

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI DISEMBER 2016

DEE 6122: SIGNAL AND SYSTEM

TARIKH : 05 APRIL 2017

MASA : 2.30PM – 4.30PM (2 JAM)

Kertas ini mengandungi ENAM (6) halaman bercetak.

Bahagian A: Struktur (4 soalan)

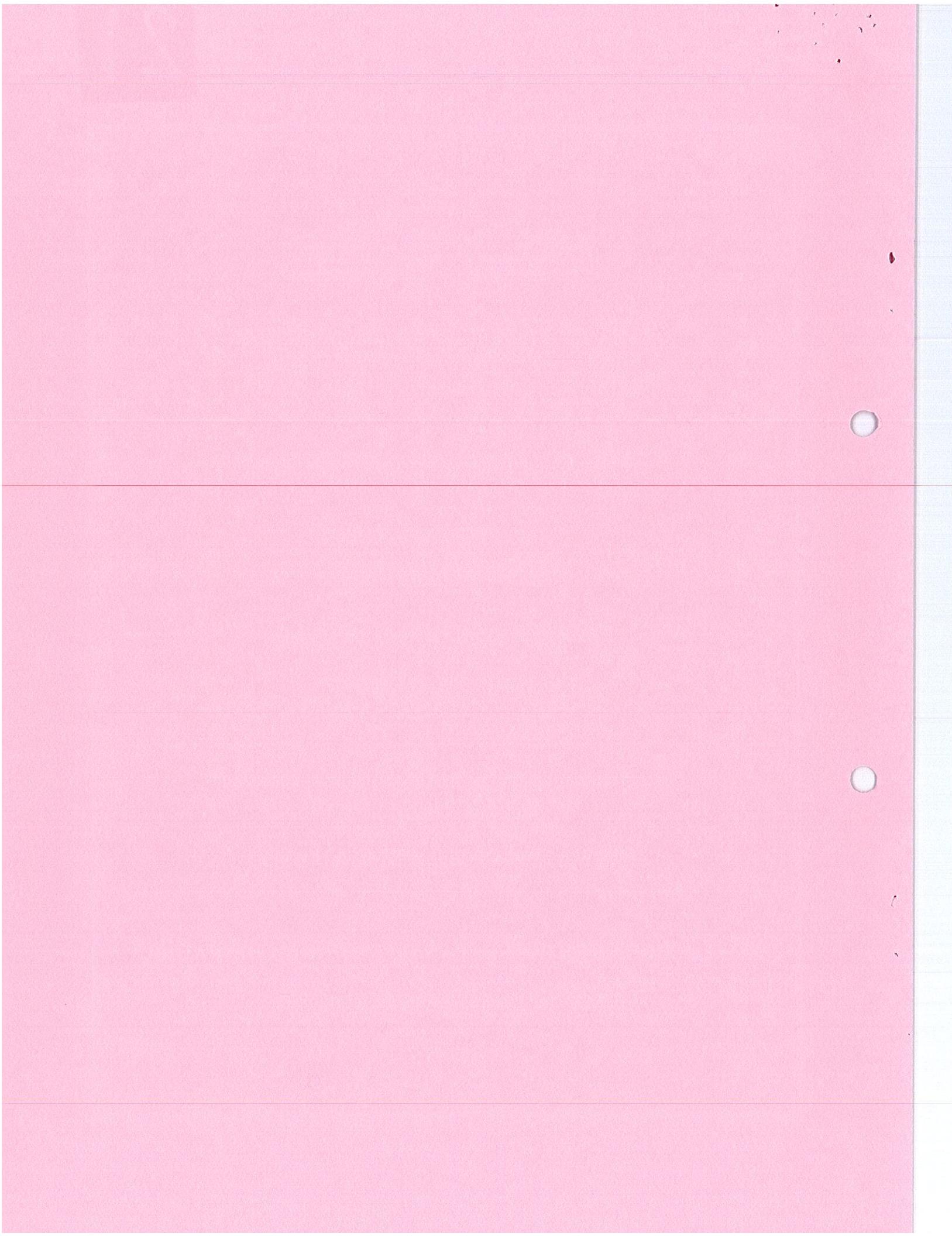
Bahagian B: Esei (2 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALANINI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT



SECTION A : 60 MARKS
BAHAGIAN A : 60 MARKAH

INSTRUCTION:

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

ARAHAN :

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

QUESTION 1**SOALAN 1**

CLO1

C1

- (a) Identify the difference between even and odd signals.

Kenal pasti perbezaan di antara isyarat genap dan ganjil.

[3 marks]

[3 markah]

CLO1

C2

- (b) Describe the signal of Unit Step Function $u(t)$ and Unit Impulse Function, $\delta(t)$.

