KOLEJ YAYASAN PELAJARAN JOHOR
ONLINE FINAL EXAMINATION

COURSE NAME	**:**	**CONTROL SYSTEMS**
COURSE CODE	**:**	**DKE 2163**
SESSION	**:**	**NOVEMBER 2020**
DURATION	**:**	**6 HOURS**

INSTRUCTION TO CANDIDATES /
ARAHAN KEPADA CALON

1. The examination paper consists of **FOUR (4)** questions. /
   *Kertas soalan ini mengandungi **EMPAT (4)** soalan.*

2. Students are allowed to refer to resources such as lecture notes, books, internet or any other relevant resources. /
   Pelajar dibenarkan merujuk kepada sumber seperti nota kuliah, buku, internet atau mana - mana sumber yang berkaitan.

3. Answer ALL questions in the answer sheet which is A4 size paper (or other paper with the consent of the relevant lecturer)./
   Jawab SEMUA soalan di dalam kertas jawapan iaitu kertas bersaiz A4 (atau lain-lain kertas dengan persetujuan pensyarah berkaitan).

4. Write your details as follows in the upper left corner for each answer sheet:/
   Tulis butiran anda sepertimana berikut di penjuru atas kiri bagi setiap kertas jawapan:
   i. Student Full Name */ Nama Penuh Pelajar*
   ii. Identification Card (I/C) No. */ No. Kad Pengenalan*
   iii. Class Section */ Seksyen Kelas*
   iv. Course Code */ Kod Kursus*
   v. Course Name */ Nama Kursus*
   vi. Lecturer Name */ Nama Pensyarah*

5. Each answer sheet must have a page number written at the bottom right corner./
   Setiap helai kertas jawapan mesti ditulis nombor muka surat di penjuru bawah kanan.

6. Answers should be handwritten, neat and clear./
   Jawapan hendaklah ditulis tangan, kemas dan jelas.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO /
JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

This examination paper consists of **5** printed pages including front page
*Kertas soalan ini mengandungi **5** muka surat termasuk kulit hadapan*

This paper contains of **FOUR(4)** questions. Answer **ALL** questions in an Answering Booklet.

*Kertas soalan ini mengandungi **EMPAT(4)** soalan. Jawab **SEMUA** soalan di dalam buku jawapan yang disediakan.*

QUESTION 1/ *SOALAN 1*

(a) Define a control system and give **four(4)** example the system.

*Definisikan sistem kawalan dan senaraikan **empat(4)** contoh sistem tersebut.*

(8 marks / *8 markah*)

(b) List **five(5)** characteristic of time response in control system .

*Senaraikan **lima(5)** ciri-ciri tindakbalas masa dalam system kawalan .*

(10 marks / 10 *markah*)

QUESTION 2/ *SOALAN 2*

Show the state equations for the electrical modeling system in **Figure Q2.**

*Tunjukkan persamaan tetap bagi sistem permodelan elektrik pada **Rajah Q2.***

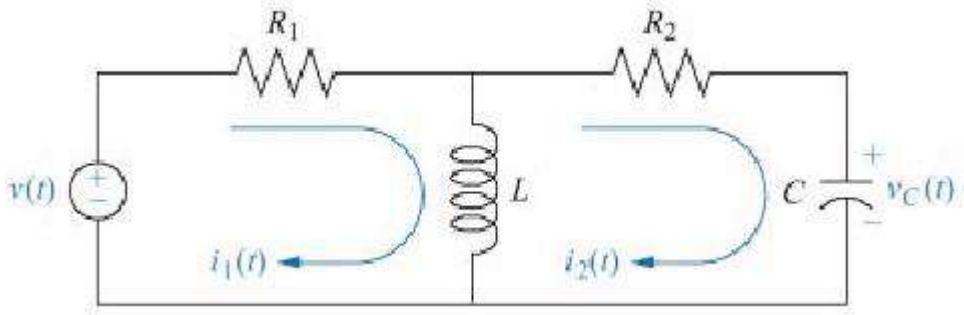

Figure Q2 / *Rajah Q2*

(12 marks / 12 *markah*)

QUESTION 3/ *SOALAN 3*

(a) Explain **three(3)** topologies of block diagrams in terms of block diagram example and their transfer function, Ge(s).

*Terangkan **tiga(3)** bentuk topologi rajah blok pada contoh rajah blok dan rangkap pindah, Ge(s).*

(9 marks / 9 *markah*)

(b) Solve the sub system in **Figure 3(b)** to a single transfer function.

