

SULIT



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

JABATAN AKADEMIK

**PENILAIAN ALTERNATIF BERIKUTAN
PELAKSANAAN PERINTAH KAWALAN BERSYARAT**

SESI JUN 2020

KOD KURSUS : BASIC CONTROL SYSTEM (DEJ 30013)

NAMA PENYELARAS KURSUS : ROKIAH BINTI HASSAN

KAEDAH PENILAIAN : PEPERIKSAAN ONLINE

**JENIS PENILAIAN : SOALAN OBJECTIVE (10 SOALAN)
SOALAN ESSAY STRUCTURE
(2 SOALAN)**

TARIKH PENILAIAN : 02 FEBUARI 2021

TEMPOH PENILAIAN : (1 JAM)

LARANGAN TERHADAP PLAGIARISM (AKTA 174)

**PELAJAR TIDAK BOLEH MEMPLAGIAT APA-APA IDEA, PENULISAN, DATA
ATAU CIPTAAN ORANG LAIN. PLAGIAT ADALAH SALAH SATU
PENYELEWENGAN AKADEMIK. SEKIRANYA PELAJAR DIBUKTIKAN
MELAKUKAN PLAGIARISM, PENILAIAN BAGI KURSUS BERKENAAN AKAN
DIMANSUHKAN DAN DIBERI GRED F DENGAN NILAI MATA 0.**

**(RUJUK BUKU ARAHAN-ARAHAN PEPERIKSAAN DAN KAEDAH PENILAIAN (Diploma) EDISI 6, JUN 2019,
KLAUSA 17.3)**

SECTION A : 20 MARKS
BAHAGIAN A : 20 MARKAH

INSTRUCTION:

This section consists of **TWENTY (20)** objective questions. Write your answers in the answer sheet form provided.

ARAHAN :

*Bahagian ini mengandungi **DUA PULUH (20)** soalan objektif. Tulis jawapan anda di dalam helaian kertas yang disediakan.*

CLO1
C3

1. Calculate the values of poles for the transfer function given below:

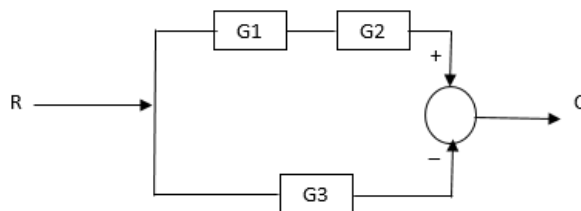
Kirakan nilai kutub bagi rangkap pindah yang diberikan dibawah:

$$T(s) = \frac{(3 + s)}{s(7 - s)}$$

- A. $s = 0, s = 3$
 B. $s = -3, s = 7$
 C. $s = 0, s = 7$
 D. $s = -3, s = 0$

CLO1
C3

2. Solve the block diagram below.
Selesaikan gambarajah blok di bawah.



- A. $\frac{C}{R} = G1 + G2 + G3$
 B. $\frac{C}{R} = G1G2 - G3$
 C. $\frac{C}{R} = G1 + G2 - G3$
 D. $\frac{C}{R} = G1G2 + G3$

CLO1
C3

3. Three blocks with gains of 4, 6 and 8 are connected in parallel. Calculate the total gain of the arrangement.

Tiga blok dengan gandaan 4, 6 dan 8 disambung secara selari. Kira jumlah gandaan bagi susunan tersebut adalah

- A. 18
B. 32
C. 196
D. 52

CLO1
C3

4. Based on the figure A4, how many forward paths are there?

Berdasarkan kepada rajah A4, tunjuk berapakah bilangan laluan hadapan?

