FIJI NATIONAL UNIVERSITY

COLLEGE OF ENGINEERING, SCIENCE AND TECHNOLOGY

SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING

Trade Diploma in Electronics Engineering
(Electronics Instrumentation & Control)

EEE 583 CONTROL SYSTEM ENGINEERING

FINAL EXAMINATION
(TRIMESTER 1, 2019)

DATE/TIME/ROOM – Refer to Timetable

Total Marks – 100 Time Duration – 3 hours & 10 Minutes

INSTRUCTIONS TO CANDIDATES

1. You are allowed 10 minutes extra time during which you are not to write.
2. Begin each answer on a fresh new page and use both sides of the sheets.
3. Write your identification number on the top of each attached sheet.
4. Insert all written foolscaps, graph paper, drawing paper etc. in their correct sequence and secure with string provided.
5. For all sheets of paper in which rough work has been done, cross it through and you must attach to your answer script.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. This paper has two sections. Section A has 10 multiple choice questions and section B has 11 questions. Students have to answer all the questions.
8. Total number of pages – 4

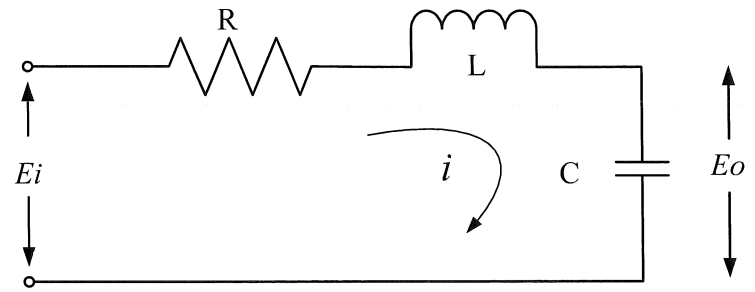
SECTION A *(MULTIPLE CHOICE QUESTION)* **[10 MARKS]**

1. The transfer function of a system is used to calculate
   (a) output for a given input (b) input for a given output
   (c) order of the system (d) time constant
2. The inverse Laplace transform of $\frac{1}{s+3}$ is
   (a) e^{-3t} (b) $3e^{-3t}$
   (c) $-3e^{-3t}$ (d) $6e^{-3t}$
3. The output signal is fed back at the input side from the _____point
   (a) Summing (b) Differential
   (c) Take-off (d) All of them
4. While shifting a take-off point after the block, which among the following should be added?
   (a) Summing point in series with take-off point
   (b) Summing point in parallel with take-off point
   (c) Block of reciprocal transfer function
   (d) Block of inverse transfer function
5. The Laplace transform of a unity function is
   (a) zero (b) 1
   (c) 1/s (d)s
6. The Laplace transform of *sin ωt* is
   (a) $\frac{\omega}{s^2+\omega^2}$ (b) $\frac{s}{s^2+\omega^2}$
   (c) $\frac{s}{s^2-\omega^2}$ (d) $\frac{\omega}{s^2-\omega^2}$
7. Transfer function can be obtained from
   (a) analogous table (b) standard block diagram
   (c) output-input ratio (d) signal flow graph
8. In an open loop system the control action
   (a) depends on the input signal (b) depends on the output signal
   (c) independent of the output (d) depends on the size of the system
9. The main application of transfer function is in the study
   (a) steady behavior of system (b) transient behavior
   (c) steady & transient behavior of system (d) none of these
10. Reference input minus the primary feedback is
    (a) zero sequence (b) actuating signals
    (c) error signal (d) manipulated variable

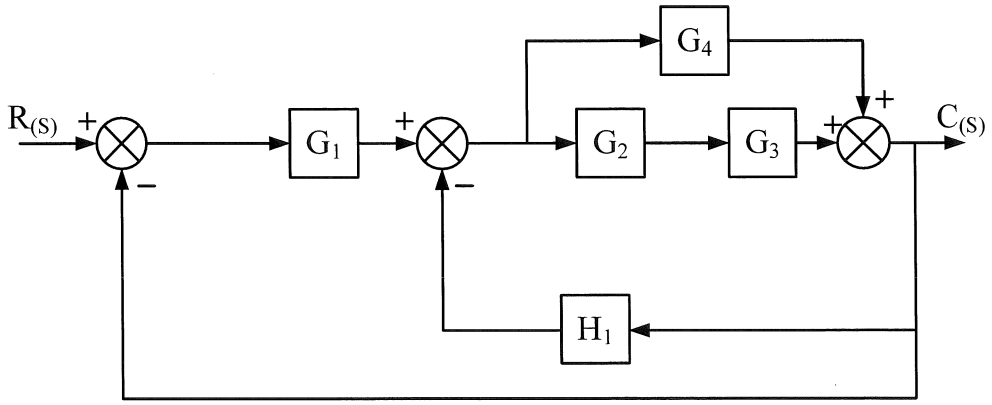
SECTION B **[90 MARKS]**

1. Define open loop and closed loop control systems. Give comparisons between open loop system and closed loop system (atleast three points). [10 Marks]

2. Define transfer function of a system and determine the transfer function of the electrical network. [10 Marks]



3. Using block diagram reduction technique, determine the closed loop transfer function $C_{(s)}/R_{(s)}$ of the system whose block diagram is shown below. [10 Marks]



4. Explain step function and ramp function standard test signals used in control system. [8 Marks]

5. Discuss transient response, steady state response and steady state error of a control system? [5 Marks]

6. The closed loop transfer function of a unity feedback control system is

$$\frac{C(s)}{R(s)} = \frac{20s}{(s+1)(s+3)}$$

Determine the equation for response of the system when a unit step is applied to the input terminal. [10 Marks]

7. Discuss automatic controllers in control system and explain two position ON-OFF controllers. [6 Marks]

8. Define Stability and state necessary but not sufficient conditions for stability. [6 Marks]

9. Determine the stability of control system with below characteristic equation using Routh Hurwitz criterion $s^4 + 2s^3 + 6s^2 + 4s + 1 = 0$. [10 Marks]

10. The forward path transfer function of a unity feedback system is given by

$$G(s) = \frac{K}{s(s+4)(s+5)}$$

Sketch the root locus as K varies from zero to infinity. [10 Marks]

11. With the help of suitable example, differentiate between electrical transducers and actuators. [5 Marks]

[THE END]