SULIT

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

JABATAN KEJURUTERAAN ELEKTRIK

PENILAIAN ALTERNATIF

SESI 1 : 2021/2022

DEJ30013 : BASIC CONTROL SYSTEM

NAMA PENYELARAS KURSUS : ROKIAH BINTI HASSAN

KAEDAH PENILAIAN : **PEPERIKSAAN ATAS TALIAN**

JENIS PENILAIAN : ***OPEN BOOKED ASSESSMENT***
SOALAN STRUKTUR (3 SOALAN)
SOALAN ESEI (1 SOALAN)

TARIKH PENILAIAN : **03 FEBUARI 2022**

TEMPOH PENILAIAN : **2 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 : 75 MARKS
BAHAGIAN A : 75 MARKAH

INSTRUCTION:
This section consists of **SEVENTY-FIVE (75)** structured questions. Write your answers in the answer sheet form provided.
ARAHAN :
*Bahagian ini mengandungi **TUJUH PULUH LIMA(75)** soalan berstruktur. Tulis jawapan anda di dalam helaian kertas yang disediakan.*

CLO1
C3

QUESTION 1
SOALAN 1

a) Draw a block diagram of the open loop system and explain how the system works.
Lukiskan gambarajah blok system gelung terbuka dan terangkan bagaimana system berfungsi.

[8 marks]
[*8 markah*]

CLO1
C3

b) Consider a turbine generator shown in Figure B1 below, where it has a steam turbine to drive the electric generator and thus generates electric energy.
Write which type of control system should be implemented and how it works to control the turbine generator with the suitable aid of a block diagram.

Pertimbangkan penjana turbin yang ditunjukkan dalam Rajah B1 di bawah di mana ia mempunyai turbin stim untuk memacu penjana elektrik dan dengan itu menjana tenaga elektrik.
Tuliskan jenis sistem kawalan yang harus dilaksanakan dan cara ia berfungsi untuk mengawal penjana turbin dengan bantuan gambar rajah blok yang sesuai.

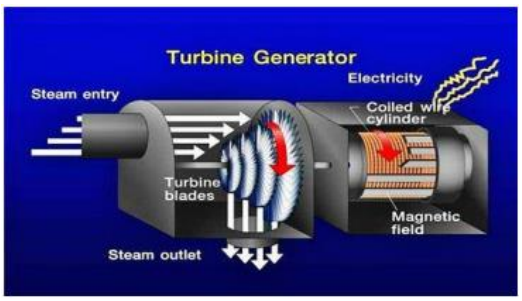


Figure A1(b) / *Rajah A1(b)*

[8 marks]
[*8 markah*]

CLO1
C3

c) The system shown in Figure C1 solves the transfer function where $V_o(t)$ is output and Vi(t) is input to the system.
Merujuk kepada system pada Rajah C1,selesaikan rangkap pindahnya dimana $V_o(t)$ adalah keluaran dan and Vi(t) adalah masukan bagi system ini.

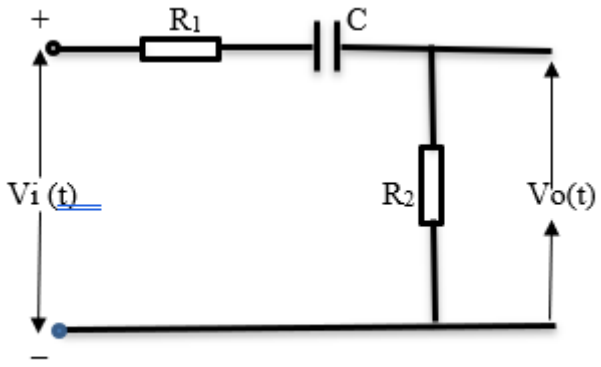


Figure A1(c)/Rajah A1(c)

[9 marks]
[*9 markah*]

QUESTION 2
SOALAN 2

CLO1
C3

a) By referring to Figure A2(a), calculate all values of poles and zeros for the system and then sketch the system poles and zeros on the s-plane.
Dengan merujuk gamarajah A2(a),kira semua nialai bagi kutub dan sifar untuk system tersebut dan kemudian lakarkan kutub dan sifar untuk system tersebut di atas satah -s.

