SECTION A : 60 MARKS

BAHAGIAN A : 60 MARKAH

INSTRUCTION:

This section consists of **FOUR (4)** structured questions. Answer **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab semua soalan.*

QUESTION 1

SOALAN 1

CLO1
C1

(a) Define Continuous-time signals and Discrete –time signal with a graphic representation.

Takrifkan isyarat Selanjar-Masa dan isyarat Diskret-Masa dengan perwakilan graf.

[3 marks]

[*3 markah*]

CLO1
C2

(b) Describe the signal of Unit Step Sequence $u[n]$ and Unit Impulse Sequence $\delta[n]$.

Terangkan isyarat Unit Langkah Dedenyut $u[n]$ *dan Unit Sambutan Dedenyut* $\delta[n]$.

[5 marks]

[*5 markah*]

CLO1
C3

(c) A Continuous-time signals *x(t)* and Discrete –time signal *x[n]* is shown in Figure A1(c). Sketch and label the even and odd components of the signals.

Satu isyarat Selanjar-Masa dan isyarat Diskret-Masa ditunjukkan dalam Rajah A1(c). *Lukis dan labelkan komponen genap dan ganjil bagi isyarat tersebut.*

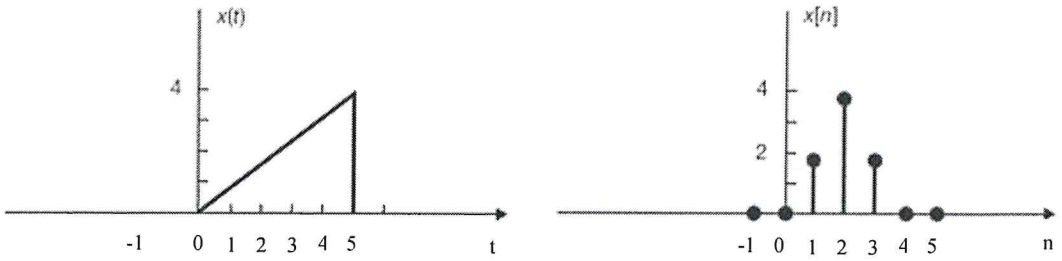

Figure A1(c) / *Rajah A1(c)*

[7 marks]
[7 markah]

CLO1
C1

QUESTION 2
SOALAN 2

(a) State **ONE (1)** property of convolution integral and give an example.
*Nyatakan **SATU (1)** ciri pengamiran konvolusi dan berikan contoh.*

[3 marks]
[*3 markah*]

CLO1
C2

(b) Consider the input signal $x[n]$ and impulse response $h[n]$ of Discrete-Time LTI system shown in Figure A2(b) below. Determine the expression of input signal $x[n]$ and impulse response $h[n]$.

Pertimbangkan isyarat masukan $x[n]$ *and sambutan dedenyut* $h[n]$ *bagi sistem LTI Diskret –Masa yang ditunjukkan pada Rajah A2(b) di bawah. Tentukan ungkapan isyarat masukan* $x[n]$ *dan sambutan dedenyut* $h[n]$.

