FINAL EXAMINATION / *PEPERIKSAAN AKHIR*
SEMESTER 1 – SESSION 2021 / 2022
PROGRAM KERJASAMA

COURSE CODE /   :   DDWE 2103
KOD KURSUS

COURSE NAME /   :   NETWORK AND SYSTEM
NAMA KURSUS   *SISTEM DAN RANGKAIAN*

YEAR / PROGRAMME   :   2 DDWE/H
TAHUN / PROGRAM

DURATION /   :   3 HOURS (INCLUDING SUBMISSION HOUR)
TEMPOH   *3 JAM (TERMASUK MASA PENGHANTARAN)*

DATE /   :   DECEMBER 2021 / JANUARY 2022
TARIKH

INSTRUCTIONS / *ARAHAN:*

1. Answer **ALL** questions and write your answers on the answer sheet.
   *Jawab **SEMUA** soalan dan tulis jawapan anda pada kertas jawapan.*

2. Write a name, matric no., identity card no. , course code, course name, section and lecturer name in the upper left corner of the answer sheet.
   Tulis nama, no. matrik, no.kad pengenalan, kod kursus, nama kursus, seksyen dan nama pensyarah di penjuru atas kiri kertas jawapan.

3. Each answer sheet must have a page number written at the bottom right corner.
   Setiap helai kertas jawapan mesti ditulis nombor mukasurat pada bahagian bawah penjuru kanan.

4. Answers should be handwriting, neat and clear.
   Jawapan hendaklah ditulis tangan, kemas dan jelas menggunakan huruf cerai.

<u>WARNING / *AMARAN*</u>

Students caught copying / cheating during the examination will be liable for disciplinary actions and the faculty may recommend the student to be expelled from sitting for exam.

Pelajar yang ditangkap meniru / menipu semasa peperiksaan akan dikenakan tindakan disiplin dan pihak fakulti boleh mengesyorkan pelajar diusir dari menduduki peperiksaan.

This examination paper consists of **9** pages including the cover
*Kertas soalan ini mengandungi **9** muka surat termasuk kulit hadapan*

ONLINE EXAMINATION RULES AND REGULATIONS
PERATURAN PEPERIKSAAN SECARA DALAM TALIAN

1. Student must carefully listen and follow instructions provided by invigilator.
   Pelajar mesti mendengar dan mengikuti arahan yang diberikan oleh pengawas peperiksaan dengan teliti.

2. Student is allowed to start examination only after confirmation of invigilator if all needed conditions are implemented.
   Pelajar dibenarkan memulakan peperiksaan hanya setelah pengesahan pengawas peperiksaan sekiranya semua syarat yang diperlukan telah dilaksanakan.

3. During all examination session student has to ensure, that he is alone in the room.
   Semasa semua sesi peperiksaan pelajar harus memastikan bahawa dia bersendirian di dalam bilik.

4. During all examination session student is not allowed to use any other devices, applications except other sites permitted by course lecturer.
   Sepanjang sesi peperiksaan pelajar tidak dibenarkan menggunakan peranti dan aplikasi lain kecuali yang dibenarkan oleh pensyarah kursus.

5. After completing the exam student must inform invigilator via the set communication platform (eg. WhatsApp etc.) about completion of exam and after invigilator's confirmation leave examination session.
   Selepas peperiksaan selesai, pelajar mesti memaklumkan kepada pengawas peperiksaan melalui platform komunikasi yang ditetapkan (contoh: Whatsapp dan lain-lain) mengenai peperiksaan yang telah selesai dan meninggalkan sesi peperiksaan selepas mendapat pengesahan daripada pengawas peperiksaan.

6. Any technical issues in submitting answers online have to be informed to respective lecturer within the given 30 minutes. Request for re-examination or appeal will not be entertain if complains are not made by students to their lecturers within the given 30 minutes.
   Sebarang masalah teknikal dalam menghantar jawapan secara dalam talian perlu dimaklumkan kepada pensyarah masing-masing dalam masa 30 minit yang diberikan. Permintaan untuk pemeriksaan semula atau rayuan tidak akan dilayan sekiranya aduan tidak dibuat oleh pelajar kepada pensyarah mereka dalam masa 30 minit yang diberikan.