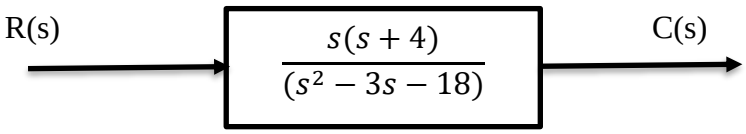


Figure A2(a)./Rajah A2(a)

CLO1
C3

b) Solve the close cloop transfer function of the system shown in figure A2 by using the Block Diagram Reduction Method.

Selesaikan rangkap pindah bagi sistem yang ditunjukkan di Rajah A2 dengan menggunakan Kaedah Pengecilan Blok Diagram.

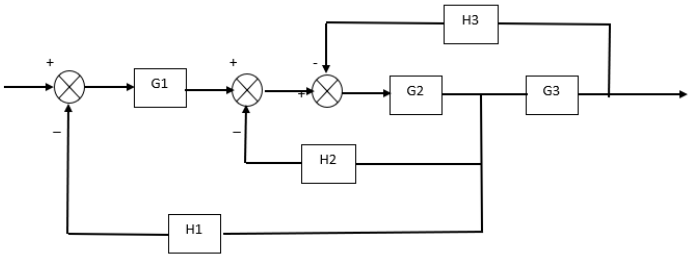


Figure A2(b)./Rajah A2(b)

CLO1
C3

c) Calculate the system's transfer function shown in Figure A2 (c) using Manson Gain Formula.
Kirakan rangkap pindah bagi siatem yang ditunjukan di Rajah A2(c) dengan menggunakan Formula Gandaan Mason.

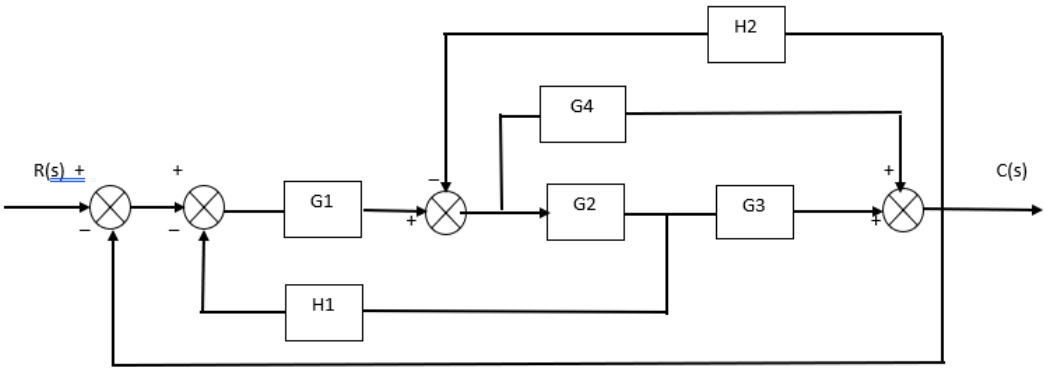


Figure A2(c)./Rajah A2(c)

QUESTION 3
SOALAN 3

CLO1
C3

a) By referring to the Figure A3(a),calculate the output value of PD controller when Kp = 3% and K_D = 0.5% with p(0) = 20%.
Berdasarkan kepada Rajah A2(b),kirakan nilai keluaran bagi pengawal jenis PD apabila Kp = 3% dan K_D = 0.5% dengan p(0) = 20%.

[8 marks]
[*8 markah*]

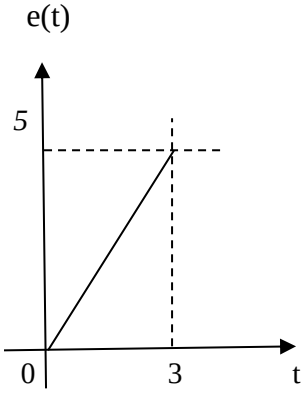


Figure A3(a)/Rajah A3(a)

CLO1
C3

b) A Proportional + Integral (PI) controller controls certain processes. The controller's setting is Kp =4% and Ki = 5% per min. While p(0) = 3% ,the error signal is found to be 10t + 4 where t is the time. Calculated the controller output in % after 0.5 minute.
Satu pengawal perkadaran + kamiran (PI) digunakan untuk mengawal proses tertentu.Tetapan Kp = 4% dan Ki = 5% setiap minit.Manakala p(0) =3% isyarat ralat ialah 10t + 4 dimana t ialah masa.Tentukan nilai % keluaran pengawal dalam selepas 0.5 minit.

