COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Electrical & computer Control Engineering
Lecturer : Prof. Dr. Medhat El Singaby
Course : Discrete-Time control systems
Course Code : EE 511 **Marks** : 40
Date : 10/1/2016 **Time** : 2 hours

Final Exam

Answer the following questions:

Question no.1

A-2

a) Find the Z-transform of the number sequence generated by sampling the time function e (t) every T seconds; in a closed form. The function e (t) is specified by its Laplace transform.

$$E(s) = \frac{1 - e^{-TS}}{s(s+2)}, \quad T = 0.2 \text{ seconds}$$

b) Find the Z- transfer function of the system shown below in Fig.1 and hence determine the output sequence if the input is a unit step.

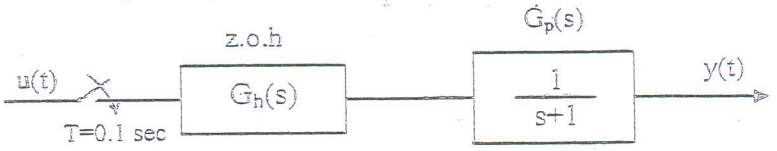

Fig.1 (10 marks)

Question no.2

B-1

a) Obtain the closed-loop discrete transfer function of the system in Fig.2.If k = 1, calculate and describe the unit step response as the sampling interval increased from 0.25 to 5 sec. and comment on the results.

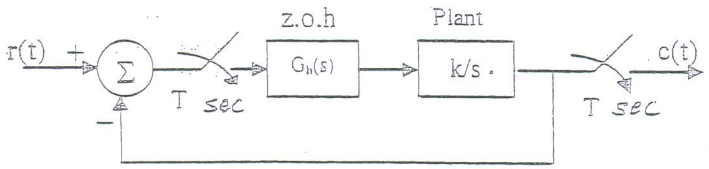

Fig.2

b) Consider the system shown in Fig.3, with T = 0.1 sec.Find the range of K for which the system is stable.

(10 marks)

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Question no.3

C-1

Find, using the root locus technique the stability range for the system shown in Fig.3 for sampling period T = 0.4 second.

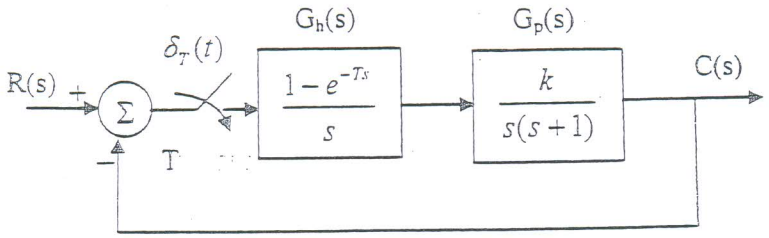

Fig.3

(10 marks)

Question no.4

C-2

a) Obtain the state space representation and the signal flow graph of the discrete – data dynamic system presented by the difference equation

$$y(K+2) + y(K+1) + 0.16\,y(K) = u(K+1) + 2\,u(K)$$

Subjected to zero initial conditions.

b) Consider the system presented by its transfer function G(s) ; where

$$G(s) = \frac{z^2 + 5z + 6}{z^3 + z^2 + 0.29\,z + 0.02}$$

Calculate the steady – state response of this system, if the input is a step sequence with a magnitude 10.

(10 marks)

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Course Coordinator: Ahmed El Shenawy		3/1/2016
Head of Department: Hamdy Ashour	Hamdy	3/1/2016