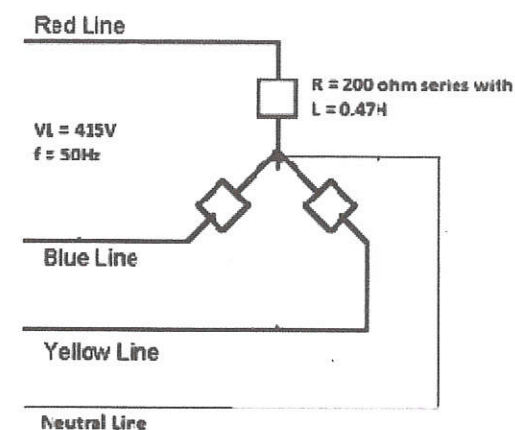


Figure B3 / Rajah B3

[7 marks]
[7 markah]

QUESTION 4
SOALAN 4

CLO1
C1

(a) Draw and label clearly winding, voltages and current for a step down transformer.

Lukis dan labelkan dengan lengkap menunjukkan lilitan, voltan dan arus bagi pengubah langkah turun.

[3 marks]
[3 markah]

CLO1
C2

(b) Identify **FIVE (5)** characteristics of an Ideal Transformer.

*Kenalpasti **LIMA (5)** ciri bagi Pengubah Unggul.*

[5 marks]
[5 markah]

CLO2
C3

(c) Referring to Figure B4;

- (i) Calculate the secondary voltage (V_s), primary current (I_p) and secondary current (I_s).
- (ii) State type of the transformer.

Merujuk Rajah B4 ;

- (i) Kirakan voltan sekunder (V_s), arus primer (I_p) dan arus sekunder (I_s).
- (ii) Nyatakan jenis pengubah tersebut.

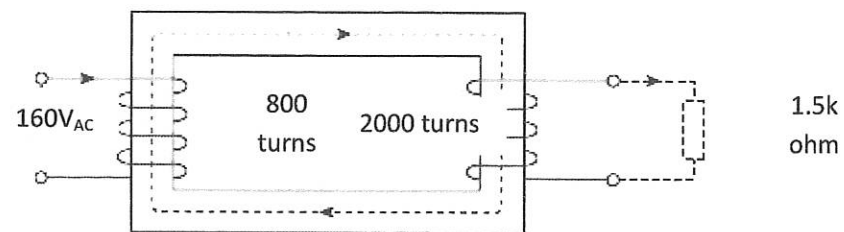


Figure B4 / Rajah B4

[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

Three impedances are connected in series across a 240V, 50Hz supply. The impedances comprise:

- (i) an inductance of 45mH and 20Ω resistance
- (ii) an inductance of 0.065H and 50Ω resistance
- (iii) a capacitor of capacitance $2.4\mu\text{F}$ and resistance 140Ω .

Assuming no mutual inductive effect between the two inductances, calculate the voltage drop across each impedance.

Tiga galangan disambungkan secara siri merentasi bekalan 240V, 50Hz. Nilai-nilai galangan terdiri dari:

- (i) satu peraruh bernilai 45mH dan rintangan 20Ω
- (ii) satu peraruh bernilai 0.065H dan rintangan 50Ω
- (iii) Satu kapasitor dengan nilai kemuatan $2.4\mu\text{F}$ dan rintangan 140Ω .

Dengan menganggap tiada kesan aruhan saling diantara kedua-dua induktor, kirakan susutan voltan merentasi setiap galangan.

[15 marks]

[15 markah]

QUESTION 2**SOALAN 2**CLO2
C3

A series resonance circuit consists of $20.3\mu\text{F}$ capacitor, a coil 0.5H and a resistor 40Ω . When the circuit is connected to a 240V AC supply, calculate the frequency resonance, current of the circuit, voltage across each component, the bandwidth and the Q factor. Sketch the graph of current vs frequency labeled with frequency resonance and current of the circuit.

Sebuah litar salun sesiri mempunyai pemuat $20.3\mu\text{F}$, peraruh 0.5H dan perintang 40Ω . Apabila litar disambungkan kepada bekalan kuasa AU 240V , kirakan frekuensi salun, arus litar, voltan merentasi setiap komponen, jalur lebar dan faktor Q . Lakar graf arus melawan frekuensi disertai dengan label untuk frekuensi salun, dan arus litar.

[15 marks]

[15 markah]

SOALAN TAMAT