[8 marks]
[*8 markah*]

CLO1
C3

c) Solve the response c(t) of the following transfer function for a unit step input
Kirakan sambutan c(t) bagi rangkap pindah berikut dengan masukan unit tanjakan.

$$G(s) = \frac{3}{s(s+4)}$$

[9 marks]
[*9 markah*]

SECTION B : 25 MARKS
BAHAGIAN B : 25 MARKAH

INSTRUCTION:
This section consists of **0NE (1)** Essay questions. Answer **ALL** questions.

ARAHAN:
*Bahagian ini mengandungi **SATU (1)** soalan esei. Jawab semua soalan.*

CLO1
C3

The closed-loop unity feedback control system is shown in Figure B1. For values of A=20 and 400, Calculate the value of damping ratio, damped natural frequency, delay time, maximum overshoot, rise time and the time at which peak overshoot occurs.

Sistem kawalan maklum balas gelung tertutup ditunjukkan dalam Rajah B1. Untuk nilai A=20 dan 200, Kirakan nisbah redaman, frekuensi redaman, masa tunda, overshoot maksimum, masa kenaikan dan masa di mana lampau lajak maksimum berlaku.

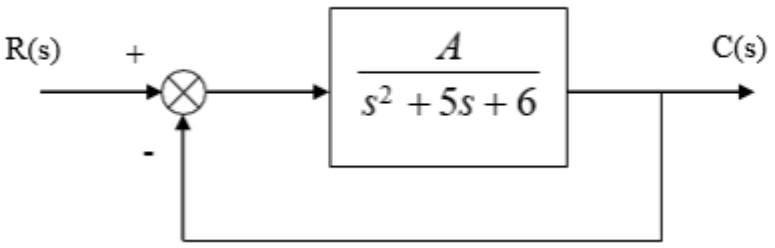


Figure B1/Rajah B1

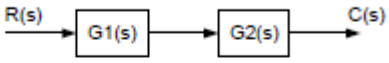
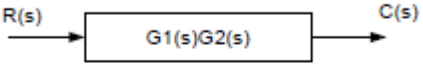
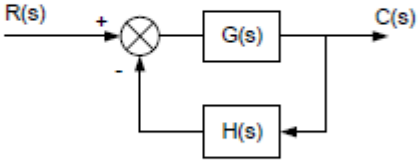
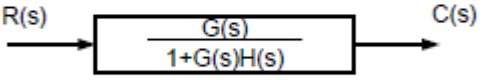
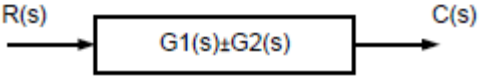
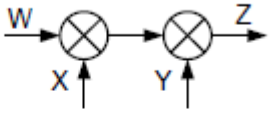
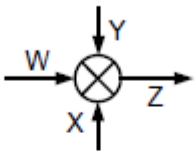
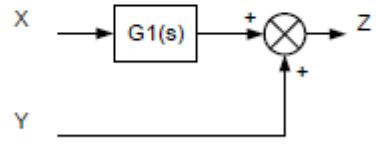
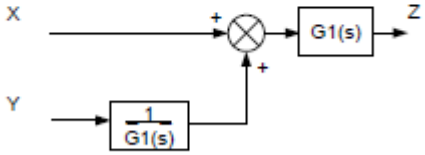
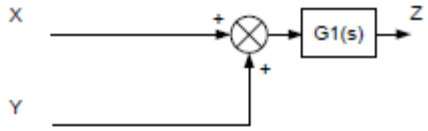
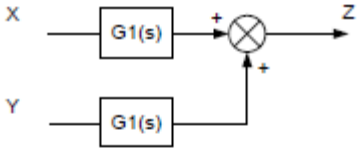
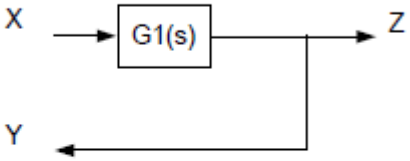
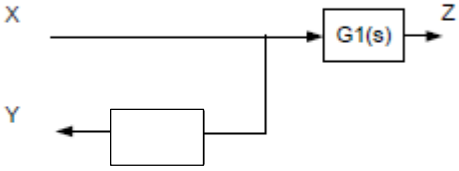
.

[25 marks]
[*25 markah*]

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

SOALAN TAMAT

BLOCK DIAGRAM REDUCTION TABLE

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