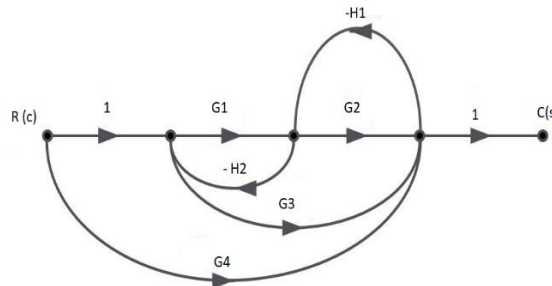


Figure A4 / Rajah A4

- A. 1
B. 2
C. 3
D. 4

CLO1
C3

5. A system produces the following equation. Calculate the damping ratio (ξ) for the system.

Satu sistem menghasilkan persamaan berikut, kirakan nisbah redaman (ξ) untuk sistem berikut.

$$G(s) = \frac{100}{s^2 + 8s + 100}$$

- A. 0.2
B. 0.4
C. 0.8
D. 8

For question 6 and 7, please refer to figure A6.

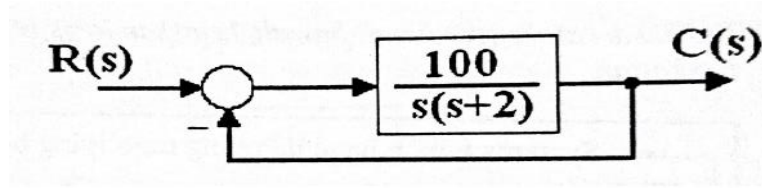


Figure A6/Rajah A6

CLO1
C3

6. Based on figure A6, calculate the value of settling time (T_s) when it is subjected by unit step input.

Berdasarkan Rajah A6, kirakan nilai masa penempatan (T_s) apabila diberi dengan masukan langkah unit.

- A. 0.36 sec C. 0.40 sec
B. 0.67 sec D. 0.04 sec

CLO1
C3

7. For the system as show in figure A6 , calculate the percentage of maximum overshoot (%) M_p when it is subjected by unit step input.

Bagi sistem yang ditunjukkan pada rajah A6, kirakan peratus lajakan maksimum (%) M_p apabila ia diberi dengan masukan langkah unit.

- A. 0.733% C. 5.66%
B. 0.337% D. 9.47%

CLO1
C3

8. By referring to figure A8, calculate the output value of PID controller when $K_p = 6$ and $K_D = 0.4$ with $p(0) = 25\%$.

Berdasarkan kepada rajah A8, kirakan nilai keluaran bagi pengawal PD apabila $K_p = 6$ dan $K_D = 0.4$ dengan $p(0) = 25\%$.

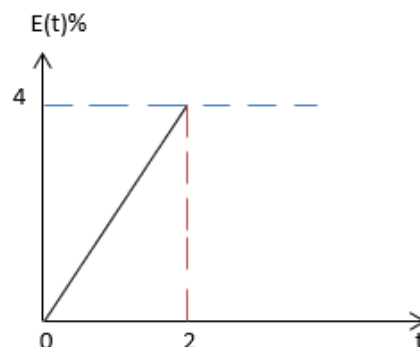


Figure A8 / Rajah A8

- A. $12t + 5.05s$
- B. $10 + 5t$
- C. $10t + 5.05$
- D. $12t + 5.05$

9. Mathematically, the proportional control mode is expressed as :

CLO1
C3

Secara matematik, pengawal mod jenis berkadaran dinyatakan sebagai:

$$P(t) = K_P e^{(t)} + P_0$$

Expose K_P / Dedahkan maksud K_P

- A. Proportional gain constant / *Pemalar gandaan berkadaran*
- B. Proportional control mode / *Mod kawalan berkadaran*
- C. Proportional error detector / *Pengesan takat berkadaran*
- D. Proportional band output / *Kebenarsn ruang berkadaran*

10. The range of measured variable for a certain control system is 2mV to 10mV and the set point is 7mV. Calculate the error in percentage of span when the measured variable is 6.5mV.

CLO1
C3

Julat pembolehubah yang telah diukur untuk satu sistem kawalan tertentu ialah 2mV kepada 10mV dan setpointnya ialah 7mV. Hitung ralat dalam peratus span apabila pemboleh ubah yang telah diukur ialah 6.5mV.

