

SULIT



KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI II : 2025/2026

DEJ30073: CONTROL SYSTEMS 1

TARIKH : 08 MEI 2026
MASA : 3.00 PETANG – 5.00 PETANG (2 JAM)

Kertas soalan ini mengandungi **LAPAN (8)** halaman bercetak.

Bahagian A: Struktur (4 soalan)

Bahagian B: Esei (1 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SECTION A : 80 MARKS
BAHAGIAN A : 80 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 | <p>(a) Define open loop and closed loop system by giving suitable examples.
<i>Terangkan sistem gelung terbuka dan gelung tertutup dengan memberikan contoh yang sesuai.</i></p> <p style="text-align: right;">[4 marks]
[4 markah]</p> |
| CLO1 | <p>(b) Explain the advantages on using closed loop system.
<i>Terangkan kelebihan menggunakan sistem gelung tertutup.</i></p> <p style="text-align: right;">[6 marks]
[6 markah]</p> |
| CLO1 | <p>(c) A student is chasing a ball on the field as shown in Figure A1(c). Write the operations in closed-loop control system with the aid of a block diagram.
<i>Seorang pelajar sedang mengejar bola di atas padang seperti yang ditunjukkan dalam Rajah A1(c.) Tulis operasi dalam sistem kawalan gelung tertutup dengan bantuan gambar rajah blok.</i></p> <p style="text-align: right;">[10 marks]
[10 markah]</p> |



Figure A1(c) / Rajah A1(c)

QUESTION 2**SOALAN 2**

- CLO1 (a) State the concept of the transfer function by using a block diagram in Laplace transform.
Nyatakan konsep rangkap pindah menggunakan gambarajah blok dalam penjelmaan Laplace.

[4 marks]

[4 markah]

- CLO1 (b) By referring to Figure A2(b), express all values for poles and zeros of the system on the s-plane.
Dengan merujuk kepada Rajah A1(b), nyatakan semua nilai kutub dan sifar untuk sistem pada satah-s.

[6 marks]

[6 markah]

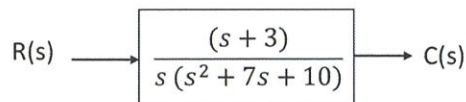


Figure A2(b)

- CLO1 (c) Given an RC circuit as shown in Figure A2(c) with unit step input is applied to input voltage $V_i(t)$ and output voltage $V_o(t)$ is measured across the capacitor. With the aid of circuit, calculate transfer function (TF) of the circuit using first order analysis.
Diberikan litar RC pada Rajah A2(c) dengan input langkah unit digunakan pada voltan masukan $V_i(t)$ dan voltan keluaran $V_o(t)$ diukur pada pemuat. Dengan bantuan litar, hitung rangkap pindah menggunakan analisis peringkat pertama.

[10 marks]

[10 markah]

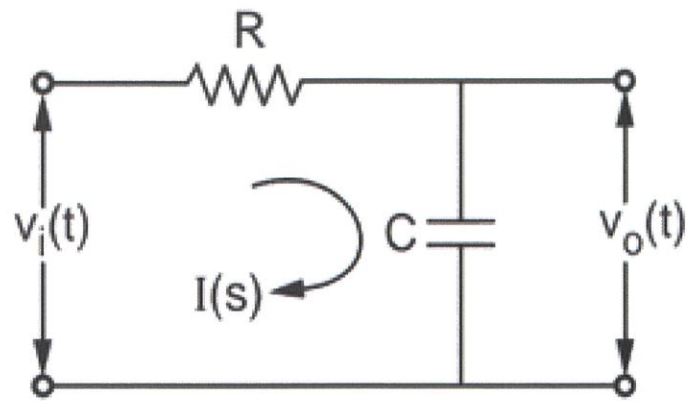


Figure A2(c) / Rajah A2(c)

QUESTION 3

SOALAN 3

- CLO1 (a) Define time response analysis of a control system and give a suitable example.
Terangkan analisis tindakbalas masa bagi sistem kawalan dan berikan contoh yang sesuai.

[4 marks]

[4 markah]

- CLO1 (b) Express steady state error for **THREE (3)** different types of input with the aid of diagram.

Nyatakan ralat keadaan mantap untuk TIGA (3) jenis masukan yang berbeza dengan bantuan gambarajah.

[6 marks]

[6 markah]

- CLO1 (c) Calculate damping ratio ξ if the unit step input applied to unity feedback system as shown in Figure A3(c).

Kira nisbah redaman ξ jika masukan langkah unit yang digunakan pada sistem suapbalik unit tertentu seperti yang ditunjukkan pada Rajah A3(c).

