KOLEJ YAYASAN PELAJARAN JOHOR

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FINAL EXAMINATION

COURSE NAME	:	**ANALISA LITAR**
COURSE CODE	:	**DEG 2093**
EXAMINATION	:	**APRIL 2018**
DURATION	:	**2 HOURS 30 MINUTES**

INSTRUCTION TO CANDIDATES

1. This examination paper consists of **FIVE (5)** Questions.

2. Answer **ALL** Questions.

3. Please check to make sure that this examination pack consist of:
   i. Question Paper
   ii. Answer Booklet
   iii. Attachment
   iv. Semilog Paper

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

This paper contains of **FIVE(5)** questions. Answer **ALL** questions. Answer the questions in Answer Booklet.
*Kertas soalan ini mengandungi **LIMA (5)** soalan. Jawab **SEMUA** soalan. Sila jawab dalam buku jawapan.*

QUESTION 1/*SOALAN 1*

a. Write the correct elements in the box provided in Table Q1 (a): characteristics of energy storage elements.

Tulis elemen yang betul dalam petak yang telah disediakan dalam Jadual Q1 (a): ciri-ciri daripada unsur-unsur penyimpan tenaga.

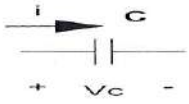
Variable/ *Pembolehubah*	Inductor/ *Induktor*	Capacitor/ *Kapasitor*
Passive sign convention *Tanda lazim pasif*	i)	
Voltage *Voltan*	ii)	$V_c = \frac{1}{c}\int i_c dt$
Current *Arus*	iii)	iv)
In steady-state condition, this element acts as a: *Dalam keadaan mantap, elemen ini berkelakuan seperti:*	short circuit *litar pintas*	v)

Table Q1 (a)/Jadual Q1 (a)

(5 marks/*markah*)

b. Referring to Figure Q1 (b). Circuit show that the switch is closed at $t < 0$.

i. Find the initial value at $t < 0$.
ii. State possible behaviour for the natural response by refers to circuit.
iii. Determine the complete response of the current, i(t). Assumed that the circuit has reached steady state at $t = 0$.

Merujuk kepada Rajah Q1 (b). Litar menunjukkan bahawa suis ditutup pada $t < 0$.

i. Dapatkan nilai awalan pada $t < 0$.
ii. Nyatakan kemungkinan kelakuan sambutan tindak balas semula jadi tabii dengan merujuk kepada litar.
iii. Tentukan tindak balas lengkap bagi arus, i(t). Dianggap bahawa litar telah mencapai keadaan mantap pada $t = 0$.

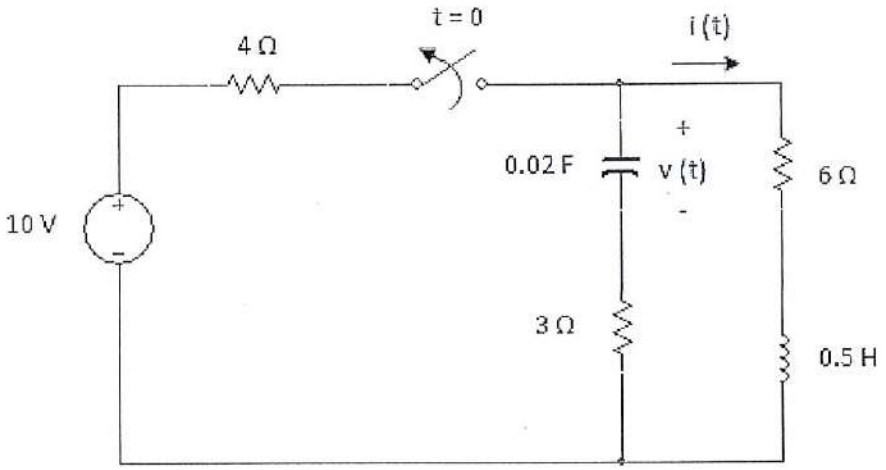


Figure Q1 (b)/*Rajah Q1 (b)*

(15 marks/*markah*)

QUESTION 2/*SOALAN 2*

a. Determine the transfer function H(s) = Vo(s)/Is(s) of the Figure Q2 (a).

