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**FINAL EXAMINATION / PEPERIKSAAN AKHIR**  
**SEMESTER 2 – SESSION 2015 / 2016**  
**PROGRAM KERJASAMA**

COURSE CODE : DDPE 2173  
KOD KURSUS

COURSE NAME : CIRCUIT THEORY / TEORI LITAR  
NAMA KURSUS

YEAR / PROGRAMME : 2 DDPB / E / K / P  
TAHUN / PROGRAM

DURATION : 2 HOURS 30 MINUTES / 2 JAM 30 MINIT  
TEMPOH

DATE : APRIL 2016  
TARIKH

INSTRUCTION : ANSWER ALL QUESTIONS / JAWAB **SEMUA** SOALAN  
ARAHAN

( You are required to write your name and your lecturer's name on your answer script )  
( Pelajar dikehendaki tuliskan nama dan nama pensyarah pada skrip jawapan )

NAME / NAMA PELAJAR	:	.....
I.C NO. / NO. K/PENGENALAN	:	.....
YEAR / PROGRAMME TAHUN / PROGRAM	:	.....
COLLEGE'S NAME NAMA KOLEJ	:	.....
LECTURER'S NAME NAMA PENSYARAH	:	.....

This examination paper consists of **7** pages including the cover  
Kertas soalan ini mengandungi **7** muka surat termasuk kulit hadapan

Q1. Calculate the current,  $I_o$  in the circuit of Figure Q1 using nodal analysis.

Kira nilai arus,  $I_o$  dalam litar Rajah Q1 menggunakan analisis nod.

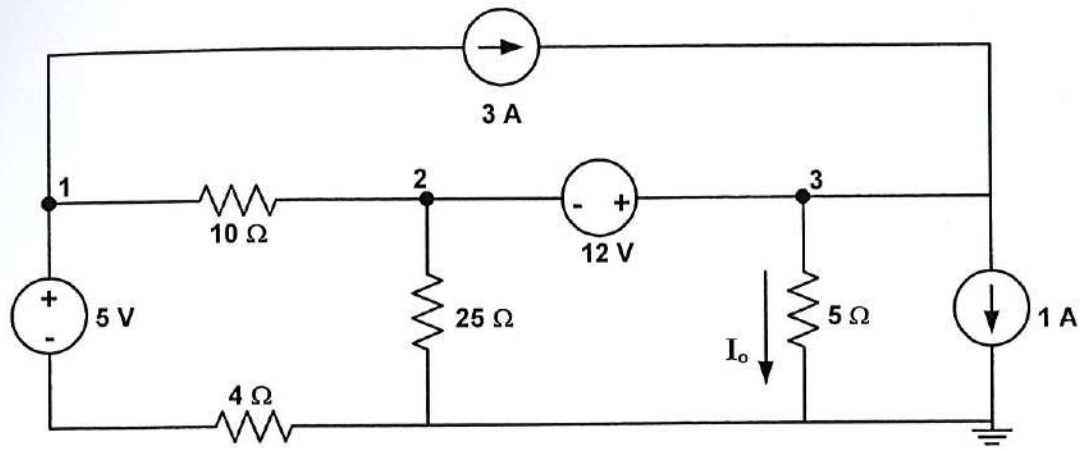


Figure Q1 / Rajah Q1

( 13 marks/ markah )

Q2. Determine the voltage,  $V_o$  in the circuit of Figure Q2 using Norton's theorem. Solve for Norton current,  $I_N$  using mesh analysis.

Tentukan voltan,  $V_o$  dalam litar Rajah Q2 menggunakan teorem Norton. Gunakan analisis jejaring untuk mendapatkan arus Norton,  $I_N$ .

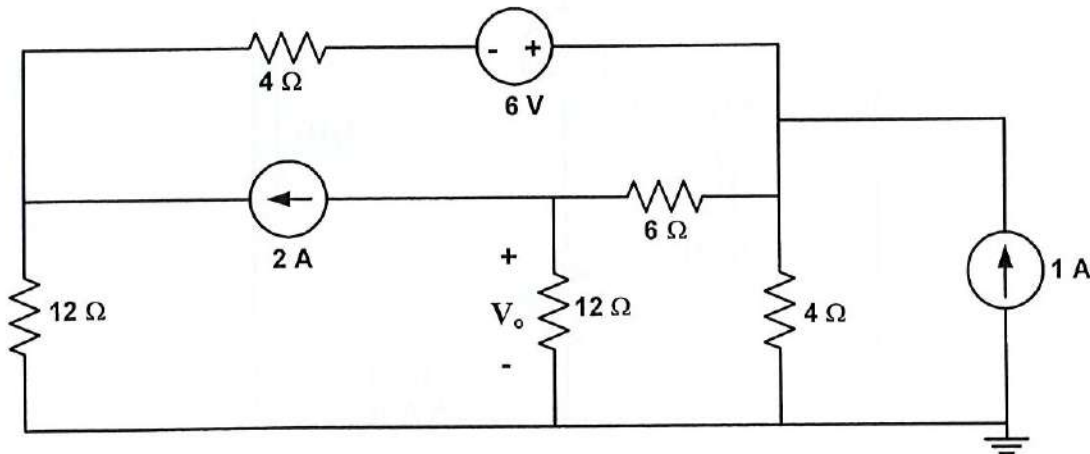


Figure Q2 / Rajah Q2

( 15 marks/ markah )