*Selesaikan sistem sub dalam **Rajah 3(b)** kepada rangkap pindah tunggal.*

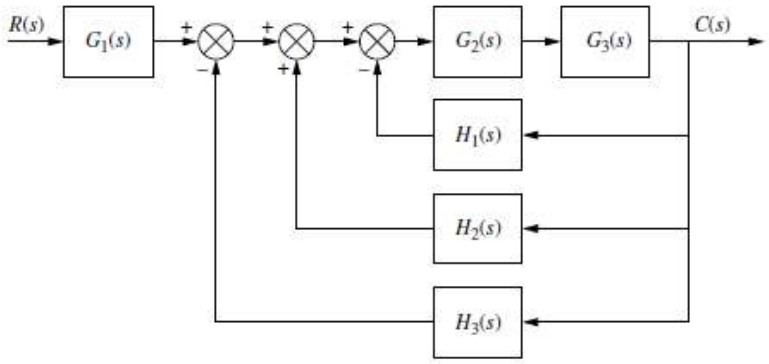

Figure Q3 (b) / *Rajah Q3 (b)*

(8 marks / 8 *markah*)

(c) From the Routh-Hurwitz table shown in **Table Q3(c).**
*Berdasarkan jadual Routh-Hurwitz ditunjukkan dalam **Jadual Q3(c).***

i. Show the stability of the system.
Tunjukan kestabilan sistem.

ii. Classify the number of poles at the right half plane, left half plane and on the $j\omega$ axis.
Kelaskan bilangan kutub-kutub di satah sebelah kanan, satah sebelah kiri dan pada paksi $j\omega$.

s^5	6	12	3
s^4	2	4	1
s^3			
s^2			
s^1			
s^0			

Table Q3(c) / ***Jadual Q3(c)***

(10 marks / 10 ***markah*****)**

QUESTION 4/ ***SOALAN 4***

(a) For the unity feedback control system shown in **Figure Q4(a),** where K and T are constants. The maximum overshoot (%O.S) for unit step is 10%. Peak time, t_p for the system is 0.75s.

Untuk sistem kawalan suapbalik unit ditunjukkan dalam ***Rajah Q4(a),*** *di mana K dan T adalah pemalar. Lajakan maksimum bagi sambutan unit langkah ialah 10%. Masa puncak,* t_p *untuk sistem ialah 0.75s.*

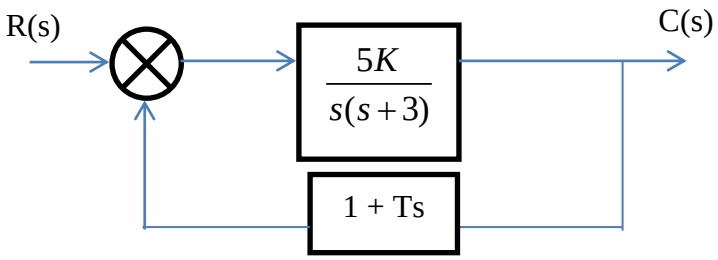

Figure Q4(a) / ***Rajah Q4(a)***

i) Construct the transfer function system ,C(s)/R(s) in terms of K and T.

ii) Determine the damping ratio, ξ and natural frequency, ω_n in terms of K and T.

iii) Shows damping ratio, ξ and natural frequency, ω_n.

iv) Solve the value of K and T.

i) Ungkapkan rangkap pindah sistem, C(s)/R(s) dalam sebutan K dan T.

ii) Tentukan nisbah redaman, ξ dan frekuensi tabii, ω_n dalam sebutan K dan T.

iii) Tunjukan nisbah redaman, ξ dan frekuensi tabii, ω_n.

iv) Selesaikan nilai K dan T.

(18 marks /18 *markah*)

(b) Solve the transfer function, *C(s)/R(s),* for the signal-flow graph in **Figure 5(a).**
*Selesaikan Rangkap , C(s)/R(s), untuk graf isyarat –laluan pada **Rajah 5(a).***

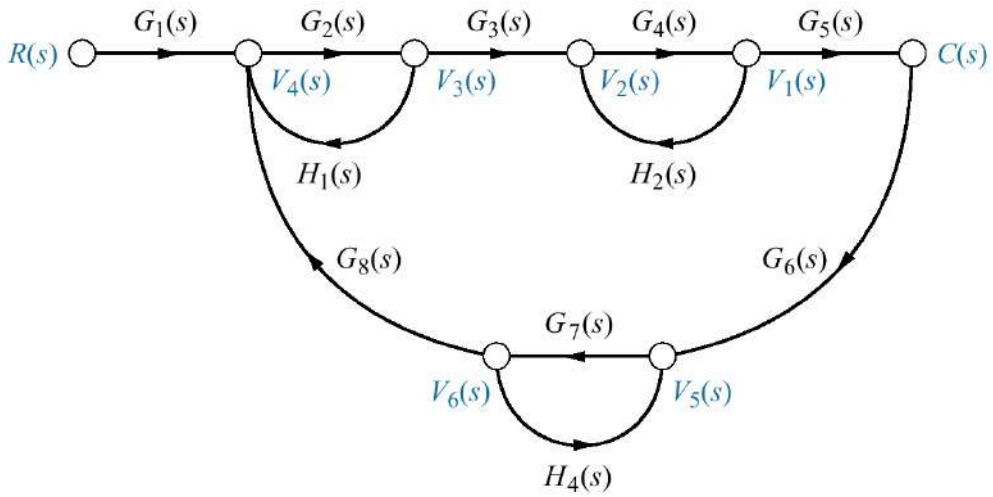

Figure Q5(a) / ***Rajah Q5(a)***

(25 marks /25 *markah*)

[100 MARKS/ 100 *MARKAH*]

END OF QUESTION PAPER/ ***KERTAS SOALAN TAMAT***