[10 marks]

[10 markah]

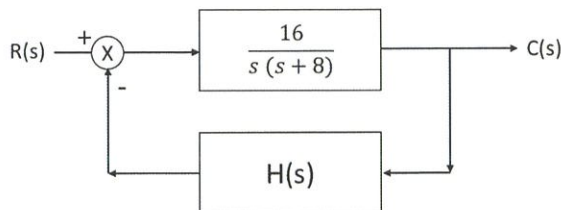


Figure A3(c)

QUESTION 4**SOALAN 4**

- CLO1 (a) Define **TWO (2)** terminologies related to controller.
*Takrifkan **DUA (2)** istilah yang berkaitan dengan pengawal.*
[4 marks]
[4 markah]
- CLO1 (b) Compare **THREE (3)** differences between Proportional Controller and Integral Controller.
*Bandingkan **TIGA (3)** perbezaan antara Pengawal Berkadaran dan Pengawal Kamiran.*
[6 marks]
[6 markah]
- CLO1 (c) A continuous controller is used to control a line follower robot. By using value $K_p = 2\%$ and $K_i = 4\%$ per min, $p(0) = 50\%$, $e(t) = 3t+7$. Calculate the controller output in % after 2 minutes.
Satu pengawal berterusan digunakan untuk mengawal robot pengikut garisan. Dengan menggunakan nilai $K_p = 2\%$ dan $K_i = 4\%$ setiap min, $p(0) = 50\%$, $e(t) = 3t+7$. Kira keluaran pengawal dalam % selepas 2 minit.
[10 marks]
[10 markah]

SECTION B : 20 MARKS**BAHAGIAN B : 20 MARKAH****INSTRUCTION:**

This section consists of **ONE (1)** essay question. Answer **ONE (1)** question only.

ARAHAN:

Bahagian ini mengandungi **SATU (1)** soalan esei. Jawab **SATU (1)** soalan sahaja.

QUESTION 1

CLO1

SOALAN 1

Calculate the transfer function by using Mason's gain formula for C/R_1 based on Figure B1. Assume value $R_2 = 0$.

Kirakan rangkap pindah menggunakan formula Gandaan Mason untuk C/R_1 berdasarkan Rajah B1. Anggap nilai $R_2 = 0$.

[20 marks]

[20 markah]

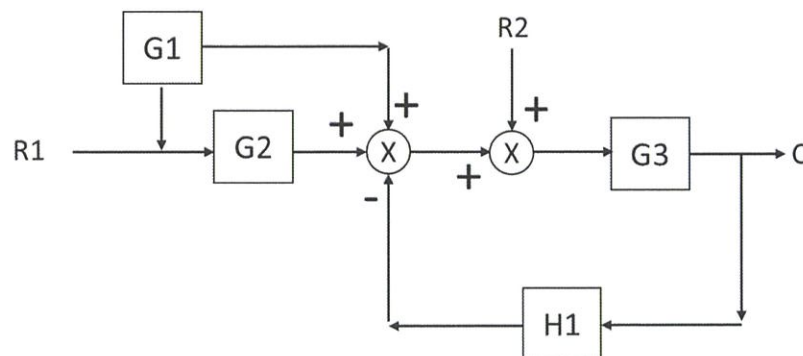


Figure B1 / Rajah B1

SOALAN TAMAT

Table 1 : Block Conversion

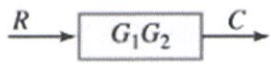
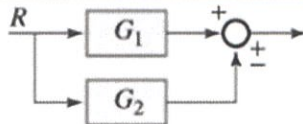
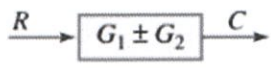
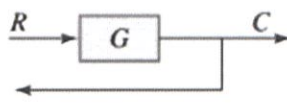
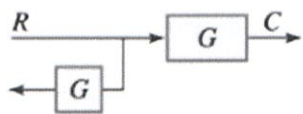
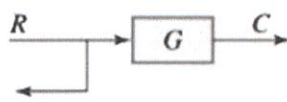
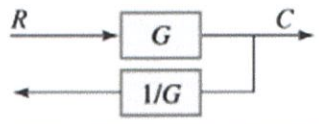
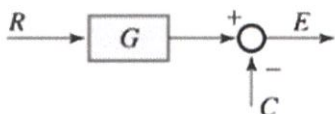
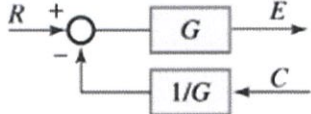
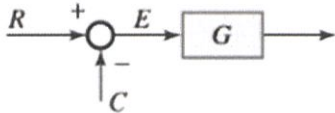
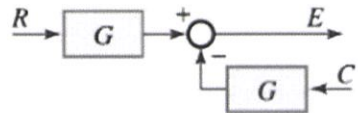
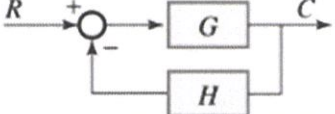
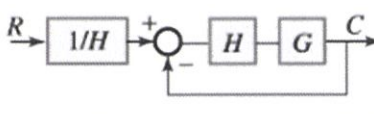
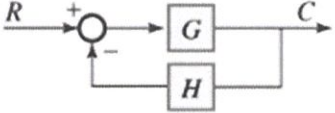
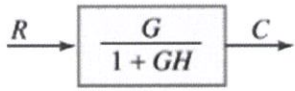
Original Block Diagram	Manipulation	Modified Block Diagram
	Cascaded elements	
	Addition or subtraction (eliminating auxiliary forward path)	
	Shifting of pickoff point ahead of block	
	Shifting of pickoff point behind block	
	Shifting summing point ahead of block	
	Shifting summing point behind block	
	Removing H from feedback path	
	Eliminating feedback path	

Table 2 : Laplace Transform Of Electrical Network

Element	Time domain expression for voltage	Laplace domain expression for voltage	Laplace domain behaviour
Resistance R	$i(t) \cdot R$	$I(s) R$	R
Capacitance C	$\frac{1}{C} \int i(t) dt$	$\frac{1}{sC} I(s)$	$\frac{1}{sC}$
Inductance L	$L \frac{di(t)}{dt}$	$sL I(s)$	sL