

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI JUN 2015

DET2033 ELECTRICAL CIRCUIT

TARIKH : 19 OKTOBER 2015

TEMPOH : 2.30 PM - 4.30 PM (2 JAM)

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

Bahagian A: Objektif (10 soalan)

Bahagian B: Struktur (4 soalan)

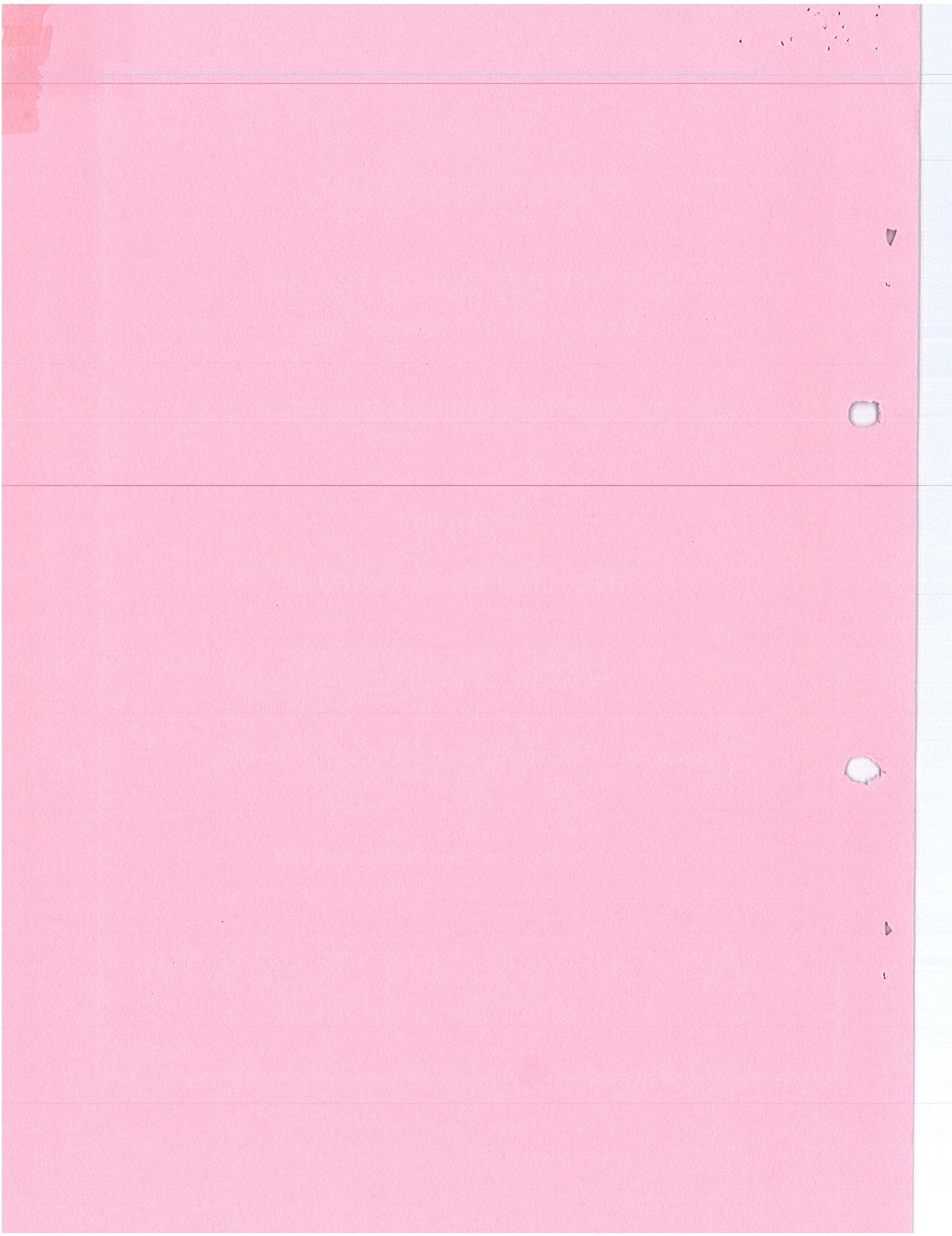
Bahagian C: Esei (2 soalan)

Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS 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. The basic equation of voltage sinusoidal waveform is expressed by:

CLO1
C1

Persamaan asas bagi bentuk gelombang sinusoid voltan dinyatakan oleh:.