Tentukan rangkap pindah H(s) = Vo(s)/Is (s) Rajah Q2 (a).

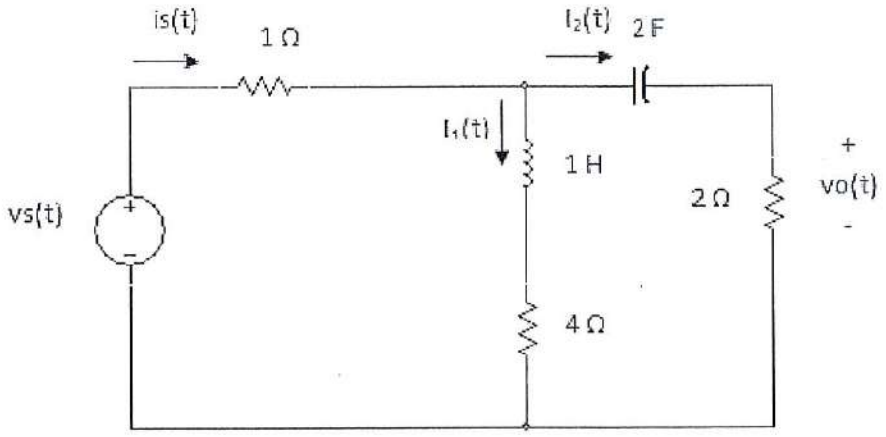


Figure Q2 (a)/*Rajah Q2 (a)*

(5 marks/*markah*)

b. For the domain circuit in Figure Q2 (b), find the response when vi(t) = 8 cos 2t V.

Untuk litar domain dalam Rajah Q2 (b), cari tindak balas apabila vi(t) = 8 cos 2t V.

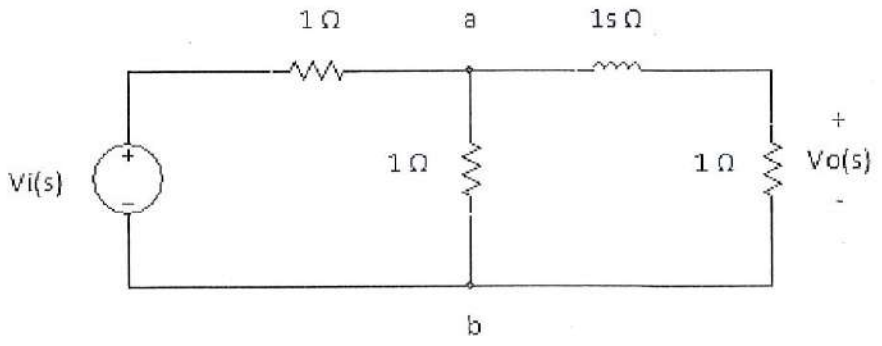


Figure Q2 (b)/*Rajah Q2 (b)*

(15 marks/*markah*)

QUESTION 3/*SOALAN 3*

a. Sketch the magnitude Bode Plot for the following transfer function:

$$H(s) = \frac{10\,(s+5)}{(s+2)(s^2+2s+4)}$$

Use minimum frequency, ω=0.1 radian/second and maximum frequency, ω=10,000 radian/second.

Lakar Plot Bode magnitud untuk rangkap pindah berikut:

$$H(s) = \frac{10\,(s+5)}{(s+2)(s^2+2s+4)}$$

Guna frekuensi minima, ω=0.1 radian/saat dan frekuensi maksima, ω=10,000 radian/saat.

(10 marks/*markah*)

b. Referring to Figure Q3 (b).
   i. Calculate the value of cut-off frequency.
   ii. Determine what type of filter.

Merujuk kepada Rajah Q3 (b).
i. Kirakan nilai bagi frekuensi potong.
ii. Tentukan jenis bagi penapis.