7. During online examination, the integrity and honesty of the student is also tested. At any circumstances student is not allowed to cheat during examination session. If any kind of cheating behaviour is observed, UTM have a right to follow related terms and provisions stated in the respective Academic Regulations and apply needed measures.
   Semasa peperiksaan dalam talian, integriti dan kejujuran pelajar juga diuji. Walau apa pun keadaan pelajar tidak dibenarkan menipu semasa sesi peperiksaan. Sekiranya terdapat sebarang salah laku, UTM berhak untuk mengikuti terma yang dinyatakan dalam Peraturan Akademik.

Excerpts from online final exam guidelines
Petikan daripada panduan peperiksaan akhir
dalam talian Universiti Teknologi Malaysia

Q1.   a)   The switch in Figure Q1(a) has been in position B for a long time. At t = 0, the switch is moved to position A. Find v(t) for t > 0.

Suis dalam Rajah Q1(a) telah berada pada posisi B untuk jangka masa yang panjang. Pada t = 0, suis diubah ke posisi A. Dapatkan v(t) untuk t > 0.
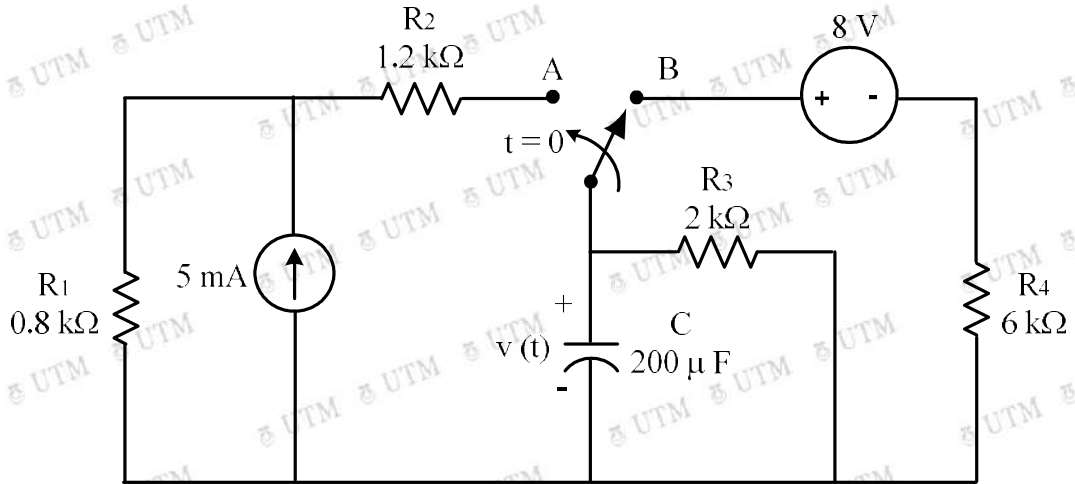

Figure Q1/ *Rajah Q1*

(10 marks / *markah*)

b)   Assume the circuit in Figure Q1(b) is in its steady state condition at t < 0. Find i(t) for t > 0.

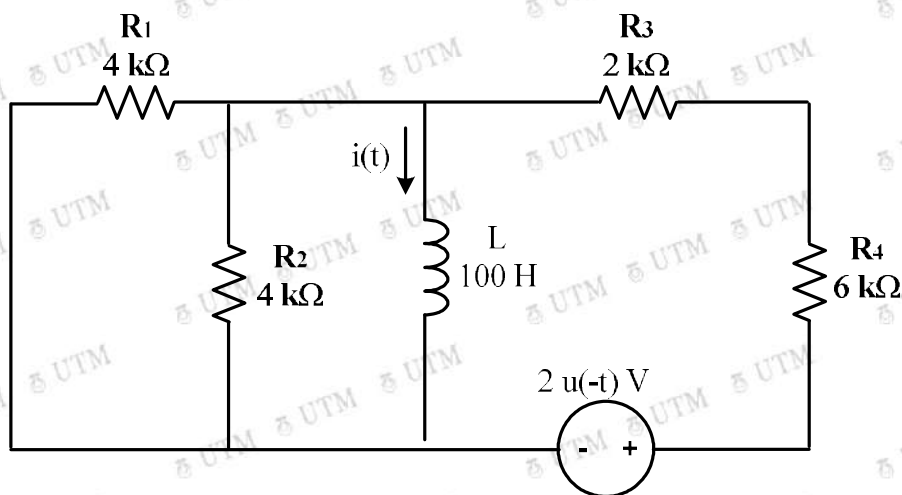*Anggapkan bahawa litar dalam Rajah Q1(b) berada dalam keadaan mantap pada t < 0. Dapatkan i(t) untuk t > 0.*