Q3. Referring to Figure Q3, given that the current,  $i_1(t) = 5 \sin(500t + 100^\circ) \text{ A}$ .

- (a) Draw the phasor circuit.
- (b) Find the total impedance,  $Z_T$ .
- (c) Draw the impedance triangle.
- (d) Determine the voltage source,  $V_S$ .
- (e) Find the current,  $i_2(t)$ .
- (f) Find the voltage,  $V_C$ .

Merujuk kepada Rajah Q3, diberi arus,  $i_1(t) = 5 \sin(500t + 100^\circ) \text{ A}$ .

- (a) Lukiskan litar pemfasa.
- (b) Dapatkan jumlah galangan,  $Z_T$ .
- (c) Lukiskan segitiga galangan.
- (d) Tentukan sumber voltan,  $V_S$ .
- (e) Dapatkan arus,  $i_2(t)$ .
- (f) Dapatkan voltan,  $V_C$ .

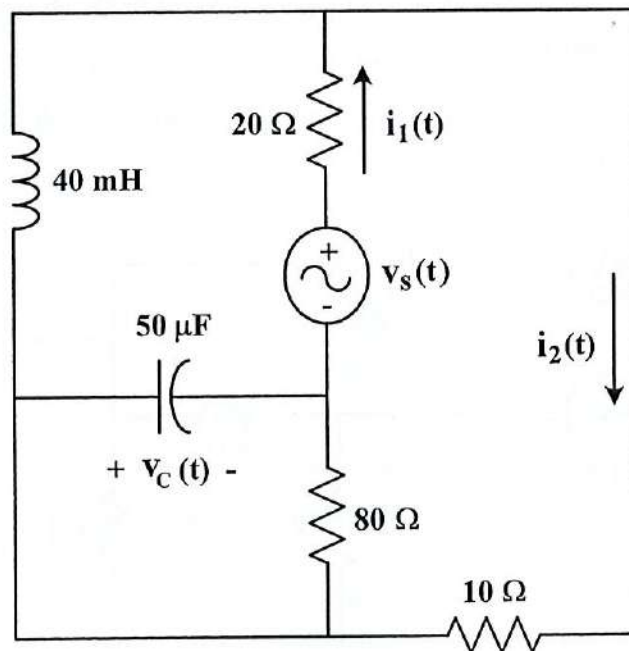


Figure Q3 / Rajah Q

(18 marks/ markah)

Q4. Referring to Figure Q5, find the voltage,  $V_o$  using superposition theorem.

*Merujuk Rajah Q5, dapatkan voltan,  $V_o$  menggunakan teorem tindihan.*

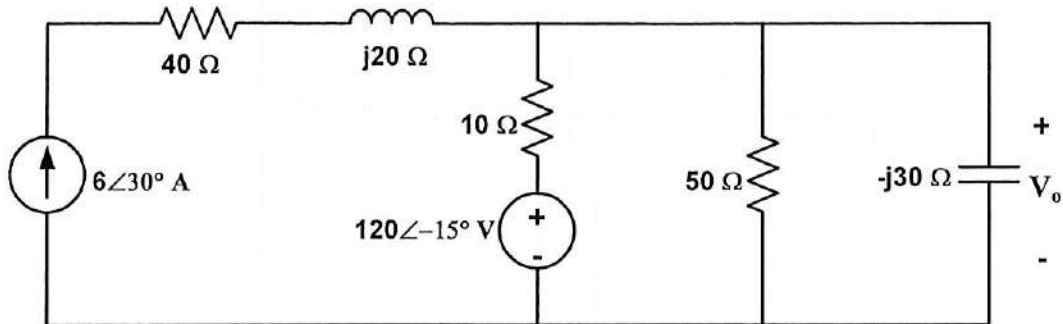


Figure Q4 / Rajah Q4

( 13 marks/ markah )

Q5. Referring to the circuit in Figure Q5,

- Determine the Thevenin's equivalent circuit looking from terminal ab.
- The value of the load impedance,  $Z_L$  for maximum power to be transferred to the load.
- Calculate the maximum power.

