

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)

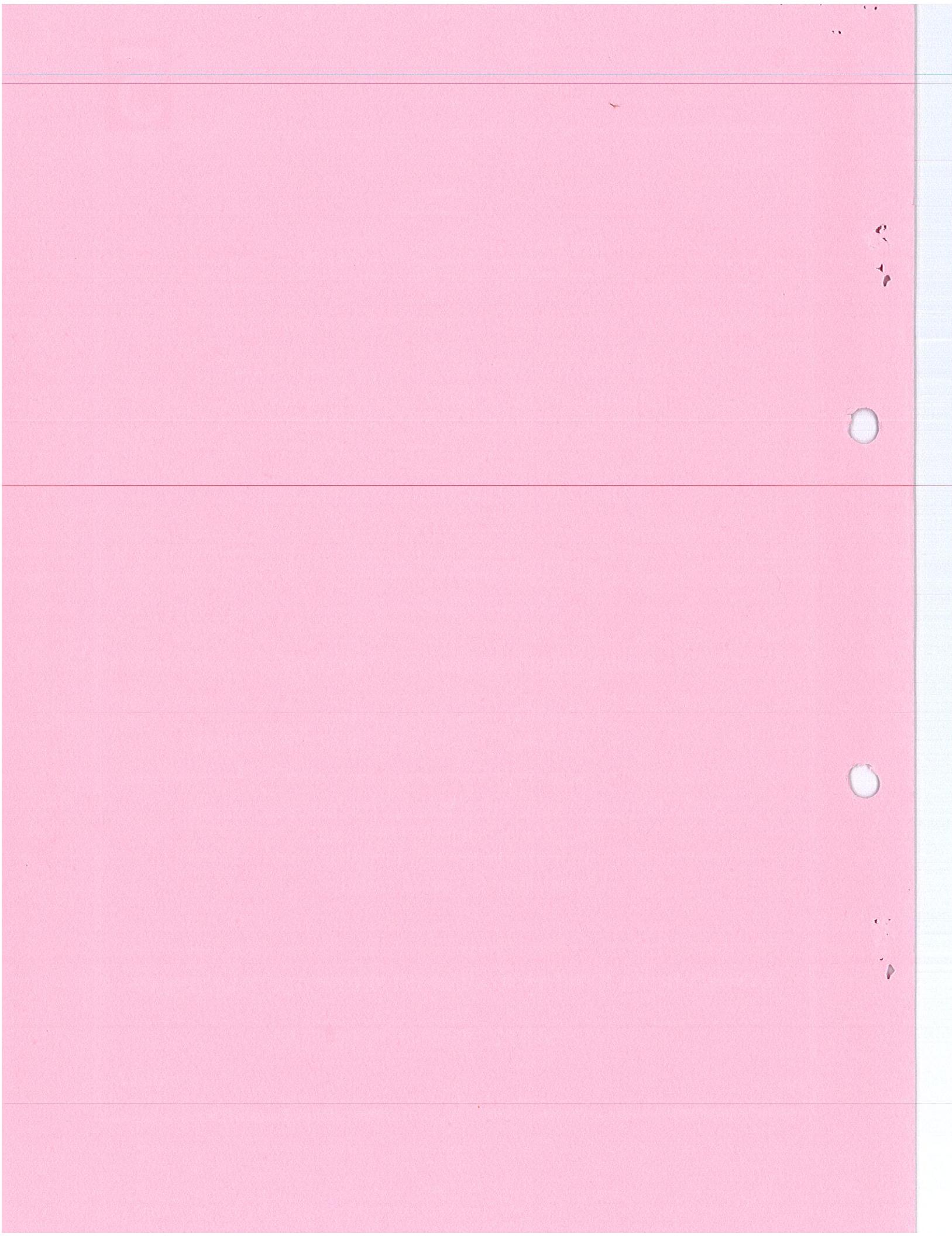
Bahagian B: Struktur (4 soalan)

Bahagian C: Esei (2 soalan)

JANGAN BUKA KERTAS SOALANINI 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

C2

3. Describe the resonance in a series RLC circuit

Terangkan salunan 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. Identify the directly measured voltage across one of the windings in a three-phase connection.

