



FINAL EXAMINATION / PEPERIKSAAN AKHIR
SEMESTER II – SESSION 2021 / 2022 / SEMESTER II – SESSI 2021 / 2022
PROGRAM KERJASAMA

COURSE CODE /
KOD KURSUS : DDWE 2103

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

YEAR / PROGRAMME : 2 DDWB/E/K
TAHUN / PROGRAM

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

DATE /
TARIKH : JUN / JULY 2022

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 handwritten, neat and clear.
Jawapan hendaklah ditulis tangan, kemas dan jelas menggunakan huruf cerai.

WARNING / AMARAN

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.

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 A for a long time. At $t = 0$, the switch is moved to position B. Find $i(t)$ for $t > 0$.

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

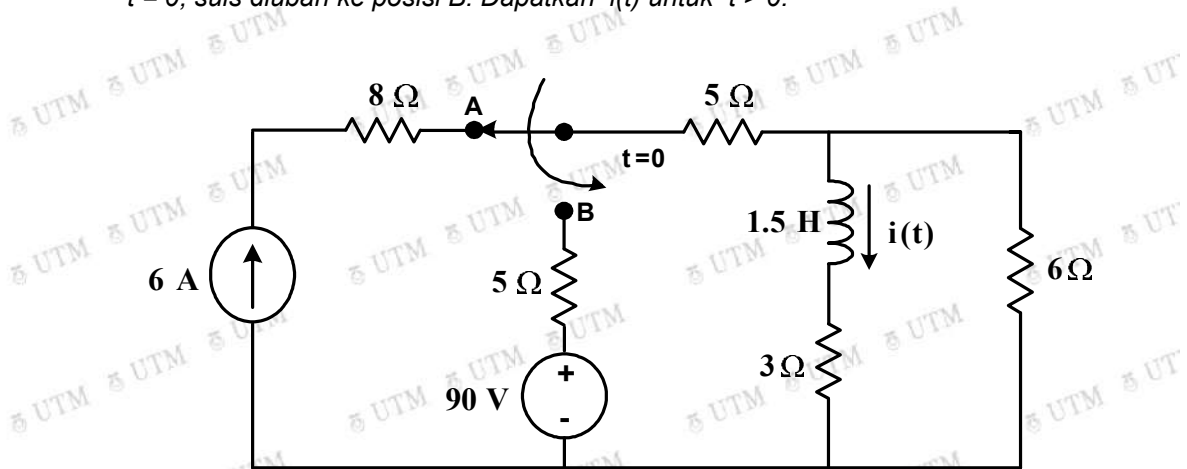


Figure Q1(a) / Rajah Q1(a)

(10 marks/markah)

- (b) Assume that the circuit in Figure Q1(b) has reached its steady state at $t = 0^-$. Find $v(t)$ for $t > 0$.

Anggapkan bahawa litar dalam Rajah Q1(b) telah mencapai keadaan mantap pada $t = 0^-$. Dapatkan $v(t)$ untuk $t > 0$.

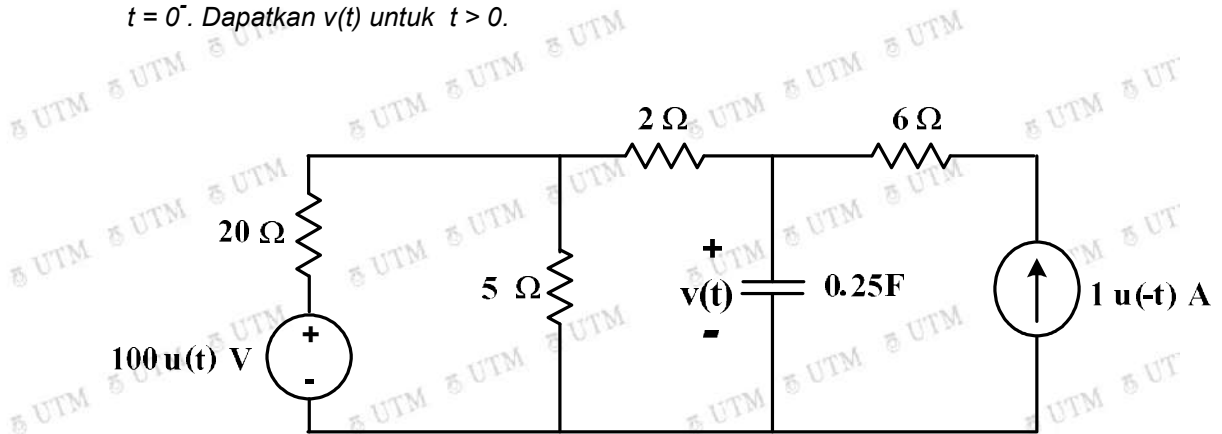


Figure Q1(b) / Rajah Q1(b)

(10 marks/markah)

Q2. The circuit in Figure Q2 has reached its steady state at $t = 0^-$. Determine:

- (a) the initial value of capacitor voltage, $v(0^-)$ and inductor current, $i(0^-)$.
- (b) the differential equation of $i(t)$ for $t > 0$.
- (c) the value of $\frac{di}{dt}(0^+)$.
- (d) $i(t)$ for $t > 0$.

