

SULIT



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

JABATAN KEJURUTERAAN ELEKTRIK

**PEPERIKSAAN AKHIR
SESI DISEMBER 2014**

DET2033 ELECTRICAL CIRCUITS

**TARIKH : 09 APRIL 2015
MASA : 11.15 – 1.15 PETANG**

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.

Bahagian A: Objektif (10 soalan)

Bahagian B: Struktur (4soalan)

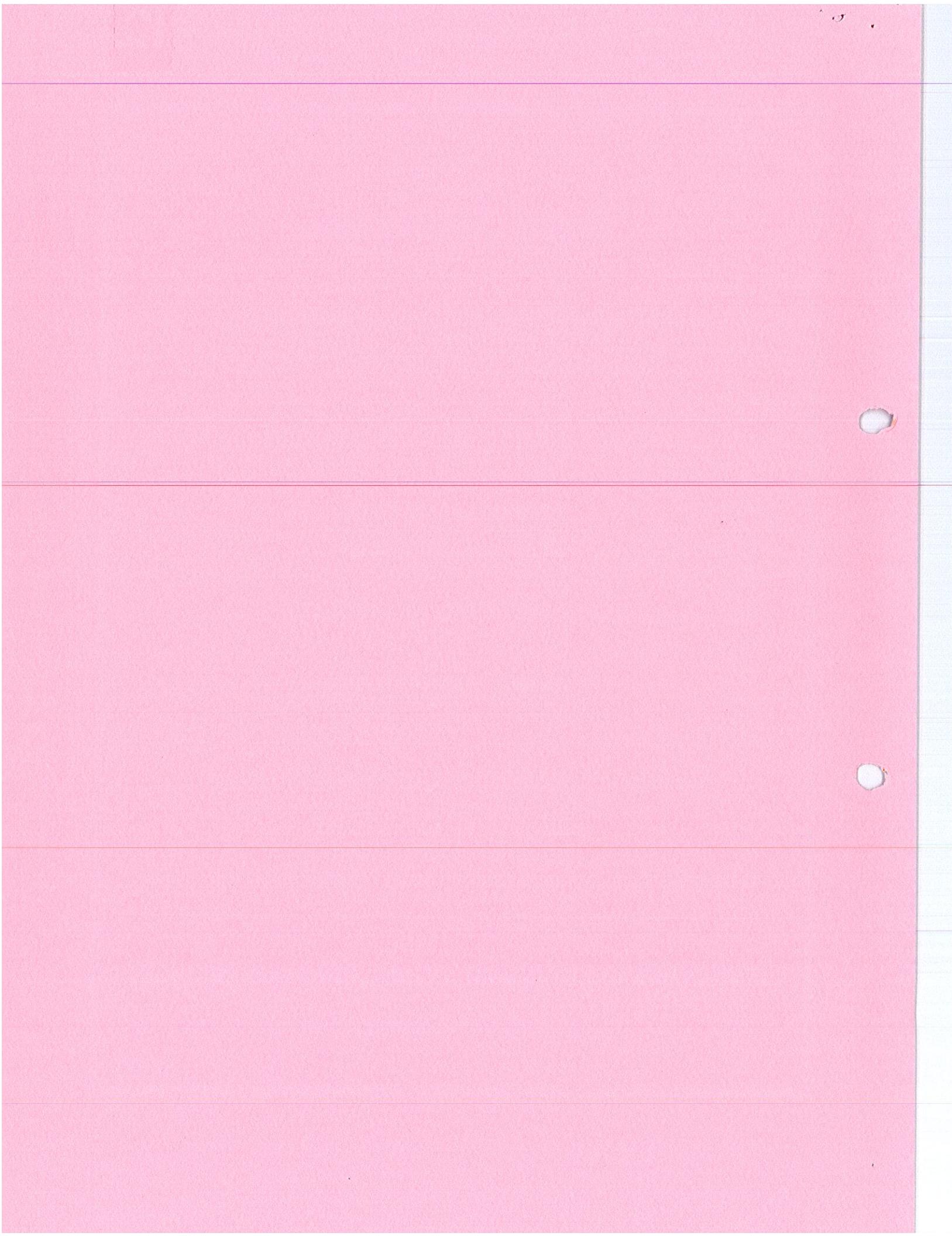
Bahagian C: Esei (2 soalan)

Dokumen sokongan yang disertakan : Kertas Graf, Formula-dsb / Tiada

JANGAN BUKA KERTAS SOALANINI 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.

