SULIT

POLITEKNIK MALAYSIA

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 SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

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

   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 √3 time of phase voltage
Voltan talian adalah √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
B. 9
C. 90
D. 900

CLO2 C3

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

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

A. 100s

B. 10ms

C. 0.1s

D. 1s

CLO2 C3

8. A 10 Ω resistance, a 90 mH inductance, and a 0.015 uF capacitance are connected in series across an AC source. Calculate the impedance magnitude at the frequency of 1.2 kHz.

Satu rintangan 10 Ω, aruhan 90mH dan kemuatan 0.015uF disambung secara sesiri melalui bekalan AU. Kirakan magnitud galangan pada frekuensi 1.2 kHz.

A. 816 Ω

B. 81.6 Ω

C. 8.16 Ω

D. 8.16 k Ω

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 V, 60 Hz supply. Calculate the capacitance required to give series resonance.

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

A. 24.9μF
B. 28.1μF
C. 94.247 μF
D. 249.9 mF

CLO2
C3

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

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

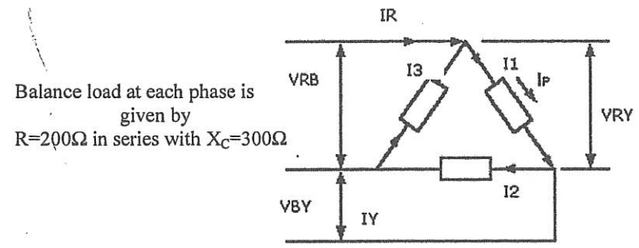

Figure A10 / Rajah A10

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.

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

QUESTION 1
SOALAN 1

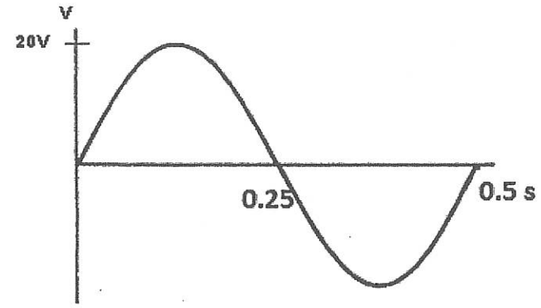

Figure B1(a)/ Rajah B1(a)

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, Vp.
Nyatakan nilai voltan puncak, Vp.

[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 (Vavg).
Voltan purata (Vavg).

[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, 50 Ω and capacitance, 20 μF are connected to supply 200 V, 100 Hz. Calculate:

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

i. The circuit impedance, Z
Galangan litar, Z

ii. The current flowing in the circuit
Arus yang mengalir dalam litar

iii. 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 V1 dan V2. Kemudian kirakan voltan bekalan untuk litar tersebut.

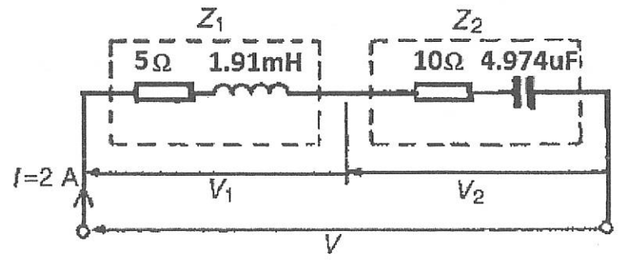

Figure B2(c) / *Rajah B2(c)*

[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 40 Ω is connected in delta to a 415 V, 3ϕ. Determine phase voltage and phase current for the system.

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

[5 marks]
[5 *markah*]

CLO2 C3

c) Each phase in Delta (Δ) connected consists of 50 Ω resistor and connected in series with the capacitor,50 uF. 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 50 Ω yang disambung bersiri dengan kapasitor 50 uF. 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:

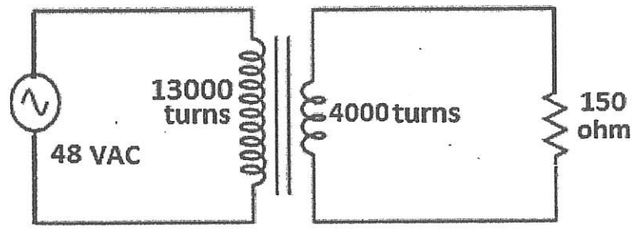

Figure B4(c) / *Rajah B4(c)*

(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
C3

A series of RLC circuit has the following values R= 8Ω, C= 220 uF and L= 25 mH. If the circuit has an instantaneous voltage of Vs = 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 Ω, C= 220 uF and L= 25 mH. Sekiranya litar mempunyai nilai voltan seketika iaitu Vs=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
C3

A coil of inductance 120 mH are connected in series with a capacitance of 2 μF and a resistance of 12 Ω across a 50 Vand 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 μF dan perintang 12 Ω 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