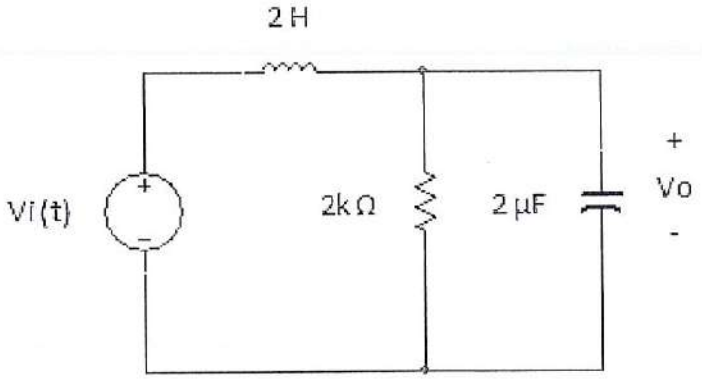


Figure Q3 (b)/*Rajah Q3 (b)*

(10 marks/*markah*)

QUESTION 4/*SOALAN 4*

a. Find the z parameters for the network in Figure Q4 (a) as function of s.

Dapatkan parameter z untuk rangkaian dalam Rajah Q4 (a) sebagai fungsi s.

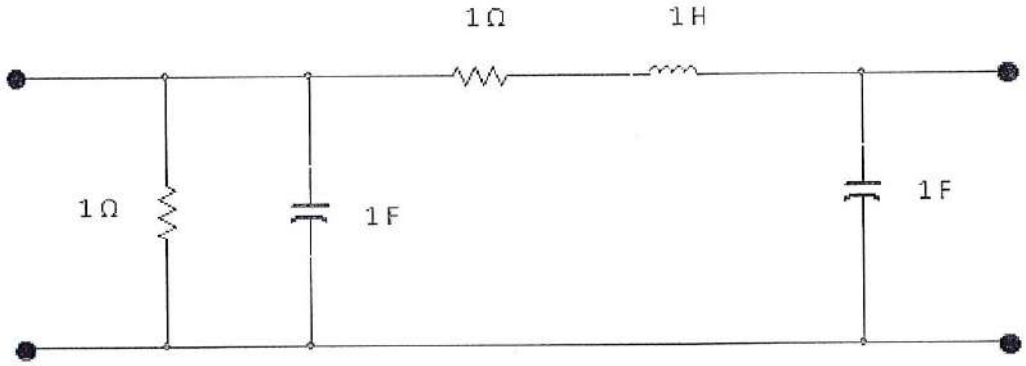


Figure Q4 (a)/*Rajah Q4 (a)*

(10 marks/*markah*)

b. Given $Z = \begin{pmatrix} 10 & 6 \\ 5 & 7 \end{pmatrix}$

Determine the ABCD and h parameters.

Diberi $Z = \begin{pmatrix} 10 & 6 \\ 5 & 7 \end{pmatrix}$

Tentukan parameter bagi ABCD dan h.

(10 marks/*markah*)

QUESTION 5/*SOALAN 5*

Referring to Figure Q5.

a. Determine the Fourier series of the waveform.
b. Sketch the figure of amplitude and phase spectrum.

Dengan merujuk kepada Rajah Q5.

a. Tentukan Siri Fourier bagi bentuk gelombang.
b. Lakarkan rajah bagi amplitud dan spektrum fasa.