Litar dalam Rajah Q2 telah mencapai keadaan mantap pada $t = 0^-$. Tentukan:

- (a) nilai awal voltan kapasitor, $v(0^-)$ dan arus induktor, $i(0^-)$.
- (b) persamaan kebezaan bagi $i(t)$ untuk $t > 0$.
- (c) nilai $\frac{di}{dt}(0^+)$.
- (d) $i(t)$ untuk $t > 0$.

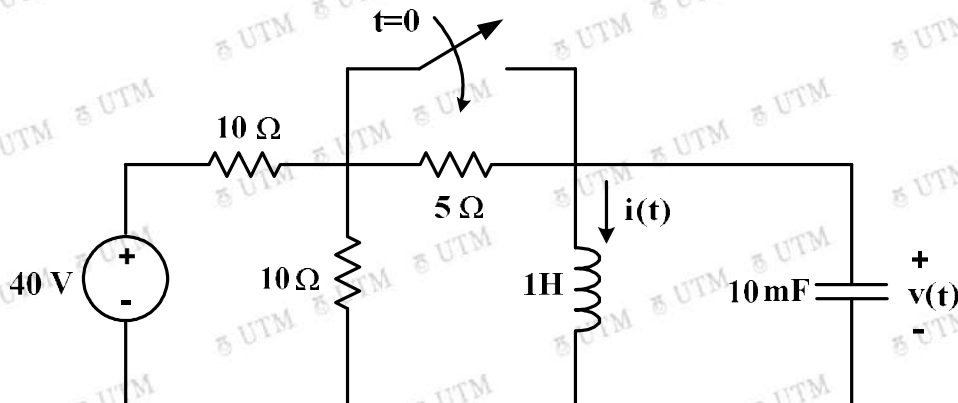


Figure Q2 / Rajah Q2

(20 marks/markah)

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

$$H(s) = \frac{100 (s^2 + 3.2s + 400)(s + 8000)}{s^2 (s + 500)^2}$$

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

Lukiskan Plot Bode magnitud untuk rangkap pindah berikut:

$$H(s) = \frac{100(s^2 + 3.2s + 400)(s + 8000)}{s^2 (s + 500)^2}$$

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

(20 marks/markah)

Q4. Referring to Figure Q4, switch S_1 has been closed and switch S_2 has been opened for a long time until the circuit reaches its steady-state. At $t = 0$, switch S_1 is open and switch S_2 is closed simultaneously. Find the Laplace function of the voltage across the capacitor, $V(s)$ for $t \geq 0$.

Merujuk kepada Rajah Q4, suis S_1 telah ditutup dan suis S_2 telah dibuka untuk jangkamasa yang lama sehingga litar berada dalam keadaan mantap. Pada $t = 0$, suis S_1 dibuka dan suis S_2 ditutup secara serentak. Dapatkan fungsi Laplace bagi voltan melintang kapasitor, $V(s)$ untuk $t \geq 0$.

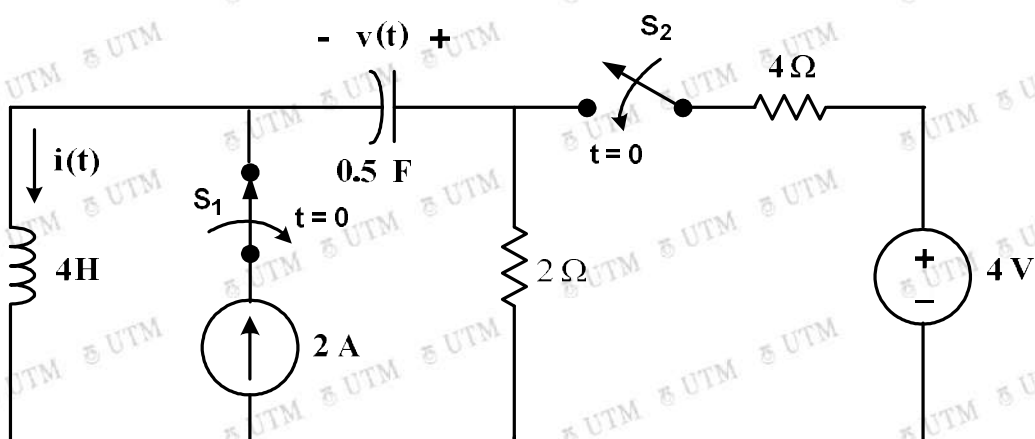


Figure Q4 / Rajah Q4

(20 marks/markah)

- Q5. (a) Referring to Figure Q5(a), determine the hybrid parameters h_{11} and h_{21} for the two-port network.

Merujuk kepada Rajah Q5(a), tentukan parameter hibrid h_{11} dan h_{21} untuk rangkaian dua-liang ini.