*Merujuk kepada litar dalam Rajah Q5,*

- Tentukan litar setara Thevenin yang dilihat dari terminal ab.*
- Nilai galangan beban,  $Z_L$  untuk kuasa maksima dipindahkan kepada beban.*
- Kirakan nilai kuasa maksima tersebut.*

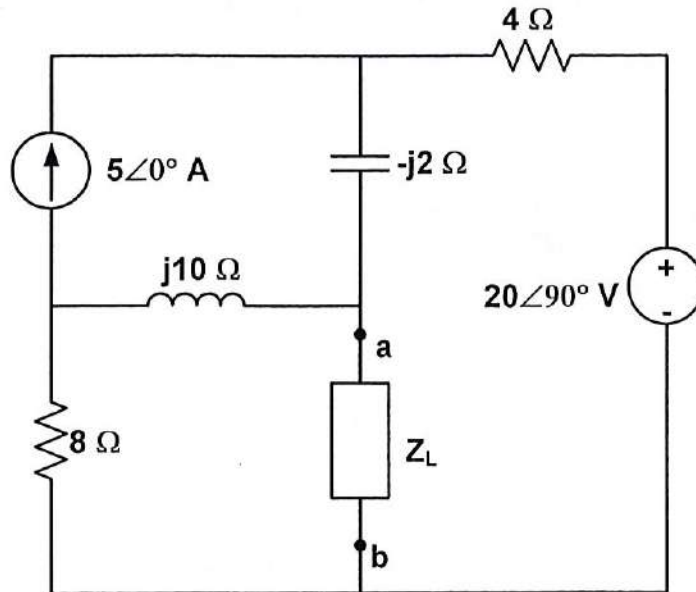


Figure Q5/Rajah Q5

(17 marks/ markah)

- Q6. a) State the components of the complete response for a first order circuit.

*Nyatakan komponen sambutan lengkap bagi satu litar tertib pertama.*

( 2 marks/ markah)

- b) The circuit in Figure Q6(b) is in steady state for  $t < 0$ . Find:

- i) the initial value for the current flowing through the inductor,  $i(0^-)$
- ii) the complete solution for the current flowing through the inductor,  $i(t)$  for  $t \geq 0$ .

*Litar dalam Rajah Q6(b) berada dalam keadaan mantap untuk  $t < 0$ . Dapatkan:*

- i) *nilai awal arus melalui induktor,  $i(0^-)$*
- ii) *penyelesaian lengkap bagi arus melalui induktor  $i(t)$  untuk  $t \geq 0$ .*



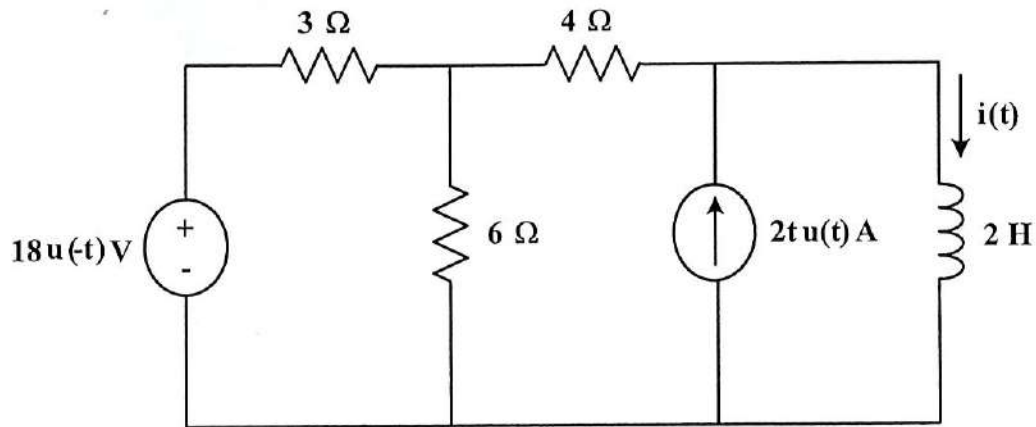


Figure Q6(b) / Rajah Q6(b)

(22 marks/ markah)

Forcing functions and their assumed solutions

Forcing function		Assumed solution
Constant	$f(t) = A$	$x_f(t) = K_2$
Exponential	$f(t) = M e^{-st}$	$x_f(t) = K_2 e^{-st}$
Variable	Ramp $f(t) = mt$	$x_f(t) = K_2 t + K_3$
	Parabolic $f(t) = t^2$	$x_f(t) = K_2 t^2 + K_3 t + K_4$
Sinusoidal	$f(t) = M \sin(\omega t + \theta)$	$x_f(t) = K_2 \sin \omega t + K_3 \cos \omega t$
	$f(t) = M \cos(\omega t + \theta)$	
Exponential Sinusoidal	$f(t) = M e^{-st} \sin(\omega t + \theta)$	$x_f(t) = e^{-st} (K_2 \sin \omega t + K_3 \cos \omega t)$