- 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. When the frequency is increased, the capacitive reactance will.....

Apabila nilai frekuensi meningkat, regangan kemuatan akan.....

- A. Increase
Meningkat
- B. Become constant
Tetap
- C. Decrease
Menurun
- D. remain unchanged
Tiada perubahan

CLO1

C2

3. Identify the condition in a circuit when $X_L = X_C$.

Kenalpasti keadaan yang berlaku dalam litar apabila $X_L = X_C$.

- A. Draw maximum current.

Arus maksimum terhasil

- B. Applied voltage is zero.

Voltage gunaan bersamaan dengan kosong.

- C. At resonance.

Dalam keadaan resonan.

- D. Draw minimum current.

Arus minima terhasil.

CLO1

C2

4. Which of the following statements associated with 3-phase delta connected circuits is TRUE.

Antara pernyataan berikut yang berkaitan dengan litar 3 fasa sambungan delta adalah benar.

- A. Line voltage is equal to phase voltage

Voltan adalah bersamaan dengan voltan fasa

- B. Line current is equal to phase current.

Arus talian adalah bersamaan arus fasa

- C. Line voltage is $\sqrt{3}$ time of phase voltage

Voltan talian adalah $\sqrt{3}$ kali voltan fasa

- D. Line currents are 60° apart.

Arus talian 60°

CLO1

C1

5. Transformer basically works on,

Pengubah secara asasnya berkerja berdasarkan,

- A. Mutual induction

Aruhan saling

- C. Self induction

Aruhan diri

- B. Static induction

Aruhan kekal

- D. None of these

Tiada berkenaan

- CLO1
C2
6. Calculate the value of primary voltage required to ensure the turn ratio is 0.1 in which the a secondary voltage is 9 V.

Berapakah nilai voltan yang diperlukan bagi memastikan nilai nisbah lilitan adalah 0.1 di mana voltan sekunder adalah 9 V.

- A. 0.9 C. 90
B. 9 D. 900

- CLO2
C3
7. An alternating voltage is given by $v = 150 \sin(200\pi t - 60^\circ)$ volts. Calculate the period of the given waveform.

Satu voltan ulang alik $v = 150 \sin(200\pi t - 60^\circ)$ volts. Kira nilai tempoh bagi gelombang tersebut.

- A. 100s
B. 10ms
C. 0.1s
D. 1s

- CLO2
C3
8. A $10\ \Omega$ resistance, a 90 mH inductance, and a $0.015\text{ }\mu\text{F}$ capacitance are connected in series across an AC source. Calculate the impedance magnitude at the frequency of 1.2 kHz .

Satu rintangan $10\ \Omega$, aruhan 90mH dan kemudan $0.015\text{ }\mu\text{F}$ disambung secara sesiri melalui bekalan AU. Kirakan magnitud galangan pada frekuensi 1.2 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 250 mH and a variable capacitance connected across a $100 \text{ V}, 60 \text{ Hz}$ supply. Calculate the capacitance required to give series resonance.

Satu litar siri dengan rintangan 4Ω , kearuhan 250 mH dan kapasitor boleh laras disambung pada bekalan $100 \text{ V}, 60 \text{ Hz}$. 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 mF

CLO2
C3

10. Refer to Figure A10 below. Given $V_{\text{Line}} = 415 \text{ V}, 50\text{Hz}$. Calculate the line current.

Berdasarkan Rajah A10 dibawah. Diberi nilai $V_{\text{Line}} = 415 \text{ V}, 50 \text{ Hz}$. Kira arus talian.

Balance load at each phase is given by
 $R=200\Omega$ in series with $X_C=300\Omega$

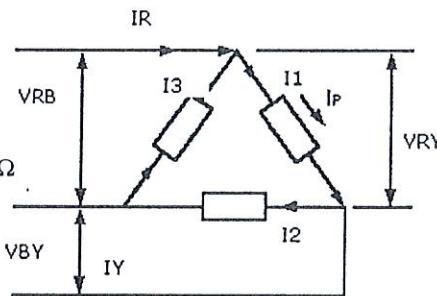


Figure A10 / Rajah A10

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

SECTION B : 60 MARKS**BAHAGIAN B : 60 MARKAH****INSTRUCTION:**

This section consists of **FOUR (4)** structured questions. Answer **ALL** questions.