1. Which of the following statements refer to Alternating Current.

CLO1
C1

Yang manakah pernyataan berikut merujuk kepada Arus Ulang Alik.

- A. Continuous direction and magnitude
Arah dan magnitude berterusan
- B. Varied direction but continuous magnitude
Arah berbeza tetapi magnitude berterusan
- C. Continuous direction but varied magnitude
Arah berterusan tetapi magnitude berbeza
- D. Varied direction and magnitude
Arah dan magnitude yang berbeza

2. Which one of these will be used as a vector reference in a RLC series circuit.

CLO1
C2

Yang manakah akan digunakan sebagai vektor rujukan di dalam litar selari RLC.

- A. Current
Arus
- B. Frequency
Frekuensi
- C. Impedance
Galangan
- D. Voltage
Voltan

CLO1

C2

3. In a series RLC circuit that is operating under the resonant frequency, the current.....

- A. lags the applied voltage
mengekori voltan gunaan
- B. is in phase with the applied voltage
sefasa dengan voltan gunaan
- C. leads the applied voltage
mendahului voltan gunaan
- D. is zero
sifar

4. Select the best explanation for “three phase supply”.

Pilih keterangan yang terbaik untuk “bekalan tiga fasa”.

- A. 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 diputarkan dalam medan magnet seragam.
- B. A 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 diputarkan dalam medan magnet seragam.
- C. A three phase supply is generated when two coils are placed 120° apart and the whole coil is rotated in a uniform magnetic field.
Bekalan tiga fasa dihasilkan apabila dua gegelung diletakkan 120° dan seluruh gegelung diputarkan dalam medan magnet seragam.
- D. A 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 diputarkan dalam medan electromagnet seragam.

CLO1

C1

5. Which one of these are the characteristics of a non-ideal transformer.

Diantara berikut yang manakah merupakan ciri pengubah tidak ideal.

- i. Winding resistance
Rintangan lilitan
- ii. Losses in the core
Kehilangan dalam teras
- iii. Magnetic flux leakage
Kebocoran fluk magnet
- iv. Winding capacitance
Kemuatan lilitan

A. i, ii and iii

C. i, iii and iv

B. ii, iii and iv

D. i, ii, iii and iv

CLO1

C2

6. Transformer changes the value of

Pengubah menukarkan nilai

- A. Voltage
Voltan
- B. Frequency
Frekuensi
- C. Power
Kuasa
- D. Reactance
Reaktan

CLO2
C3

7. An alternating voltage is given by $e = 70 \sin(314t + 30^\circ)$ volt. Determine the voltage if this wave is measured by voltmeter.

Diberi voltan ulangalik sebagai $e = 70 \sin(314t + 30^\circ)$ volt. Dapatkan nilai voltan jika gelombang ini diukur menggunakan jangka volt.

- A. 44.59 V
- B. 49.49 V
- C. 70 V
- D. 140 V

CLO2
C3

8. A $10\ \Omega$ resistance, 90mH inductance, and a $0.015\ \mu\text{F}$ capacitance are connected in series across an AC source. Calculate the impedance magnitude at frequency $1.2\ \text{kHz}$.

Satu rintangan $10\ \Omega$, aruhan 90mH dan kemuatan $0.015\mu\text{F}$ disambung secara siri merentasi bekalan AU. Kirakan magnitud galangan pada frekuensi $1.2\ \text{kHz}$.

- A. $816\ \Omega$
- B. $81.6\ \Omega$
- C. $8.16\ \Omega$
- D. $8.16\ \text{k}\ \Omega$

CLO2
C3

9. A series circuit consists of a resistance of 4Ω , an inductance of 250mH and a variable capacitance connected across a 100V , 60Hz supply. Calculate the capacitance required to give series resonance.

Satu litar siri dengan rintangan $4\ \Omega$, kearuan 250mH dan kapasitor boleh laras disambung pada bekalan 100V , 60Hz . Kirakan nilai kemuatan yang akan menghasilkan keadaan resonan siri.

- A. $24.9\ \mu\text{F}$
- B. $28.1\ \mu\text{F}$
- C. $94.247\ \mu\text{F}$
- D. $249.9\ \text{mF}$

CLO2
C3

10. A three phase generator is connected in delta supplies 200 Volt as line voltage (V_L) and 50 Amp as line current (I_L). What is the value of phase current (I_{PH}).