- A. 0.6225%
- B. 70%
- C. 6.25%
- D. 53.3%

SECTION B : 30 MARKS
BAHAGIAN B : 30 MARKAH

INSTRUCTION:

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

ARAHAN:

Bahagian ini mengandungi DUA(2) soalan berstruktur. Jawab semua soalan.

CLO1
C3

QUESTION 1

Solve transfer function of the system shown in the figure B1 by using Block Reduction Method..

SOALAN 1

Selesaikan rangkap pindah bagi sistem yang ditunjukkan di Rajah B1 dengan menggunakan Kaedah Pengecilan Blok Diagram.

[15 marks]
[15 markah]

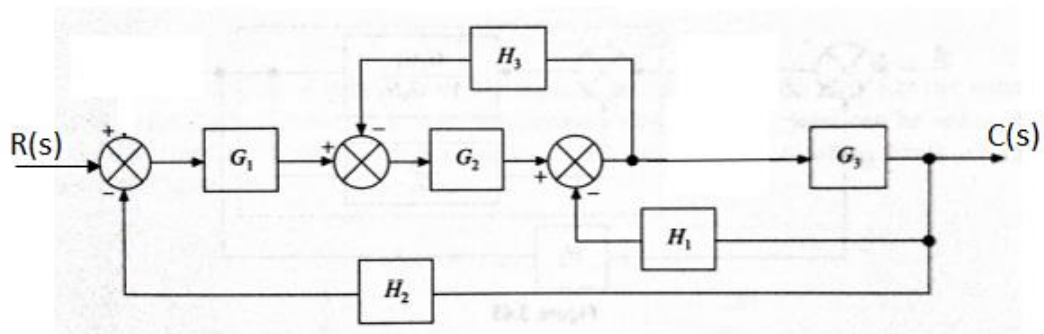


Figure B1 / Rajah B1

CLO2
C3

QUESTION 2

The system shown in figure B2 (a) when subjected to a unit step input with the output response shown in figure B2 (b). Calculate the value of K and T from the response curve.

SOALAN 2

Sistem yang ditunjukkan pada rajah B2 (a) apabila dikenakan masukan unit Langkah, tindak balas keluaran ditunjukkan pada rajah B2 (b). Kirakan nilai K dan T dari keluk tindak balas.

[15 marks]
[15 markah]

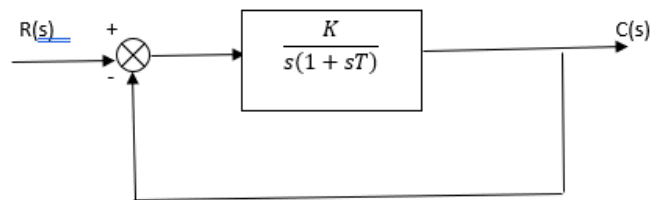


Figure B2 (a) / Rajah B2 (a)

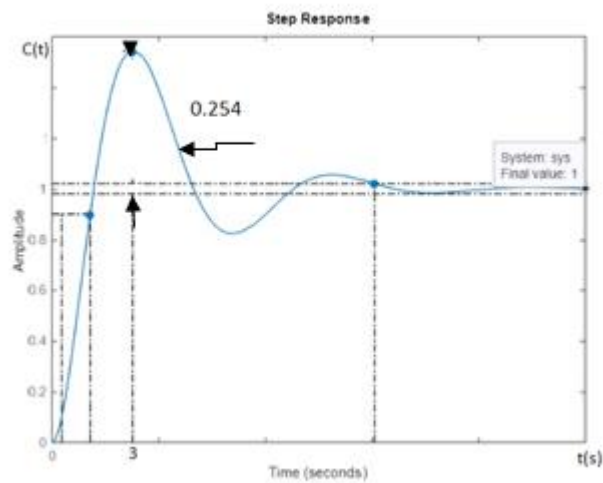


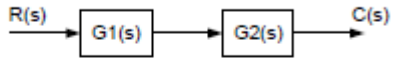
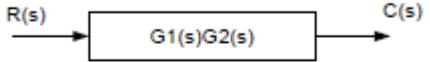
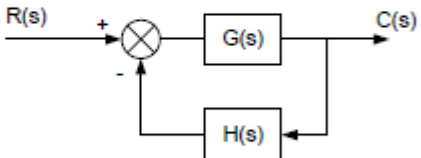
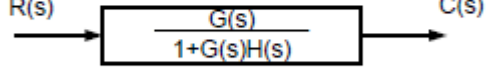