Kenal pasti voltan yang diukur secara terus melalui satu lilitan untuk sambungan tiga-fasa.

- A. Phase voltage – line voltage

Voltan fasa – Voltan talian



- B. Line voltage – phase voltage

Voltan talian –voltan fasa

- C. Line voltage.

Voltan talian

- D. Phase voltage

Voltan fasa

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

7. A waveform of an alternating voltage is given as

$v = 150 \sin(200\pi t - 60^\circ)$ volts. Calculate the frequency of the given waveform.

Satu voltan ulangalik $v = 150 \sin(200\pi t - 60^\circ)$ volts

Kira nilai frekuensi bagi gelombang tersebut.

A. 100Hz

B. 31.8Hz

C. 60Hz

D. 150Hz

CLO2

C3

8. By referring to Figure A1, calculate the current, I_1 .

Dengan merujuk Rajah A1, kirakan arus I_1 .

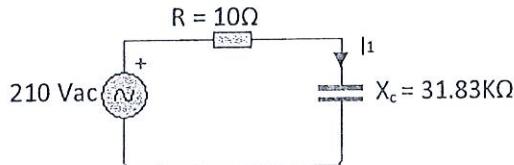


Figure A1 / Rajah A1

A. 2.33mA

B. 5.12mA

C. 3.32mA

D. 6.59mA

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. $24.9 \mu F$
- B. $40.53 \mu F$
- C. $94.247 \mu F$
- D. $249.9 mF$

CLO2
C3

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

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

- (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.

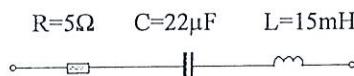


Figure B1 / Rajah B1

[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.

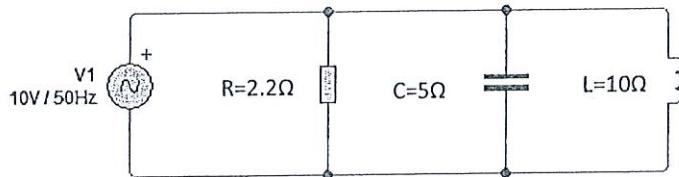


Figure B2 / Rajah B2

[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 taliān
- (iii) true power
kuasa sebenar

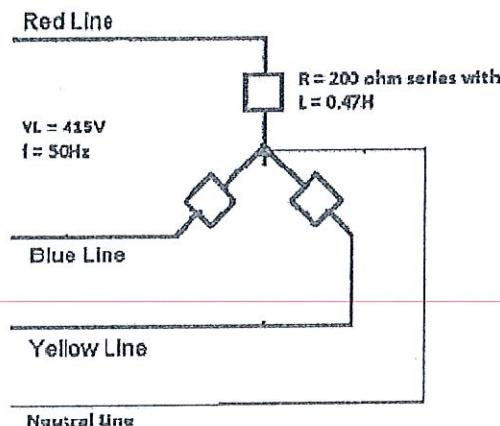


Figure B3 / Rajah B3

[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.*

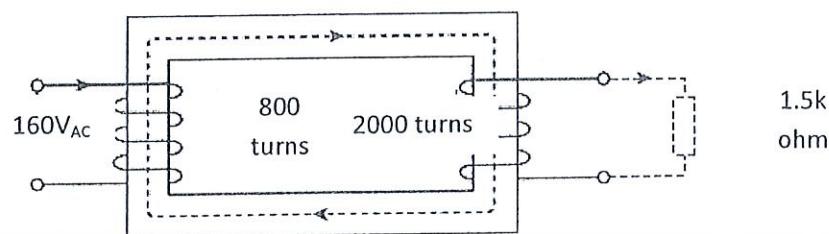


Figure B4 / Rajah B4

[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 20 Ω resistance
- (ii) an inductance of 0.065H and 50 Ω resistance
- (iii) a capacitor of capacitance 2.4 μ F and resistance 140 Ω .

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 20 Ω
- (ii) satu peraruh bernilai 0.065H dan rintangan 50 Ω
- (iii) Satu kapasitor dengan nilai kemuatan 2.4 μ F dan rintangan 140 Ω .

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

A series resonance circuit consists of $20.3\mu F$ capacitor, a coil $0.5H$ and a resistor 40Ω .

C3

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 $20.3\mu F$, 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