Satu penjana tiga fasa dengan sambungan delta menghasilkan 200 Volt, voltan talian(V_L) dan 50 Amp arus talian (I_L). Berapakah nilai arus fasa (I_{PH}).

- A. 0.25Amp
- B. 4Amp
- C. 86.5 Amp
- D. 28.90 Amp

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***

CLO1
C1

- (a) List **TWO (2)** methods of generating alternating current.

Senaraikan DUA (2) kaedah untuk menjana arus ulangalik.

[3 marks]
[3 markah]

CLO1
C2

- (b) Calculate the rms voltage of an average value voltage of 12 V.

Kirakan nilai ppgd bagi nilai voltan purata 12 V.

[5 marks]
[5 markah]

CLO2
C3

- (c) The current in an AC circuit at any time t seconds is given by $i = 40 \sin (60\pi t + 0.36)$ A.

Calculate:

*Arus yang mengalir melalui litar AU pada mana-mana masa t saat adalah
 $i = 40 \sin (60\pi t + 0.36)$ A. Kirakan nilai bagi*

- i. The period time 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

 CLO 1
 C1

- a) With the aid of a diagram, state the relationship between the voltage and the current for pure capacitive circuit.

Dengan bantuan gambarajah, nyatakan hubungan antara voltan dan arus untuk litar kapasitif.

[3 marks]
 [3 markah]

 CLO 1
 C2

- b) With reference to Figure B2 (b), determine the total impedance, Z_T for the series circuit which has a frequency of 60 Hz.

Merujuk kepada Rajah B2 (b), tentukan jumlah galangan, Z_T untuk litar siri yang mempunyai frekuensi 60 Hz.

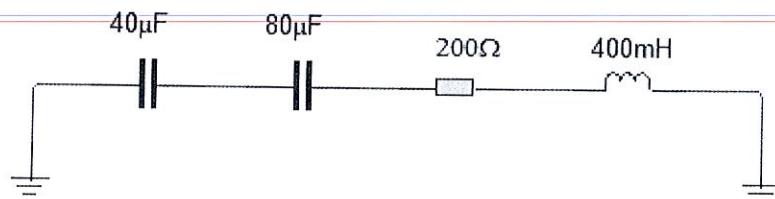


Figure B2 (b)/Rajah B2(b)

[5 marks]
 [5 markah]

 CLO 2
 C3

- c) With reference to Figure B2(c), a 7Ω resistor is connected in parallel with a 31.4 mH inductor and a $100\mu\text{F}$ capacitor. An AC sinusoidal waveform 100 V, 50 Hz is used as a supply to this circuit. Find the value of the total current, I_T flowing in the circuit.

Berdasarkan Rajah B2(c), satu perintang 7Ω disambung secara selari dengan pearuh 31.4mH dan pemuat $100 \mu\text{F}$. Gelombang AC sinusoidal 100 V, 50 Hz digunakan sebagai bekalan untuk litar ini. Cari nilai jumlah arus, I_T yang mengalir dalam litar.

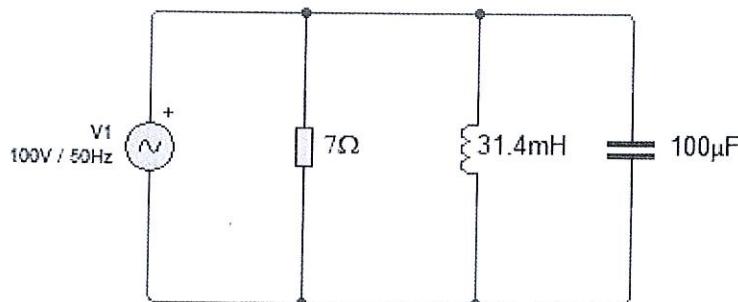


Figure B2 (c)/Rajah B2(c)

[7 marks]
 [7 markah]

CLO1
C1**QUESTION 3**
SOALAN 3

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

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

[3 marks]
[3 markah]

CLO1
C2

- b) With the aid of a diagram, identify the Star and Delta connections for 3 phase system and label all the phases involved.

Dengan bantuan gambarajah yang sesuai, nyatakan penyambungan Bintang dan Delta bagi sistem 3 fasa dan labelkan semua fasa yang terlibat.