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

(10 marks / *markah*)

Q2. The switch in Figure Q2 has been in position A for a long time. At t = 0, the switch is moved to position B. Determine:

    i.   the initial value of capacitor voltage, v(0⁻) and inductor current, i(0⁻).

    ii. the differential equation of i(t) for t > 0.

    iii. the value of $\dfrac{di(0^+)}{dt}$

    iv. i(t) for t ≥ 0.

Suis dalam Rajah Q2 telah berada pada posisi A untuk jangka masa yang panjang. Pada t = 0, suis diubah ke posisi B. Tentukan:

    i.   the initial value of capacitor voltage, v(0⁻) and inductor current, i(0⁻).

    ii. the differential equation of i(t) for t > 0.

    iii. the value of $\dfrac{di(0^+)}{dt}$

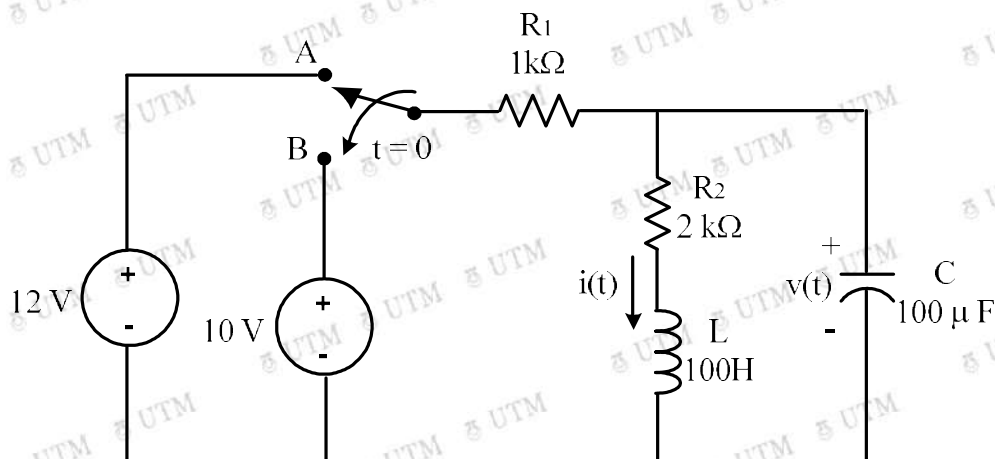   *iv. i(t) for t ≥ 0.*

Figure Q2/ *Rajah Q2*

(20 marks / *markah*)

Q3   Draw the magnitude Bode Plot for the following transfer function:

$$H(s) = \frac{200\,(s^2 + 10s + 900)(s + 2000)}{s^2(s + 400)^2}$$

Use minimum frequency, $\omega = 1$ rad/s and maximum frequency, $\omega = 100,000$ rad/s on the semilog graph at attachment 1.

Lukiskan Plot Bode Magnitud untuk rangkap pindah berikut:

$$H(s) = \frac{200\,(s^2 + 10s + 900)(s + 2000)}{s^2(s + 400)^2}$$

Guna frekuensi minima, $\omega = 1$ rad/s dan frekuensi maksima, $\omega = 100,000$ rad/s pada graf semilog di lampiran 1.

(20 marks / *markah*)

Q4.   The circuit in Figure Q4 is in steady state at $t < 0$. Find the Laplace function of the current flow through inductor, I(s) for $t \geq 0$.