Gambarkan isyarat Unit Step Function , $u(t)$ dan Unit Impulse Function, $\delta(t)$

[5 marks]

[5 markah]

CLO1

C3

- (c) Sketch $x(t) = u(1-t)$ and $x(t) = [u(t)-u(t-1)]$ for the continuous time signal shown in figure A1(c)

Lakar $x(t) = u(1-t)$ dan $x(t) = [u(t)-u(t-1)]$ untuk isyarat masa berterusan $x(t)$ pada rajah A1(c)

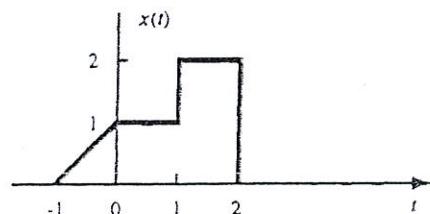


Figure A1(c) / Rajah A1(c)

[7 marks]

[7 markah]

QUESTION 2
SOALAN 2

CLO1
C1

- (a) Define the convolution of two continuous time signals $x(t)$ and $h(t)$ denoted by

$$y(t) = x(t) * h(t) = \int_{-\infty}^{\infty} x(\tau) h(t - \tau) d\tau$$

Takrifkan konvolusi dua isyarat masa berterusan $x(t)$ dan $h(t)$ bagi persamaan

$$y(t) = x(t) * h(t) = \int_{-\infty}^{\infty} x(\tau) h(t - \tau) d\tau$$

[3 marks]

[3 markah]

CLO1
C2

- (b) Express the input-output relationship for a block diagram of LTI system shown in Figure A2(b).

Nyatakan hubungan data masukan dan keluaran bagi gambar rajah blok sistem LTI seperti dalam Gambar Rajah A2(b).

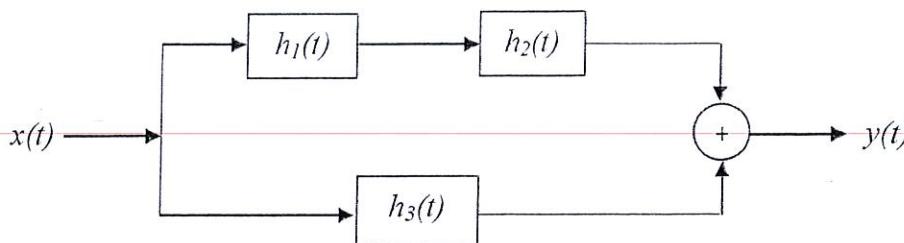


Figure A2(b) / Rajah A2(b)

[5 marks]

[5 markah]

CLO1
C3

- (c) Sketch the output of $y[n] = x[n] * h[n]$ with reference to the Figure A2(c) where

$$x[n] = -\delta[n] + 2\delta[n-1] + \delta[n-2]$$

$$h[n] = \delta[n] + \delta[n-2]$$

Lakarkan keluaran bagi $y[n] = x[n] * h[n]$ dengan merujuk kepada Rajah A2(c) di mana

$$x[n] = -\delta[n] + 2\delta[n-1] + \delta[n-2]$$

$$h[n] = \delta[n] + \delta[n-2]$$

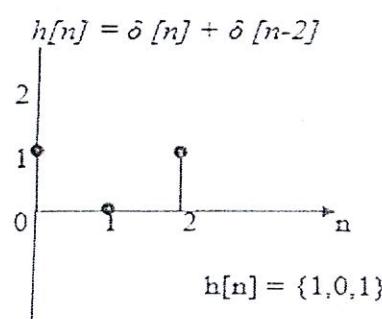
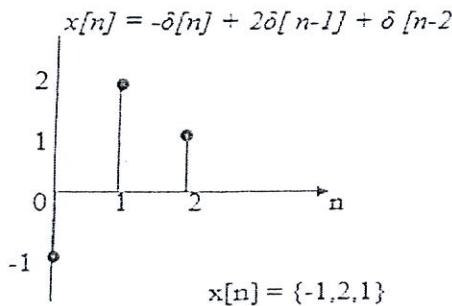


Figure A2(c) / Rajah A2(c)

[7 marks]

[7 markah]

QUESTION 3
SOALAN 3

CLO2

C1

- (a) Identify the Region of Convergence (ROC) in Linear Time Invariant (LTI) System
Kenalpasti "Region of Convergence" (ROC) dalam sistem "Linear Time Invariant" (LTI)

[3 marks]

[3 markah]

CLO2

C2

- (b) Compute the inverse of the following Laplace Transform using partial fraction method

$$X(s) = \frac{s+3}{s(s+1)}$$

Kirakan Jelmaan Laplace Songsang bagi persamaan berikut menggunakan kaedah pecahan separa

$$X(s) = \frac{s+3}{s(s+1)}$$

[5 marks]

[5 markah]

CLO2

C3

- (c) Complete the Laplace Transform $X(s)$ and sketch the pole zero with the ROC for the following signal $x(t)$

$$x(t) = e^{-t}u(t) + e^{2t}u(-t)$$

Lengkapkan Jelmaan Laplace $X(s)$ dan lakarkan kutub sifar dengan ROC bagi isyarat $x(t)$ berikut :

$$x(t) = e^{-t}u(t) + e^{2t}u(-t)$$

[7 marks]

[7 markah]

QUESTION 4
SOALAN 4

CLO2

C2

- (a) Express the following signal to the complex exponential Fourier Series representation by using Eular's formula.