[5 marks]
[5 markah]

CLO2
C3

- c) A 400 V, 3-phase, 4 wire, Star-connected system supplies three resistive loads of 15 kW, 20 kW and 25 kW in the red, yellow and blue phases respectively. Determine the current flowing through each phase of red, yellow and blue.

Satu bekalan 3 fasa, 400 V, 4 wayar, sistem sambungan Bintang membekalkan tiga beban rintangan masing-masing berkuasa 15 kW, 20 kW dan 25 kW bagi fasa merah, kuning dan biru. Tentukan arus yang mengalir melalui setiap fasa bagi fasa merah, kuning dan biru tersebut.

[7 marks]
[7 markah]

QUESTION 4
SOALAN 4CLO1
C1

- a) List **THREE (3)** types of transformer.

*Senaraikan **TIGA (3)** jenis pengubah.*

[3marks]
[3 markah]

CLO1
C2

- b) Identify **FIVE (5)** characteristics for the step down transformer and step up transformer.

*Kenalpasti **LIMA (5)** ciri bagi pegubah penurun dan pengubah penaik.*

[5marks]

[5 markah]

- c) With reference to Figure B4(c);

Merujuk Rajah B4(c);

CLO2
C3

- i) Calculate the secondary voltage (V_s), primary current (I_p) and secondary current (I_s).

Kirakan voltan sekunder (V_s), arus primer (I_p) dan arus sekunder (I_s)

- ii) State the type of the transformer.

Nyatakan jenis pengubah tersebut.

[7marks]

[7 markah]

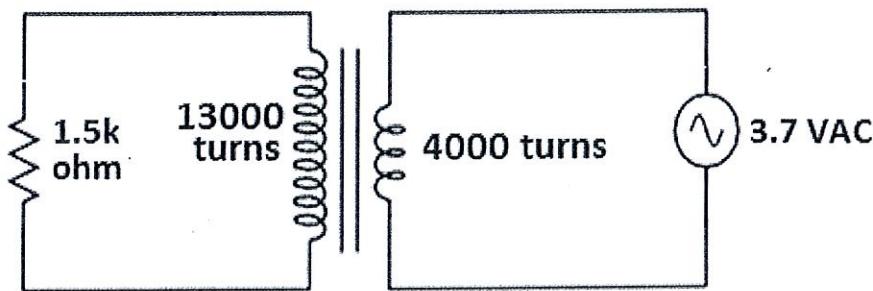


Figure B 4(c)/ Rajah B 4(c)

SECTION C : 30 MARKS**BAHAGIAN C : 30 MARKAH****INSTRUCTION:**

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

With reference to Figure C1 , determine the total current flow (I) and sketch the voltage phasor diagram of the circuit.

Rujuk Rajah C1 ,tentukan nilai jumlah arus (I) dan lakarkan gambarajah voltan fasa litar tersebut.

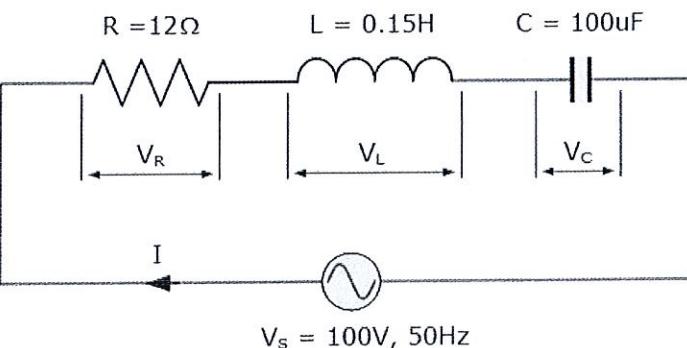


Figure C1/Rajah C1

[15marks]
[15 markah]

QUESTION 2**SOALAN 2**

CLO2
C3

A circuit which consists of a 9Ω resistor, 90 mH inductor and a $900\mu\text{F}$ capacitor is connected in series across a 150V AC supply. Calculate the upper and lower cut-off frequency. Then sketch the resonance graph Current versus Frequency with the obtained value.

Satu litar yang mengandungi perintang 9Ω , pearuh 90mH dan kapasitor $900\mu\text{F}$ disambung secara siri merentasi voltan bekalan 150V AU. Kirakan nilai frekuensi terpotong atas dan bawah. Berdasarkan jawapan yang diperolehi, lakarkan graf resonan Arus melawan Frekuensi.

[15 marks]
[15 markah]

SOALAN TAMAT