Litar dalam Rajah Q4 berada dalam keadaan mantap pada t < 0. Dapatkan fungsi Laplace bagi arus mengalir melalui induktor, I(s) untuk t ≥ 0.
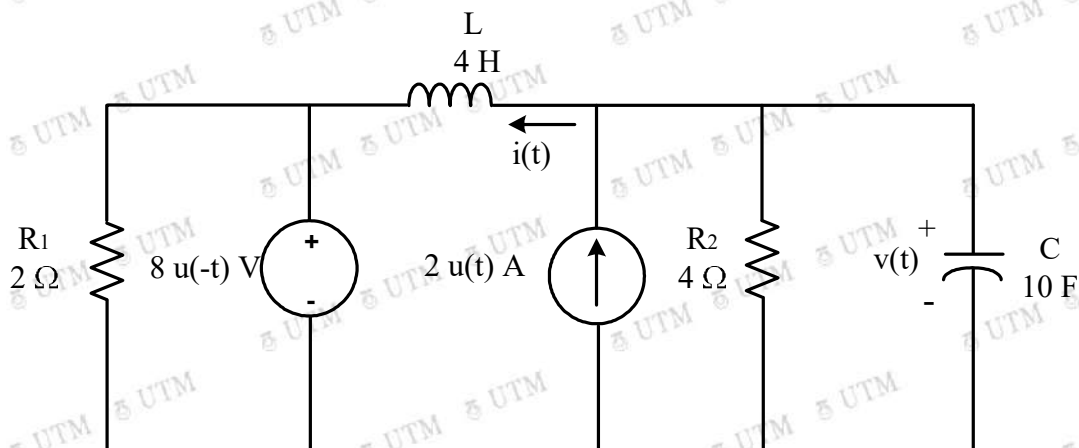

Figure Q4/ *Rajah Q4*

(20 marks / *markah*)

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

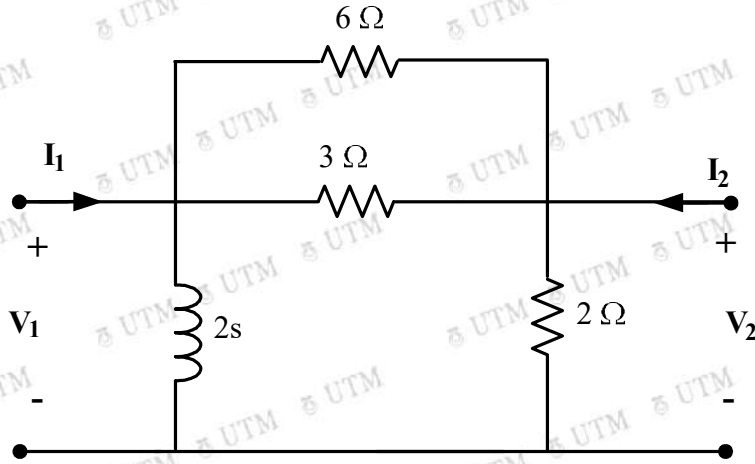*Merujuk kepada Rajah Q5(a), tentukan parameter-h bagi rangkaian dua-liang yang diberi.*

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. Find the voltage V_1, and current value I_1.

$$y = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$$

Rangkaian dua-liang dalam Rajah Q5(b) diwakili oleh parameter-y berikut. Dapatkan nilai voltan V_1, dan nilai arus I_1.

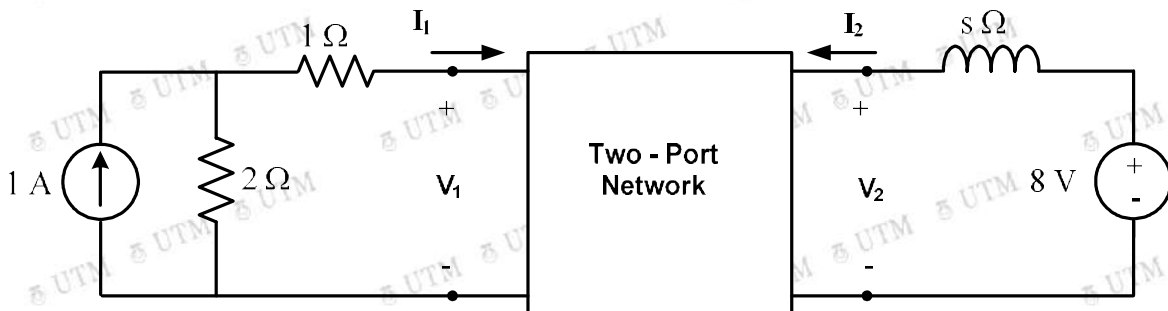$$y = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$$