ARAHAH:

Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **SEMUA** soalan.

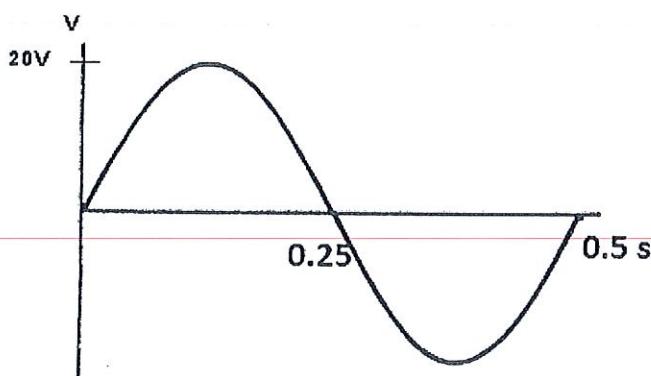
QUESTION 1
SOALAN 1

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 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, 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) An alternating voltage is given by $V(t) = 282.8 \sin 314t$ V. Find;

Satu voltan ulang alik mempunyai persamaan $V(t) = 282.8 \sin 314t$ V. Dapatkan nilai;

- i) average voltage (V_{avg}).

Voltan purata (V_{avg}).

[2 marks]

[2 markah]

- ii) frequency (f).

fekuensi (f).

[2 marks]

[2 markah]

- iii) the instantaneous voltage value when $t = 4$ ms.

Nilai voltan seketika apabila $t = 4$ ms.

[3 marks]

[3 markah]

QUESTION 2**SOALAN 2**

CLO 1

C1

- a) Draw a phasor diagram to represent relation between current and voltage for a purely resistive AC circuit, a purely inductive AC circuit and a purely capacitive AC circuit.

Lakarkan gambarajah bagi menunjukkan hubungan antara arus dan voltan bagi litar AU rintangan tulen, litar AU induktif tulen dan litar AU kapasitif tulen.

[3 marks]
[3 markah]

CLO 1

C2

- b) A series circuit consist of resistance, 50Ω and capacitance, $20 \mu F$ are connected to supply $200 V$, $100 Hz$. Calculate:

Satu litar sesiri mengandungi perintang 50Ω dan kapasitor $20 \mu F$ disambungkan kepada bekalan kuasa $200 V$, $100 Hz$. Kirakan:

- The circuit impedance, Z
Galangan litar, Z
- The current flowing in the circuit
Arus yang mengalir dalam litar
- The phase angle between voltage and current
Beza fasa antara voltan dan arus

[5 marks]
[5 markah]

CLO 2

C3

- c) For the circuit shown in Figure B2 (c), determine the voltage V_1 and V_2 if the supply frequency is $1 kHz$. Then calculate the supply voltage V .

Rujuk Rajah B2(c). Jika diberi frekuensi untuk litar tersebut adalah $1kHz$, tentukan nilai Voltan pada V_1 dan V_2 . Kemudian kirakan voltan bekalan untuk litar tersebut.

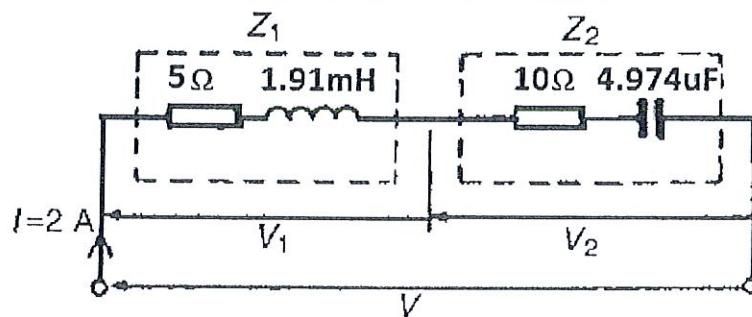


Figure B2(c) / Rajah B2(c)

[7 marks]
[7 markah]

QUESTION 3**SOALAN 3**CLO1
C1

- a) Explain the differential of connection method of Star (Y) and Delta (Δ) system.