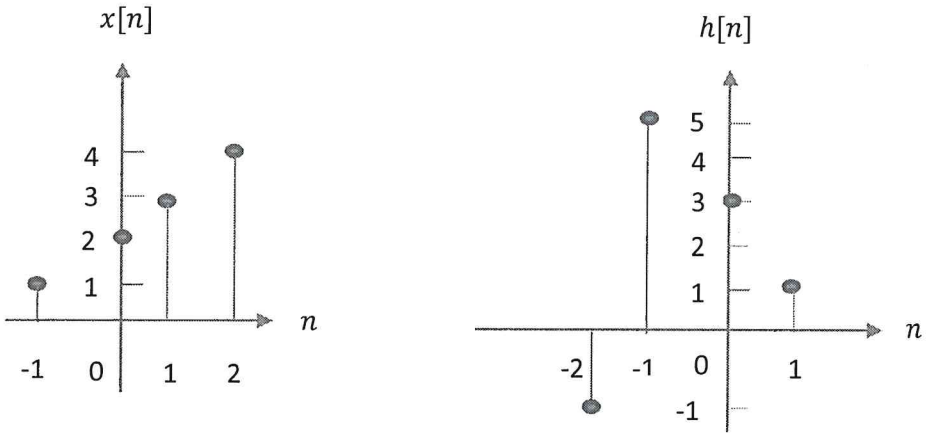

Figure A2(b) / *Rajah A2(b)*

[5 marks]

[*5 markah*]

CLO1
C3

(c) Consider the signal $x[n]$ and impulse response $h[n]$ shown in Figure A2(c). Calculate output of $y[0]$, $y[1]$ and $y[2]$ using convolution sum with graphical method.

Pertimbangkan isyarat masukan $x[n]$ *and sambutan dedenyut* $h[n]$ *yang ditunjukkan pada Rajah A2(c). Kirakan keluaran* $y[0]$, $y[1]$ *dan* $y[2]$ *menggunakan penambahan konvolusi dengan kaedah grafik.*

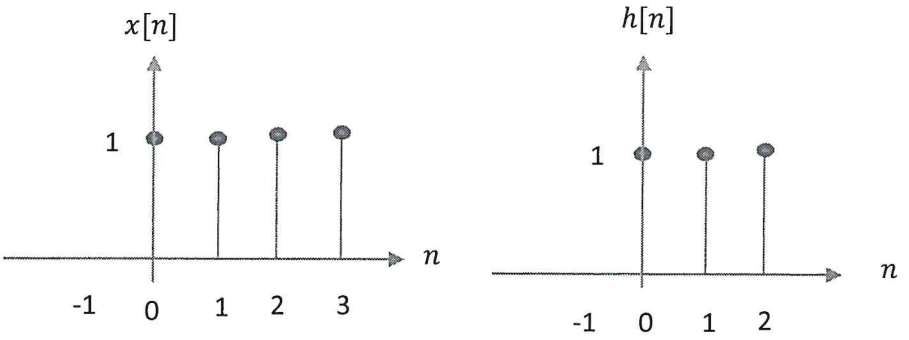

Figure A2(c) / *Rajah A2(c)*

[7 marks]

[*7 markah*]

QUESTION 3

SOALAN 3

CLO2
C1

(a) Define Region Of Convergence (ROC).

Definisikan "Region Of Convergence (ROC) ".

[3 marks]

[*3 markah*]

CLO2
C2

(b) Determine the inverse Laplace transform using a partial fraction method.

Tentukan jelmaan Laplace songsang menggunakan kaedah pecahan separa.

$$Y(s) = \frac{10}{s(s^2 + 3s + 2)}$$

[5 marks]

[*5 markah*]

CLO2
C3

(c) Calculate the inverse z-transform using a partial fraction expansion.

Kirakan jelmaan-z songsang menggunakan kembangan pecahan separa.

$$F(z) = \frac{2z^2 + z}{z^2 - 1.5z + 0.5}$$

[7 marks]

[*7 markah*]

QUESTION 4

SOALAN 4

CLO3 C2 (a) Express the following signal to the complex exponential Fourier series using Euler's Formula.

Ungkapkan isyarat berikut kepada kompleks eksponen siri Fourier dengan menggunakan formula Eular.

$$x(t) = \cos \omega_0 t$$

[3 marks]

[*3 markah*]

CLO3 C3 (b) Interpret the complex exponential Fourier series for the following signal.

Tafsirkan kompleks eksponen siri Fourier bagi isyarat berikut.

$$x(t) = \cos 6t + \sin 4t \text{ , where } \omega_0 = 2$$

[5 marks]

[*5 markah*]

CLO3 C4 (c) Referring to Figure A4(c), determine the complex exponential Fourier series of x(t).

Merujuk kepada Rajah A4(c),tentukan kompleks eksponen siri Fourier bagi x(t).

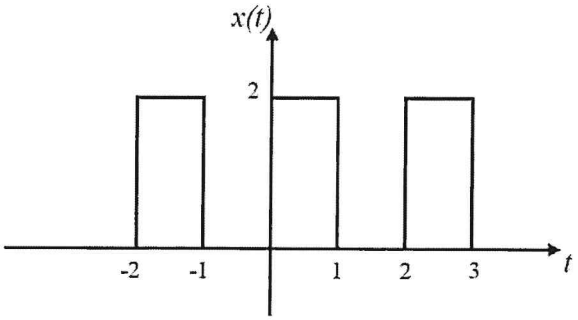

Figure A4(c) / *Rajah A4(c)*

[7 marks]

[*7 markah*]

SECTION B : 40 MARKS

BAHAGIAN B : 40 MARKAH

INSTRUCTION:

This section consists of **TWO (2)** essay questions. Answer **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **DUA (2)** soalan esei. Jawab **SEMUA** soalan.*

QUESTION 1

SOALAN 1

CLO2
C3

Calculate the $h(t)$ for causal LTI system and sketch the ROC for $H(z)$ on the poles-zeros diagram for the following equation.

$$y[n] - 3y[n-1] + 2y[n-2] = x[n]$$

Kirakan h(t) bagi sistem causal LTI dan lukiskan ROC pada rajah kutub-sifar bagi H(z) untuk persamaan berikut.

$$y[n] - 3y[n-1] + 2y[n-2] = x[n]$$

[20 marks]
[*20 markah*]

QUESTION 2

SOALAN 2

CLO3
C4

A causal discrete-time LTI system is given by:

$$y[n] - \frac{3}{4}y[n-1] + \frac{1}{8}y[n-2] = x[n]$$

Where $x[n]$ and $y[n]$ are the input and output of the system. Determine the frequency response $H(\Omega)$ and the impulse response $h[n]$ of the system.

Satu sistem causal LTI diskret – masa diberi oleh:

$$y[n] - \frac{3}{4}y[n-1] + \frac{1}{8}y[n-2] = x[n]$$

Di mana $x[n]$ *dan* $y[n]$ *ialah masukan dan keluaran sistem. Tentukan frekuensi dedenyut* $H(\Omega)$ *dan sambutan dedenyut* $h[n]$ bagi *sistem tersebut.*

[20 marks]
[*20 markah*]

SOALAN TAMAT

FORMULA FOR DEE6122 SIGNAL AND SYSTEM

LAPLACE TRANSFORM PAIRS

$f(t)$	$F(s)$
$\partial(t)$	1
$u(t)$	$\frac{1}{s}$
a	$\frac{a}{s}$
$t^n, n=1,2,3,...$	$\frac{n!}{s^{n+1}}$
e^{at}	$\frac{1}{s-a}$
$\sin at$	$\frac{a}{s^2+a^2}$
$\cos at$	$\frac{s}{s^2+a^2}$
$\sin(at+\theta)$	$\frac{s\sin\theta+a\cos\theta}{s^2+a^2}$
$\cos(at+\theta)$	$\frac{s\cos\theta-a\sin\theta}{s^2+a^2}$
$e^{-at}\sin bt$	$\frac{b}{(s+a)^2+b^2}$
$e^{-at}\cos bt$	$\frac{s+a}{(s+a)^2+b^2}$
$t^n e^{-at}$	$\frac{n!}{(s+a)^{n+1}}$
$\sinh at$	$\frac{a}{s^2-a^2}$
$\cosh at$	$\frac{s}{s^2-a^2}$