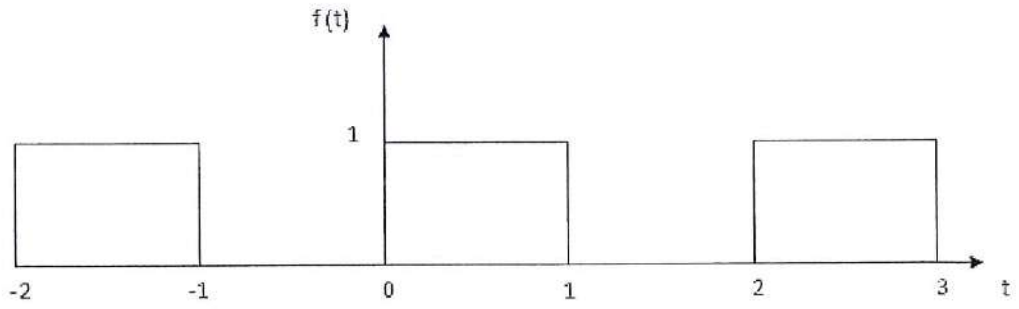


Figure Q5 *Rajah Q5*

(20 marks/*markah*)

[100 MARKS/*MARKAH*]

END OF QUESTION PAPER / KERTAS SOALAN TAMAT

ATTACHMENT/LAMPIRAN

Forcing Functions and Their Assumed Solutions
Fungsi Berdaya dan Penyelesaian Anggapan

Forcing function / *Fungsi Berdaya*			Assumed Solution / *Penyelesaian Anggapan*
Constan / *Malar*		$f(t) = A$	$x_f(t) = K_2$
Exponential/ *Eksponen*		$f(t) = M\ e^{-st}$	$x_f(t) = K_2\ e^{-st}$
Variable/ *Pembolehubah*	Ramp/ *Tanjak*	$f(t) = mt$	$x_f(t) = K_2\ t + K_3$
	Parabolic/ *Parabola*	$f(t) = t^2$	$x_f(t) = K_2\ t^2 + K_3\ t + K_4$
Sinusoidal/ *Sinus*		$f(t) = M\ sin(\omega t + \theta)$ $f(t) = M\ cos(\omega t + \theta)$	$x_f(t) = K_2\ sin\,\omega t + K_3\ cos\,\omega t$
Exponential Sinusoidal/ *Sinus Eksponen*		$f(t) = M\ e^{-st}\ sin(\omega t + \theta)$	$x_f(t) = e^{-st}(K_2\ sin\,\omega t + K_3\ cos\,\omega t)$

Fourier coefficient/ *Pekali Fourier*

$$a_0 = \frac{1}{T}\int_0^T f(t)dt$$

$$a_n = \frac{2}{T}\int_0^T f(t)\cos n\omega t dt$$

$$b_n = \frac{2}{T}\int_0^T f(t)\sin n\omega t dt$$

Table of Laplace Transform Pairs
Jadual Penukaran Pasangan Jelmaan Laplace

Function/ *Rangkap*	f(t)	F(s)
Unit Impulse/ *Dedenyut*	$\delta(t)$	1
Unit Step/ *Unit langkah* Constant / *Malar*	$u(t)$ 1	$\frac{1}{s}$
Unit Ramp/ *Unit Tanjak* t function / *Rangkap t*	$t\,u(t)$	$\frac{1}{s^2}$
Unit Parabolic / *Unit Parabola*	$\frac{1}{2}t^2\,u(t)$	$\frac{1}{s^3}$
n^{th} integral of impulse/ *Kamiran ke–n dedenyut*	$\delta^{-n}(t)$	$\frac{1}{s^n}$
n^{th} derivative of impulse/ *Kerbezaan ke–n dedenyut*	$\delta^{n}(t)$	s^n
Power of t/ *Kuasa t*	$\frac{t^{n-1}}{(n-1)!}$	$\frac{1}{s^n}$
Exponential / *Eksponen*	e^{-at}	$\frac{1}{s+a}$
t–multiplication exponential/ *Pendaraban t bagi eksponen*	te^{-at}	$\frac{1}{(s+a)^2}$
Repeated t–multiplication exponential/ *Pendaraban t berulang bagi eksponen*	$\frac{1}{(n-1)!}t^{n-1}e^{-at}$	$\frac{1}{(s+a)^n}$
Sine/ *Sinus*	$\sin \omega t$	$\frac{\omega}{s^2+\omega^2}$
Cosine/ *Kosinus*	$\cos \omega t$	$\frac{s}{s^2+\omega^2}$
Damped sine/ *Sinus teredam*	$e^{-at}\sin \omega t$	$\frac{\omega}{(s+a)^2+\omega^2}$