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

Ungkapkan isyarat berikut kepada kompleks eksponen Siri Fourier dengan menggunakan formula Eular's.

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

[3 marks]

[3 markah]

CLO2
C3

- (b) Interpret the complex exponential Fourier Series for the following signal

$$X(t) = \cos 6t + \sin 4t \quad \text{where } \omega_o = 2$$

Terangkan eksponen kompleks Siri Fourier bagi isyarat berikut

$$X(t) = \cos 6t + \sin 4t \quad \text{where } \omega_o = 2$$

[5 marks]

[5 markah]

CLO2
C4

- (c) Referring to Figure A4(c), determine the complex exponential Fourier Series of
- $x(t)$
-
- Merujuk kepada Gambar Rajah A4(c), Tentukan kompleks eksponen Siri Fourier bagi
- $x(t)$

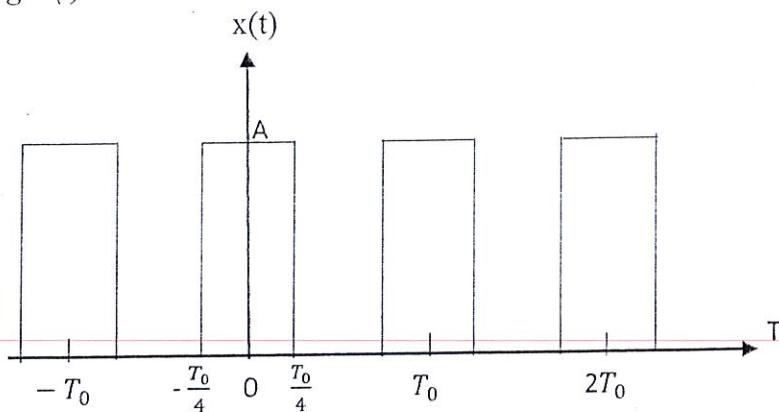


Figure A4(c) /Rajah A 4(c)

[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 eseai. 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.

(Hint: Apply linearity and time delay properties to get the system function $H(z)$ which is the equal to $Y(z)/X(z)$).

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

Kirakan $h(t)$ untuk sistem causal LTI dengan menunjukkan ROC Rajah kutub-sifar bagi $H(z)$ untuk persamaan berikut.

(Gunakan ciri Linearity dan Time delay untuk mendapatkan fungsi sistem $H(z)$ yang bersamaan dengan $Y(z)/X(z)$).

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

[20 marks]

[20 markah]

QUESTION 2**SOALAN 2**

CLO3
C4

Discrete Fourier Transform (DFT) is a mathematic operation to change the N-sample discrete signal to the same frequency samples and is defined as,

$$X(k) = \sum_{n=0}^{N-1} x[n]e^{-j2\pi nk/N}$$

Draw the real and imaginary diagram of the sequence $x[n] = \{1,2,3,4\}$ after being transformed using the above definition.

Jelmaan Diskrit Fourier (DFT) adalah operasi matematik untuk mengubah isyarat diskrit N-sample kepada sampel yang mempunyai frekuensi yang sama dan didefinisikan sebagai,

$$X(k) = \sum_{n=0}^{N-1} x[n]e^{-j2\pi nk/N}$$

Lukiskan rajah komponen real dan imaginary bagi jujukan $x[n] = \{1,2,3,4\}$ yang telah dijelmakan menggunakan definisi di atas.

[20 marks]

[20 markah]

SOALAN TAMAT



FORMULA

Laplace transforms and the inverses

$f(t) = L^{-1}\{F(s)\}$	$F(s) = L\{f(t)\}$
a	$\frac{a}{s}$
$t^n, n = 1, 2, 3, \dots$	$\frac{n!}{s^{n+1}}$
e^{at}	$\frac{1}{s - a}$
$\sin at$	$\frac{a}{s^2 + a^2}$
$\cos at$	$\frac{s}{s^2 + a^2}$
$\sinh at$	$\frac{a}{s^2 - a^2}$
$\cosh at$	$\frac{s}{s^2 - a^2}$
$e^{at} \sin bt$	$\frac{b}{(s - a)^2 + b^2}$
$e^{at} \cos at$	$\frac{s - a}{(s - a)^2 + b^2}$
$t^n e^{at}$	$\frac{n!}{(s - a)^{n+1}}$
$t^n f(t)$	$(-1)^n \frac{d^n}{ds^n} [F(s)]$
$e^{at} f(t)$	$F(s - a)$
$y'(t)$	$sY(s) - y(0)$
$y''(t)$	$s^2 Y(s) - sy(0) - y'(0)$
$\int_0^t f(t)dt$	$\frac{F(s)}{s}$

Other Related Formula

Integration by Parts	
$\int_a^b u dv$	$uv - \int_a^b v du$
V_R	$Ri(t)$
V_L	$L \frac{di(t)}{dt}$
V_C	$\frac{1}{C} \int_0^t i(t) dt + V_C(0)$
I_R	$\frac{v(t)}{R}$
I_C	$C \frac{dv(t)}{dt}$
I_L	$\frac{1}{L} \int_0^t v(t) dt$