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

(10 marks / *markah*)

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)*		$f(t) = M\,\sin(\omega t + \theta)$	$x_f(t) = K_2\,\sin \omega t + K_3\,\cos \omega t$
		$f(t) = M\,\cos(\omega t + \theta)$	
Exponential Sinusoidal *(Sinus Eksponen)*		$f(t) = M\,e^{-st}\,\sin(\omega t + \theta)$	$x_f(t) = e^{-st}(K_2\,\sin \omega t + K_3\,\cos \omega t)$

Table of Laplace Transform Pairs
(Jadual Penukaran Pasangan Penjelmaan Laplace)

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

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

$$V_1 = AV_2 - B I_2$$
$$I_1 = CV_2 - D I_2$$

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

	z	y	h	ABCD
z	z_{11} z_{12} z_{21} z_{22}	$\dfrac{y_{22}}{\Delta_y}$ $\dfrac{-y_{12}}{\Delta_y}$ $\dfrac{-y_{21}}{\Delta_y}$ $\dfrac{y_{11}}{\Delta_y}$	$\dfrac{\Delta_h}{h_{22}}$ $\dfrac{h_{12}}{h_{22}}$ $\dfrac{-h_{21}}{h_{22}}$ $\dfrac{1}{h_{22}}$	$\dfrac{A}{C}$ $\dfrac{\Delta_T}{C}$ $\dfrac{1}{C}$ $\dfrac{D}{C}$
y	$\dfrac{z_{22}}{\Delta_z}$ $\dfrac{-z_{12}}{\Delta_z}$ $\dfrac{-z_{21}}{\Delta_z}$ $\dfrac{z_{11}}{\Delta_z}$	y_{11} y_{12} y_{21} y_{22}	$\dfrac{1}{h_{11}}$ $\dfrac{-h_{12}}{h_{11}}$ $\dfrac{h_{21}}{h_{11}}$ $\dfrac{\Delta_h}{h_{11}}$	$\dfrac{D}{B}$ $\dfrac{-\Delta_T}{B}$ $\dfrac{-1}{B}$ $\dfrac{A}{B}$
h	$\dfrac{\Delta_z}{z_{22}}$ $\dfrac{z_{12}}{z_{22}}$ $\dfrac{-z_{21}}{z_{22}}$ $\dfrac{1}{z_{22}}$	$\dfrac{1}{y_{11}}$ $\dfrac{-y_{12}}{y_{11}}$ $\dfrac{y_{21}}{y_{11}}$ $\dfrac{\Delta_y}{y_{11}}$	h_{11} h_{12} h_{21} h_{22}	$\dfrac{B}{D}$ $\dfrac{\Delta_T}{D}$ $\dfrac{-1}{D}$ $\dfrac{C}{D}$
ABCD	$\dfrac{z_{11}}{z_{21}}$ $\dfrac{\Delta_z}{z_{21}}$ $\dfrac{1}{z_{21}}$ $\dfrac{z_{22}}{z_{21}}$	$\dfrac{-y_{22}}{y_{21}}$ $\dfrac{-1}{y_{21}}$ $\dfrac{-\Delta_y}{y_{21}}$ $\dfrac{-y_{11}}{y_{21}}$	$\dfrac{-\Delta_h}{h_{21}}$ $\dfrac{-h_{11}}{h_{21}}$ $\dfrac{-h_{22}}{h_{21}}$ $\dfrac{-1}{h_{21}}$	A B C D

SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
Advanced Physics Lab, Physics Dept, UIUC, Urbana, IL, USA

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN