UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Sekolah Pendidikan Profesional dan Pendidikan Berterusan (UTMSPACE)

FINAL EXAMINATION / *PEPERIKSAAN AKHIR*
SEMESTER 2 – SESSION 2016 / 2017
PROGRAM KERJASAMA

COURSE CODE / *KOD KURSUS*	:	DDPE 2103
COURSE NAME / *NAMA KURSUS*	:	NETWORK AND SYSTEM / *SISTEM DAN RANGKAIAN*
YEAR / PROGRAMME *TAHUN / PROGRAM*	:	2 DDPE/P/B
DURATION / *TEMPOH*	:	2 HOURS 30 MINUTES / *2 JAM 30 MINIT*
DATE / *TARIKH*	:	MARCH / APRIL 2017

INSTRUCTION	:	ANSWER ALL QUESTIONS IN THE ANSWER BOOKLET PROVIDED.
ARAHAN		*JAWAB SEMUA SOALAN DI DALAM BUKU JAWAPAN YANG DISEDIAKAN.*

(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 / COURSE *TAHUN / KURSUS*	:	.....
COLLEGE NAME *NAMA KOLEJ*	:	.....
LECTURER'S NAME *NAMA PENSYARAH*	:	.....

This examination paper consists of **8** pages including the cover
*Kertas soalan ini mengandungi **8** muka surat termasuk kulit hadapan*

Q1. The differential equation of the current flowing through an inductor, i(t) in a second order circuit is given as:

$$\frac{d^2i}{dt^2} + 8\frac{di}{dt} + 17i = 34t$$

Given that the initial current flowing through the inductor, $i(0^-) = 3$ A and $\frac{di}{dt}(0^+) = -8$ A/s.

Find the current i(t) using transient analysis method.

Persamaan kebezaan bagi arus melalui induktor, i(t) dalam satu litar tertib kedua diberi sebagai:

$$\frac{d^2i}{dt^2} + 8\frac{di}{dt} + 17i = 34t$$

Diberi arus awal melalui induktor, $i(0^-) = 3$ *A dan* $\frac{di}{dt}(0^+) = -8$ *A/s. Dapatkan arus i(t) menggunakan kaedah analisis ubahtika.*

(15 marks / *markah*)

Q2. The circuit in Figure Q2 is in steady state at $t < 0$. Find the Laplace function of the voltage across capacitor, V(s) for $t \geq 0$.

Litar dalam Rajah Q2 berada dalam keadaan mantap pada $t < 0$. *Dapatkan fungsi Laplace bagi voltan melintangi kapasitor, V(s) untuk* $t \geq 0$.

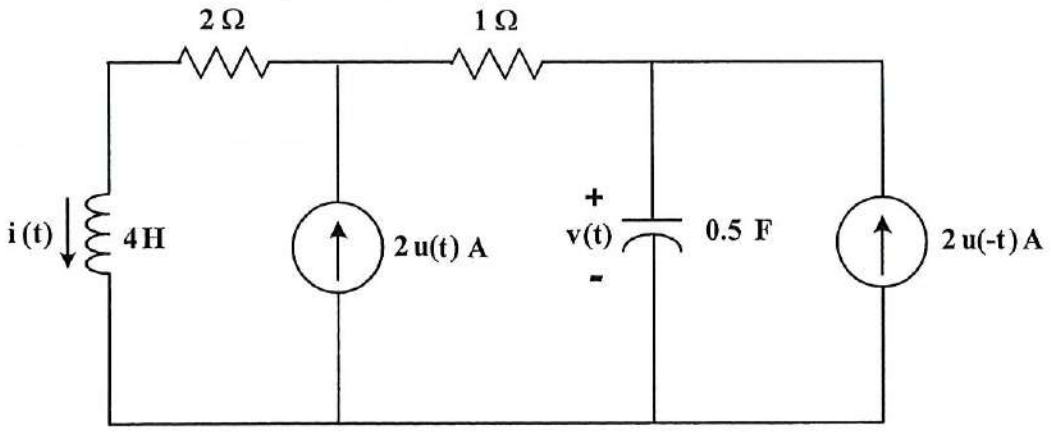

Figure Q2 / *Rajah Q2*

(15 marks / *markah*)

Q3. The transfer function that relates the current flowing through the inductor, $I_o(s)$ to the input current $I_i(s)$ is given as:

$$\frac{I_o(s)}{I_i(s)} = \frac{24(s^2+25)}{(s^2+4s)(s^2+11s+24)}$$

If $i_i(t) = 2\ \sin 5t\ u(t)$, determine the current flowing through the inductor, $i_o(t)$.

Fungsi rangkap pindah yang menghubungkan arus mengalir melalui induktor, $I_o(s)$ kepada arus masukan, $I_i(s)$ diberi sebagai:

$$\frac{I_o(s)}{I_i(s)} = \frac{24(s^2+25)}{(s^2+4s)(s^2+11s+24)}$$

Sekiranya $i_i(t) = 2\ \sin 5t\ u(t)$, tentukan arus mengalir melalui induktor, $i_o(t)$

(15 marks / *markah)*

Q4. Draw the magnitude Bode Plot for the following transfer function:

$$H(s) = \frac{36s^2(s+40000)}{(s+5000)(s^2+10s+900)}$$

Use minimum frequency, $\omega = 1$ rad/s and maximum frequency, $\omega = 100{,}000$ rad/s

Lukiskan Plot Bode magnitud untuk rangkap pindah berikut:

$$H(s) = \frac{36s^2(s+40000)}{(s+5000)(s^2+10s+900)}$$

Guna frekuensi minima, $\omega = 1$ rad/s dan frekuensi maksima, $\omega = 100{,}000$ rad/s.

(12 marks / *markah*)

Q5. a) Referring to the Figure Q5(a), determine the Z parameter equation for the two-port network.

Merujuk kepada Rajah Q5(a), tentukan parameter Z bagi rangkaian dua liang tersebut.

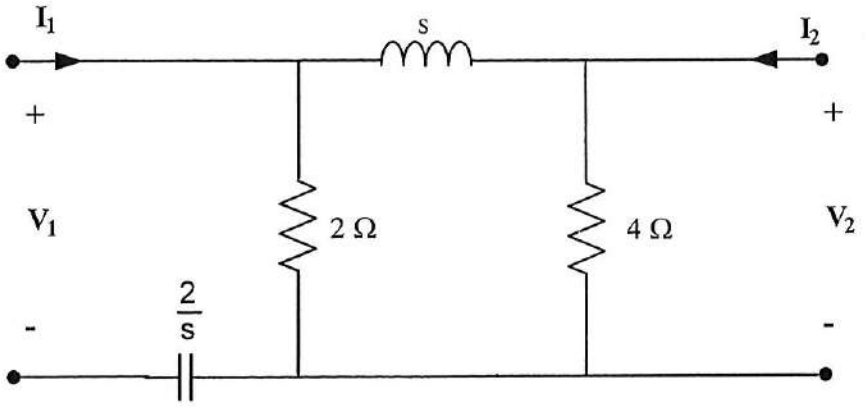

Figure Q5(a) / *Rajah Q5(a)*

(10 marks / *markah*)

b) The two-port network in Figure Q5(b) is represented by the following Y parameter. Determine the value of voltage, V_1 and current , I_2

$$Y = \begin{pmatrix} 4 & 6 \\ 6 & 12 \end{pmatrix}$$

Rangkaian dua-liang dalam Rajah Q5(b) diwakili oleh parameter Y berikut. Tentukan nilai voltan, V_1 dan arus, I_2.

$$Y = \begin{pmatrix} 4 & 6 \\ 6 & 12 \end{pmatrix}$$

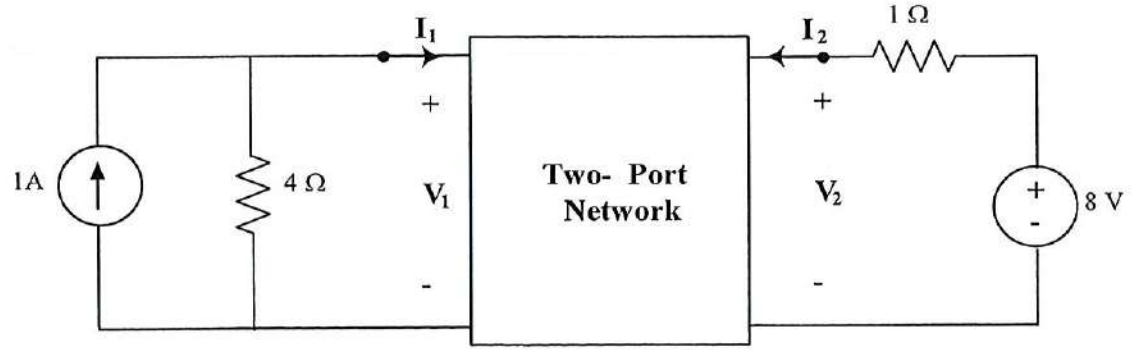

Figure Q5(b) / *Rajah Q5(b)*

(10 marks / *markah*)

Q6. a) Find the cosine Fourier coefficient for the waveform in Figure Q6(a) up to the 5th harmonics. *Dapatkan pekali Fourier kosain untuk gelombang dalam Rajah Q6(a) sehingga harmonik ke-5.*

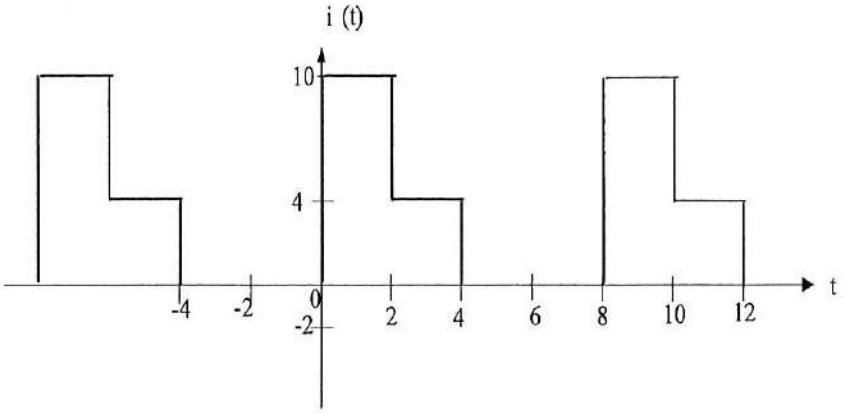

Figure Q6(a) / *Rajah Q6(a)*

(15 marks / *markah*)

b) The coefficients of the exponential Fourier series for the odd values of n are given as follows:

$$A_0 = 0 \qquad A_n = -\frac{j40}{n\pi} \qquad A_{-n} = \frac{j40}{n\pi}$$

i) write the exponential Fourier series up to the 5th harmonics.

ii) calculate the sine and cosine coefficients and obtain the trigonometric Fourier series up to the 5th harmonics.

Pekali bagi siri Fourier eksponen untuk nilai ganjil n diberi sebagai berikut:

$$A_0 = 0 \qquad A_n = -\frac{j40}{n\pi} \qquad A_{-n} = \frac{j40}{n\pi}$$

i) tuliskan siri Fourier eksponen sehingga harmonik ke-5.

ii) kirakan pekali sain dan kosain dan dapatkan siri Fourier trigonometrik sehingga harmonik ke-5.

(8 marks / *markah*)

Laplace Transform Pairs

Function	$f(t)$	$F(s)$
Unit impulse	$\delta(t)$	1
Step function	$u(t)$	$\frac{1}{s}$
Constant	1	$\frac{1}{s}$
Ramp unit	$r(t) = t\,u(t)$	$\frac{1}{s^2}$
Parabola unit	$p(t) = \frac{1}{2}t^2 u(t)$	$\frac{1}{s^3}$
n^{th} integral of impulse	$\delta^{(-n)}(t)$	$\frac{1}{s^n}$

functions and their assumed solutions

	Assumed solution
	$x_f(t) = K_2$

Forcing

Forcing function	
Constant	$f(t) = A$