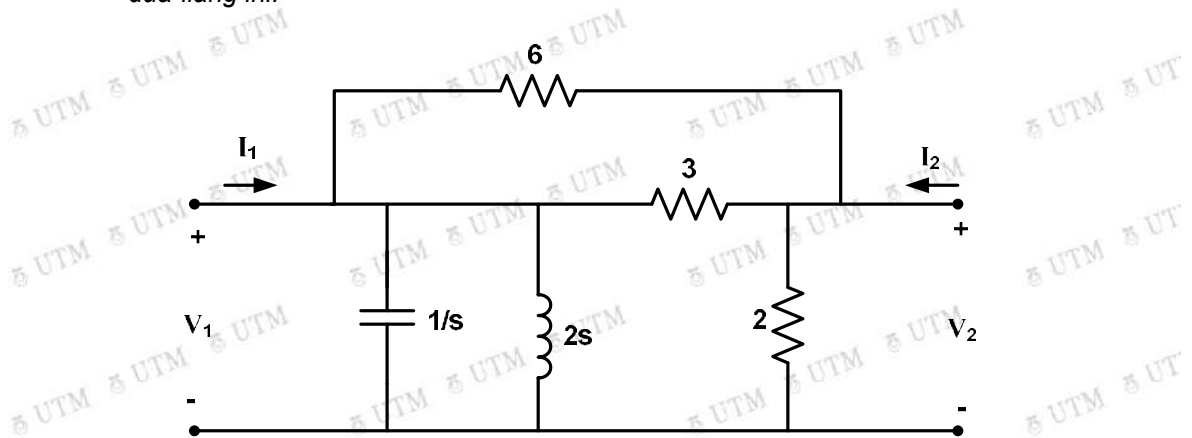


Figure Q5(a) / Rajah Q5(a)

(10 marks/markah)

- (b) The termination of a two-port network is shown in Figure Q5(b). These networks are identical and are interconnected in series. Given their Z-parameter are $\begin{bmatrix} s & 2 \\ 2 & 0.5 \end{bmatrix}$, determine the current I_1 and voltage, V_2 .

Penamatan untuk satu rangkaian dua-liang adalah seperti ditunjukkan dalam Rajah Q5(b). Kedua-dua rangkaian ini adalah yang serupa dan disalinghubung secara sesiri.

Diberikan parameter-Z kedua-dua rangkaian ialah $\begin{bmatrix} s & 2 \\ 2 & 0.5 \end{bmatrix}$, tentukan arus I_1 dan voltan V_2 .

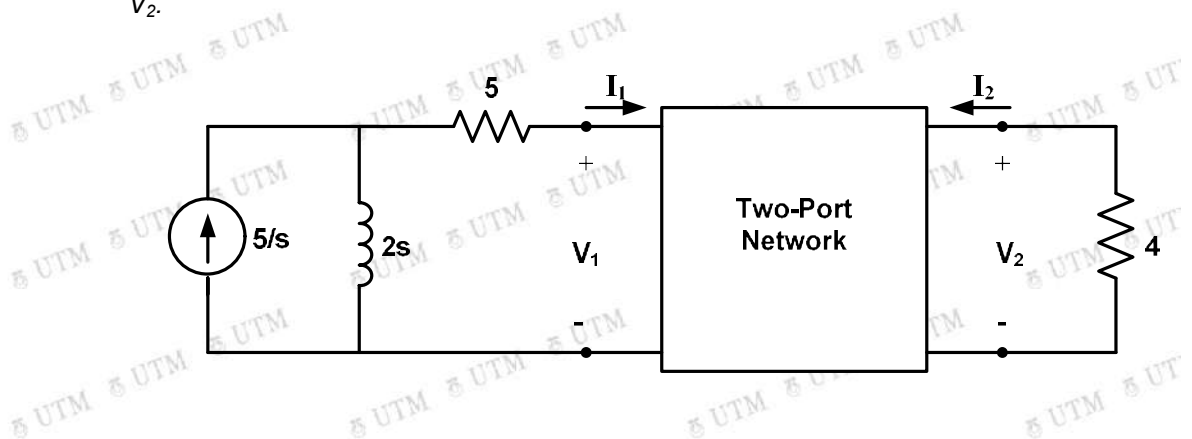


Figure Q5(b) / Rajah Q5(b)

(10 marks/markah)

Two-Port Network Parameters

(Parameter Rangkaian Dua Liang)

Impedance parameters

$$V_1 = z_{11} I_1 + z_{12} I_2$$

$$V_2 = z_{21} I_1 + z_{22} I_2$$

Hybrid parameters

$$V_1 = h_{11} I_1 + h_{12} V_2$$

$$I_2 = h_{21} I_1 + h_{22} V_2$$

Admittance parameters

$$I_1 = y_{11} V_1 + y_{12} V_2$$

$$I_2 = y_{21} V_1 + y_{22} V_2$$

Transmission parameters

$$V_1 = A V_2 - B I_2$$

$$I_1 = C V_2 - D I_2$$

Conversion Table for Two-Port Network Parameters

(Jadual Penukaran Untuk Rangkaian Dua Liang)

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