Damped cosine/ *Kosinus teredam*	$e^{-at}\cos\omega t$	$\frac{s+a}{(s+a)^2+\omega^2}$
t–multiplicated sine *Pendaraban t bagi sinus*	$t\sin\omega t$	$\frac{2\omega s}{(s^2+\omega^2)^2}$
t–multiplicated cosine *Pendaraban t bagi kosinus*	$t\cos\omega t$	$\frac{s^2-\omega^2}{(s^2+\omega^2)^2}$

Two–Port Network Parameters
Parameter Rangkaian Dua Liang

Impedance parameters

$$V_1 = z_{11} I_1 + z_{12} I_2$$
$$V_2 = z_{21} I_1 + z_{22} I_2$$

Admittance parameters

$$I_1 = y_{11} V_1 + y_{12} V_2$$
$$I_2 = y_{21} V_1 + y_{22} V_2$$

Hybrid parameters

$$V_1 = h_{11} I_1 + h_{12} V_2$$
$$I_2 = h_{21} I_1 + h_{22} V_2$$

Transmission parameters

$$V_1 = AV_2 - BI_2$$
$$I_1 = CV_2 - DI_2$$

Conversion Table for Two–Port Network Parameters
Jadual Penukaran Untuk Rangkaian Dua Liang

	Z	Y	h	ABCD
Z	z_{11} z_{12} z_{21} z_{22}	$\frac{y_{22}}{\Delta_y}$ $\frac{-y_{12}}{\Delta_y}$ $\frac{-y_{21}}{\Delta_y}$ $\frac{y_{11}}{\Delta_y}$	$\frac{\Delta_h}{h_{22}}$ $\frac{h_{12}}{h_{22}}$ $\frac{-h_{21}}{h_{22}}$ $\frac{1}{h_{22}}$	$\frac{A}{C}$ $\frac{\Delta_T}{C}$ $\frac{1}{C}$ $\frac{D}{C}$
Y	$\frac{z_{22}}{\Delta_z}$ $\frac{-z_{12}}{\Delta_z}$ $\frac{-z_{21}}{\Delta_z}$ $\frac{z_{11}}{\Delta_z}$	y_{11} y_{12} y_{21} y_{22}	$\frac{1}{h_{11}}$ $\frac{-h_{12}}{h_{11}}$ $\frac{h_{21}}{h_{11}}$ $\frac{\Delta_h}{h_{11}}$	$\frac{D}{B}$ $\frac{-\Delta_T}{B}$ $\frac{-1}{B}$ $\frac{A}{B}$
h	$\frac{\Delta_z}{z_{22}}$ $\frac{z_{12}}{z_{22}}$ $\frac{-z_{21}}{z_{22}}$ $\frac{1}{z_{22}}$	$\frac{1}{y_{11}}$ $\frac{-y_{12}}{y_{11}}$ $\frac{y_{21}}{y_{11}}$ $\frac{\Delta_y}{y_{11}}$	h_{11} h_{12} h_{21} h_{22}	$\frac{B}{D}$ $\frac{\Delta_T}{D}$ $\frac{-1}{D}$ $\frac{C}{D}$
ABCD	$\frac{z_{11}}{z_{21}}$ $\frac{\Delta_z}{z_{21}}$ $\frac{1}{z_{21}}$ $\frac{z_{22}}{z_{21}}$	$\frac{-y_{22}}{y_{21}}$ $\frac{-1}{y_{21}}$ $\frac{-\Delta_y}{y_{21}}$ $\frac{-y_{11}}{y_{21}}$	$\frac{-\Delta_h}{h_{21}}$ $\frac{-h_{11}}{h_{21}}$ $\frac{-h_{22}}{h_{21}}$ $\frac{-1}{h_{21}}$	A B C D