

**SULIT**



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

**JABATAN KEJURUTERAAN ELEKTRIK**

**PEPERIKSAAN AKHIR**

**SESI JUN 2018**

**DET2033 : ELECTRICAL CIRCUITS**

**TARIKH : 16 NOVEMBER 2018**

**MASA : 3.00 PETANG - 5.00 PETANG (2 JAM)**

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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

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**JANGAN BUKA KERTAS SOALAN INI 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.*

CLO1  
C1

1. Identify the peak voltage when an alternating voltage is given by  
 $V = 75\sin(200\pi t - 0.25)$  volt.  
*Berapakan nilai voltan puncak jika voltan ulang alik yang diberikan adalah,  
 $V = 75\sin(200\pi t - 0.25)$  volt.*

- A. 75V
- B. 200V
- C. 0.25V
- D. 53.02V

CLO1  
C2

2. Determine the inductive reactance results in a current state  
*Tentukan hasil kearuhan reaktans dalam keadaan semasa*

- A. Leads the voltage by  $90^\circ$   
*Mendulu voltage  $90^\circ$*
- B. Is in phase with the voltage  
*Sefasa dengan voltage*
- C. Leads the voltage by  $\pi$  rad  
*Mendulu voltage  $\pi$  rad*
- D. Lags the voltage by  $\pi/2$  rad  
*Mengekor voltan  $\pi/2$  rad*

CLO1  
C2

3. Identify imaginary part in a series R-L-C circuit when resonance occurs.  
*Kenal pasti bahagian khayalan dalam litar R-L-C siri apabila resonans berlaku.*

- A. 1
- B. 0.5
- C. 0
- D. 0.9

CLO1  
C2

4. Select the **CORRECT** explanation which describes the phase current, line current and load current in a Y-Y source-load configuration.  
*Pilih keterangan yang BETUL yang menerangkan arus fasa, arus talian dan arus beban dalam konfigurasi sumber-beban Y-Y.*
- A. Phase current, line current and load current are  $120^\circ$  out of phase.  
*Arus fasa, arus talian dan arus beban adalah berbeza fasa sebanyak  $120^\circ$ .*
  - B. Phase current, line current and load current are all equal in each phase.  
*Arus fasa, arus talian dan arus beban adalah kesemuanya sama fasa.*
  - C. Load current and line current are in phase, but both are out of phase with the phase current.  
*Arus beban dan arus talian adalah sama fasa, tetapi kedua-duanya berbeza fasa dengan arus fasa.*
  - D. Phase current and line current are in phase, but both are  $120^\circ$  out of phase with the load current.  
*Arus fasa dan arus talian adalah sama fasa, tetapi kedua-duanya adalah berbeza fasa dengan arus beban sebanyak  $120^\circ$ .*

CLO1  
C1

5. Choose the **CORRECT** effect in increasing the number of turns on the secondary part of a transformer.  
*Pilih kesan yang BETUL apabila berlaku penambahan bilangan lilitan pada bahagian sekunder sebuah pengubah.*
- A. Increase the primary current  
*Meningkatkan arus primer*
  - B. Increase the secondary current  
*Meningkatkan arus sekunder*
  - C. Decrease the secondary current  
*Mengurangkan arus sekunder*
  - D. Have no effect on the secondary current  
*Tiada kesan ke atas arus sekunder*

- CLO1  
C2
6. An ideal transformer has a turn's ratio of 2. Find the secondary power, if the primary power is 100 W.  
*Sebuah pengubah unggul mempunyai nisbah lilitan bersamaan 2. Cari kuasa bahagian sekunder, sekiranya kuasa bahagian primer adalah 100 W.*
- A. 50 W  
B. 75 W  
C. 100 W  
D. 200 W

- CLO2  
C3
7. Determine the frequency for the waveforms shown in Figure A(7).  
*Tentukan frekuensi bagi bentuk gelombang yang ditunjukkan dalam rajah A(7).*

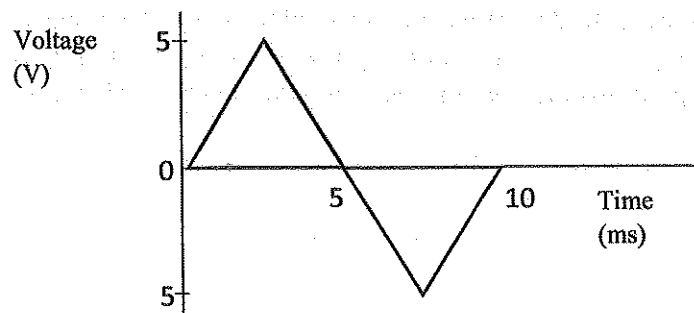


Figure A7/Rajah A7

- A. 10 Hz  
B. 0.1 Hz  
C. 100 Hz  
D. 50 Hz
- CLO2  
C3
8. Determine the capacitive reactance of a capacitor of  $10\mu\text{F}$  when connected to a circuit of frequency 50 Hz.  
*Tentukan regangan kapasitor  $10\mu\text{F}$  bila disambungkan dengan litar yang mempunyai nilai frekuensi 50 Hz.*
- A.  $318.3\Omega$   
B.  $0.796\Omega$   
C.  $33.83\Omega$   
D.  $31.83\Omega$

CLO2  
C3

9. Determine the range between lower cut-off frequency,  $f_L$  and upper cut-off frequency,  $f_H$  of an RLC circuit that frequency resonant at 150 kHz and has a Q of 30.

*Tentukan julat di antara frekuensi terpotong bawah,  $f_L$  dan frekuensi terpotong atas,  $f_H$  bagi satu litar RLC pada frekuensi resonans 150 kHz dan mempunyai nilai Q sebanyak 30.*

- A. 100 kHz to 155 kHz
- B. 147.5 kHz to 152.5 kHz
- C. 149.97 kHz to 150.03 kHz
- D. 4500 kHz to 295.5 kHz

CLO2  
C3

10. Calculate the phase current in a star connected three phase system, if given each load resistance is  $30\Omega$  per phase connected to 415V three phase supply.

*Kirakan arus fasa dalam sistem tiga fasa sambungan bintang, jika diberi beban rintangan setiap fasa ialah  $30\Omega$  bersambung dengan bekalan kuasa tiga fasa 415V.*

- A. 8.0 A
- B. 13.8 A
- C. 24.0 A
- D. 41.5 A

**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) Define the Amplitude, Frequency and Instantaneous Value.

*Takrifkan Amplitude, Frekuensi dan Nilai seketika.*

[3 marks]

[3 markah]

CLO1  
C2

b) Calculate the peak and mean values for a 240V voltage supply.

*Kirakan nilai puncak dan nilai min bagi voltan bekalan 240 V.*

[5 marks]

[5 markah]

CLO2  
C3

c) An alternating voltage is given by  $V = 75\sin(200\pi t - 0.25)$  volts. Calculate:

*Diberi voltan ulang alik  $V = 75\sin(200\pi t - 0.25)$  volts. Kirakan:*

i. The amplitude value / *Nilai puncak*

ii. The peak to peak value / *Nilai puncak ke puncak*

iii. The r.m.s value / *Nilai p.p.g.d*

iv. The periodic / *Tempoh*

v. The frequency / *Frekuensi*

vi. The phase angle (in degrees) / *Sudut fasa (dalam rajah)*

[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 capacitive circuit.

*Dengan bantuan gambarajah, nyatakan hubungan antara voltan dan arus bagi litar kapasitan tulen.*

[3 marks]

[3 markah]

CLO1  
C2

- b) A coil has an inductance of 40mH and negligible resistance. Calculate its inductive reactance and the resulting current if connected to:

*Satu gelung kearuhan 40mH dan kerintangan diabaikan. Kirakan regangan aruhan dan arus yang terhasil sekiranya disambungkan pada:*

- A 240V, 50Hz supply
- A 100V, 1KHz supply

[5 marks]

[5 markah]

CLO2  
C3

- c) With reference to Figure B2(c), calculate the total impedance  $Z_T$  and total current  $I_T$ .

*Merujuk pada Rajah B2(c), kirakan jumlah galangan dan jumlah arus.*

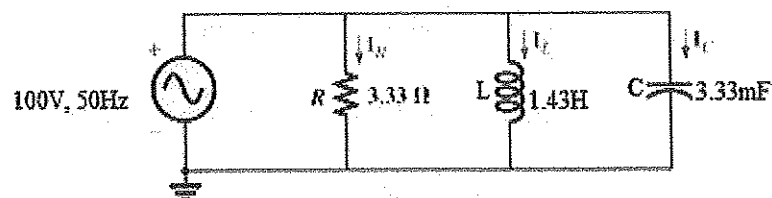


Figure B2(c)/ Rajah B2(c)

[7 marks]

[7 markah]

## QUESTION 3

## SOALAN 3

CLO1  
C1

- a) List the phasor equations of the three phase voltages,  $E_A$ ,  $E_B$  and  $E_C$  generated by a three-phase generator, and sketch its phasor diagram.