Jelaskan perbezaan di antara sistem sambungan Bintang (Y) dan Delta (Δ).

[3 marks]
[3 markah]

CLO1
C2

- b) Three load resistance of 40Ω is connected in delta to a 415 V, 3 ϕ . Determine phase voltage and phase current for the system.

Tiga beban rintangan 40Ω disambung secara delta kepada 415 V, 3 ϕ . Tentukan voltan fasa dan arus fasa untuk sistem ini.

[5 marks]
[5 markah]

CLO2
C3

- c) Each phase in Delta (Δ) connected consists of 50Ω resistor and connected in series with the capacitor, $50 \mu\text{F}$. This three phase load is supplied with line voltage, 440 V and frequency, 50 Hz. Calculate the phase and line currents.

Setiap fasa di dalam sambungan Delta (Δ) terdiri daripada perintang 50Ω yang disambung bersiri dengan kapasitor $50 \mu\text{F}$. Beban tiga fasa ini dibekalkan dengan voltan talian 440 V dan frekuensi 50 Hz. Tentukan nilai arus fasa dan arus talian.

[7 marks]
[7 markah]

QUESTION 4**SOALAN 4**CLO1
C1

- a) Define transformer ratio

Definisikan nisbah pengubah.

[3marks]
[3 markah]

CLO1
C2

- b) Explain the characteristics of the step up transformer.

Terangkan ciri-ciri pengubah langkah naik.

[5marks]
[5 markah]

CLO1
C2

- c) By referring to Figure B4(c), calculate :

Merujuk pada Rajah B4(c), kirakan:

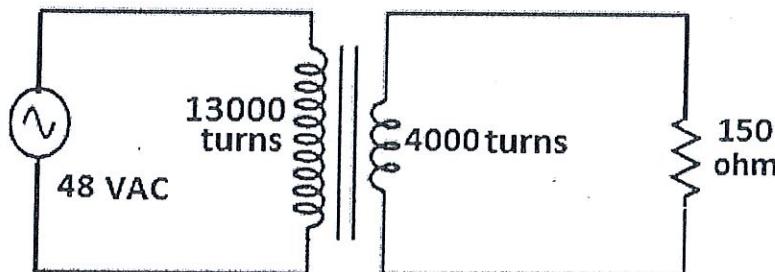


Figure B4(c) / Rajah B4(c)

- (i) Primary voltage [1 mark]

Voltan primer [1 markah]

- (ii) Secondary voltage [2 marks]

Voltan sekunder [2 markah]

- (iii) Secondary current [2 marks]

Arus sekunder [2 markah]

- (iv) Primary current [2 marks]

Arus primer [2markah]

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

- CLO2 A series of RLC circuit has the following values $R = 8\Omega$, $C = 220 \mu F$ and $L = 25 mH$. If the circuit has an instantaneous voltage of $V_s = 17 \sin(377t)$ V, determine the instantaneous current and draw its phasor diagram. What value will this current have at 5.0 m sec?

SOALAN 1

Satu litar siri RLC mengandungi nilai $R = 8\Omega$, $C = 220 \mu F$ and $L = 25 mH$. Sekiranya litar mempunyai nilai voltan seketika iaitu $V_s = 17 \sin(377t)$ V, carikan persamaan nilai arus seketika dan lukiskan gambarajah fasanya. Apakah nilai arus seketika pada 5.0 ms?

[15marks]
[15 markah]

QUESTION 2

- CLO2 A coil of inductance 120 mH are connected in series with a capacitance of $2 \mu F$ and a resistance of 12Ω across a 50 V and variable frequency supply. Determine the bandwidth of the circuit during the resonance and voltage across each component.

SOALAN 2

Satu gegelung aruhan 120 mH disambungkan secara siri dengan pemuat $2 \mu F$ dan perintang 12Ω merentasi bekalan 50V dan frekuensi bolehubah. Tentukan nilai jalur lebar litar tersebut dalam keadaan resonan dan nilai voltan pada setiap komponen.

[15 marks]
[15 markah]

END OF QUESTION

SOALAN TAMAT