FORMULA FOR DEE6122 SIGNAL AND SYSTEM

Z TRANSFORM PAIRS

$x(t)$	$X(s)$	$X(z)$
$\partial(t)=\begin{cases}1 & t=0\\ 0 & t=kT,\ k\neq 0\end{cases}$	1	1
$\partial(t-kT)=\begin{cases}1 & t=kT\\ 0 & t\neq kT\end{cases}$	e^{-kTs}	Z^{-k}
$u(t)$, *unit step*	$\frac{1}{s}$	$\frac{z}{z-1}$
t	$\frac{1}{s^2}$	$\frac{Tz}{(z-1)^2}$
t^2	$\frac{2}{s^3}$	$\frac{T^2z(z+1)}{(z-1)^3}$
e^{-at}	$\frac{1}{s+a}$	$\frac{z}{z-e^{-aT}}$
$1-e^{-at}$	$\frac{a}{s(s+a)}$	$\frac{(1-e^{-aT})z}{(z-1)(z-e^{-aT})}$
te^{-at}	$\frac{1}{(s+a)^2}$	$\frac{Tze^{-aT}}{(z-e^{-aT})^2}$
t^2e^{-at}	$\frac{2}{(s+a)^3}$	$\frac{T^2e^{-aT}z(z+e^{-aT})}{(z-e^{-aT})^3}$
$\sin\omega t$	$\frac{\omega}{s^2+\omega^2}$	$\frac{z\sin\omega T}{z^2-2z\cos\omega T+1}$
$\cos\omega t$	$\frac{s}{s^2+\omega^2}$	$\frac{z(z-\cos\omega T)}{z^2-2z\cos\omega T+1}$
$e^{-at}\sin\omega t$	$\frac{\omega}{(s+a)^2+\omega^2}$	$\frac{(ze^{-aT}\sin\omega T)}{z^2-2ze^{-aT}\cos\omega T+e^{-2aT}}$
$e^{-at}\cos\omega t$	$\frac{s+a}{(s+a)^2+\omega^2}$	$\frac{(z^2-ze^{-aT}\cos\omega T)}{z^2-2ze^{aT}\cos\omega T+e^{2aT}}$

FORMULA FOR DEE6122 SIGNAL AND SYSTEM

FOURIER TRANSFORM PAIRS

$f(t)$	$F(\omega)$
$\partial(t)$	1
1	$2\pi\partial(\omega)$
$u(t)$	$\pi\partial(\omega)+\frac{1}{j\omega}$
$u(t+\tau)-u(t-\tau)$	$2\frac{\sin\omega\tau}{\omega}$
$\lvert t\rvert$	$\frac{-2}{\omega^2}$
$\text{sgn}(t)$	$\frac{2}{j\omega}$
$e^{-at}u(t)$	$\frac{1}{a+j\omega}$
$e^{-at}u(-t)$	$\frac{1}{a-j\omega}$
$t^n e^{-at}u(t)$	$\frac{n!}{(a+j\omega)^{n+1}}$
$e^{-a\lvert t\rvert}$	$\frac{2a}{a^2+\omega^2}$
$e^{j\omega_o t}$	$2\pi\partial(\omega-\omega_o)$
$\sin\omega_o t$	$j\pi[\partial(\omega+\omega_o)-\partial(\omega-\omega_o)]$
$\cos\omega_o t$	$\pi[\partial(\omega+\omega_o)+\partial(\omega-\omega_o)]$
$\sin(\omega t+\theta)$	$\frac{s\sin\theta+\omega\cos\theta}{s^2+\omega^2}$
$\cos(\omega t+\theta)$	$\frac{s\cos\theta-\omega\sin\theta}{s^2+\omega^2}$
$e^{-at}\sin\omega_o t\ u(t)$	$\frac{\omega_o}{(a+j\omega)^2+\omega_o^{\ 2}}$
$e^{-at}\cos\omega_o t\ u(t)$	$\frac{a+j\omega}{(a+j\omega)^2+\omega_o^{\ 2}}$