*Senaraikan persamaan-persamaan fasa bagi tiga voltan fasa  $E_A$ ,  $E_B$  dan  $E_C$  yang dijanakan oleh penjana tiga fasa, seterusnya lakarkan gambarajah fasanya.*

[3 marks]

[3 markah]

CLO1  
C2

- b) A three load resistance of  $60\Omega$  is connected in delta to a 500V, 3 phase supply. Determine phase voltage and line current for the system.

*Tiga beban rintangan  $60\Omega$  disambung secara delta kepada 500V, bekalan 3 fasa. Tentukan voltan fasa dan arus talian untuk sistem ini.*

[5 marks]

[5 markah]

CLO2  
C3

- c) A three coil balanced positive sequence Y-connected source with  $E_{AN} = 100\angle 10^\circ V$  is connected to a  $\Delta$ -connected balanced load with  $(8+j4)\Omega$  per phase. Calculate the phase current and line current.

*Tiga gelung seimbang jujukan positif bekalan sambungan Y dengan*

*$E_{AN} = 100\angle 10^\circ V$  disambung kepada beban seimbang sambungan  $\Delta$  dengan  $(8+j4)\Omega$  setiap fasa. Kirakan arus fasa dan arus talian.*

[7 marks]

[7 markah]



## QUESTION 4

## SOALAN 4

CLO1  
C1

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

*Senaraikan TIGA (3) jenis pengubah.*

[3 marks]

[3 markah]

CLO1  
C2

- b) An ideal transformer is connected to a power supply 240V, supplies a lamp of 12V, 150W. Calculate the transformer turns ratio and the current taken from the supply.

*Sebuah pengubah unggul disambung kepada bekalan kuasa 240V, membekalkan lampu 12V, 150W. Kirakan nisbah lilitan pengubah dan arus pada bekalan kuasa.*

[5 marks]

[5 markah]

CLO2  
C3

- c) A 7.5kVA single phase transformer has a turns ratio of 8:1 and is fed from a 3kV supply. By neglecting losses, determine:

*Sebuah pengubah satu fasa 7.5kVA mempunyai nisbah lilitan 8:1 dan dibekalkan dengan bekalan kuasa 3kV. Dengan mengabaikan kehilangan, tentukan:*

- i. The full load secondary current  
*Arus sekunder beban penuh*
- ii. The minimum load resistance which can be connected across the secondary winding to give full load kVA  
*Beban rintangan minimum yang boleh disambung merentangi belitan sekunder untuk menghasilkan kVA beban penuh*
- iii. The primary current at full load kVA  
*Arus primer pada kVA beban penuh*

[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

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

Merujuk kepada **Rajah C1**, tentukan jumlah nilai jumlah arus ( $I$ ) dan lakarkan gambarajah voltan fasa litar tersebut.

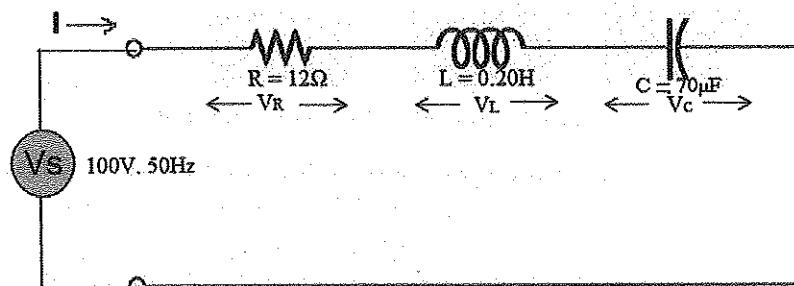


Figure C1 / Rajah C1

[15 marks]

[15 markah]

## QUESTION 2

## SOALAN 2

CLO2  
C3

An RLC series circuit has a resonant frequency of 2kHz and a Q-factor at resonance of 40. If the impedance of the circuit at resonance is  $30\Omega$ , determine the values of:

*Satu litar siri RLC mempunyai frekuensi resonan 2kHz dan faktor-Q 40 semasa resonan. Jika galangan litar semasa resonan ialah  $30\Omega$ , tentukan nilai-nilai berikut:*

- i) The inductance  
*Kearuhan*
- ii) The capacitance  
*Kemuatan*
- iii) The bandwidth  
*Lebar jalur*
- iv) The lower and upper cut-off frequencies  
*Frekuensi terpotong bawah dan frekuensi terpotong atas*
- v) Sketch current versus frequency and label  $f_L$ ,  $f_H$ , and  $f_r$ .  
*Lakarkan graf arus melawan frekuensi dan labelkan  $f_L$ ,  $f_H$ , and  $f_r$ .*

[15 marks]

[15 markah]

SOALAN TAMAT