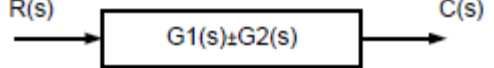
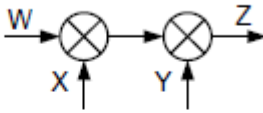
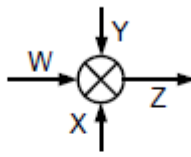
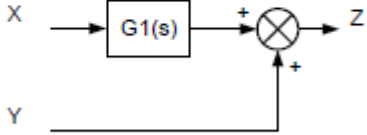
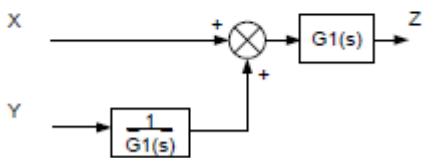
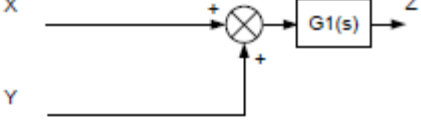
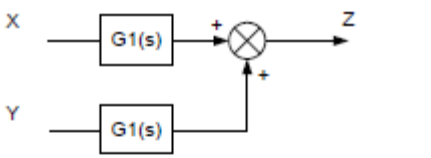
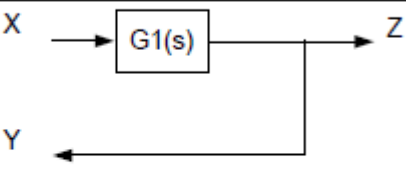
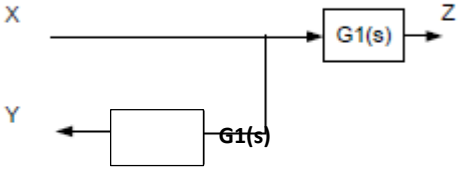
Figure B2 (b) / Rajah B2 (b)

SOALAN TAMAT

Standard Laplace Transform Pairs

$f(t) = \mathcal{L}^{-1}\{F(s)\}(t)$	$F(s) = \mathcal{L}\{f(t)\}(s) = \int_0^{\infty} e^{-st} f(t) dt$
1	$\frac{1}{s}, \quad s > 0$
$t^n, \quad n \text{ an integer}$	$\frac{n!}{s^{n+1}}, \quad s > 0$
e^{at}	$\frac{1}{s-a}, \quad s > a$
$\sin bt$	$\frac{b}{s^2 + b^2}, \quad s > 0$
$\cos bt$	$\frac{s}{s^2 + b^2}, \quad s > 0$
$e^{at} f(t)$	$F(s-a)$
$e^{at} t^n, \quad n \text{ an integer}$	$\frac{n!}{(s-a)^{n+1}}, \quad s > a$
$e^{at} \sin bt$	$\frac{b}{(s-a)^2 + b^2}, \quad s > a$
$e^{at} \cos bt$	$\frac{(s-a)}{(s-a)^2 + b^2}, \quad s > a$
$t \sin bt$	$\frac{2bs}{(s^2 + b^2)^2}, \quad s > 0$
$t \cos bt$	$\frac{s^2 - b^2}{(s^2 + b^2)^2}, \quad s > 0$
$y' = \dot{y} = \frac{dy}{dt}$	$sY(s) - y(0)$
$y'' = \ddot{y} = \frac{d^2y}{dt^2}$	$s^2Y(s) - sy(0) - \dot{y}(0)$

BLOCK DIAGRAM REDUCTION TABLE

Case	Original structure	Equivalent structure
1		
2		
3		
4		
5		
6		
7		
8	