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Paper Code : PE-EE 601A Digital control system

UPID : 006642

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [1 x 10 = 10]

(I) Anti-aliasing filter is_____.

(II) The ROC of a causal signal is _____ of a circle of radius R.

(III) Jordon canonical form state model is applicable to_____.

(IV) A linear discrete time has characteristic equation Z^3-0.16Z=0. Check the stability.

(V) Assertion (A): z-transform is used to analyze discrete time system and it is also called pulse transfer function approach. Reason (R): the sampled signal is assumed to be impulse trained whose strength or areas are equal to the continuous time signal of the sampling instants.
Which of statement is /are correct

1. Both A & R true. R is the correct explanation of A
2. Both A & R true. R is not the correct explanation of A
3. A is true and R is false
4. A & R both are false

(VI) Jury stability is used for_____.

(VII) Given a unit step function U(k) , it is time derivative of _____.

(VIII) A state space system is described by

$$F = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$$

Characteristic equation of the system is_____.

(IX) If a system has one or more non repeated roots on the unit circle, the system is _____ stable.

(X) Find the mathematical expression of given system

(XI) Find the Z transform corresponding to the Laplace transform

$$G(s) = \frac{10}{s(s+5)}$$

(XII) Find Y(z)/X(z) for the system described by the difference equation Y(n)=Y(n-1)+X(n).

Group-B (Short Answer Type Question)

Answer any three of the following : [5 x 3 = 15]

2. State initial and final value theorem of Z transform with mathematical expression. [5]
3. Write short note on folding. [5]
4. Determine Z transformation of polynomial function $a^k u(k)$ with ROC. [5]
5. Consider the function [5]

$X(S) = \frac{1-e^{-ST}}{S}$;

Show that s=0 is not a pole of X(S).

6. Define state transition matrix and write the properties of state transition matrix. [5]

Group-C (Long Answer Type Question)

Answer any three of the following : [15 x 3 = 45]

7. (a) Write the differences between digital control and continuous control system. [5]

   (b) Write short note on A/D converter [5]

   (c) Write short not on sample and hold circuit. [5]

8. (a) Find X(k) for k=0,1,2,3,4.....when $X(Z) = \frac{(10z+5)}{(z-1)(z-0.2)}$ [5]

   (b) Given Z transform [5]

$X(z) = \frac{(1-e^{-aT})z}{(z-1)(z-e^{-aT})}$ f

find inverse z transform using partial fraction method.

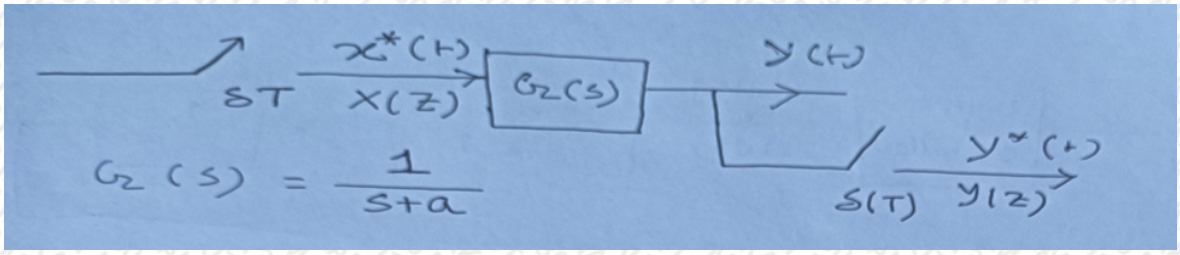
   (c) Solve the following difference equation by use of z transformation method [5]

$x(k+2) + 3x(k+1) + 2x(k) = 0; x(0) = 0, x(1) = 1,$

r 3

9. (a) Write short notes on Aliasing [5]

   (b) Obtain the pulse transfer function G(z) of the system shown in figure [5]



   (c) Obtain the pulse transfer function of a digital PID controller. [5]

10. (a) Write necessary and sufficient condition for the state observer design. [5]

    (b) Write short note on full order state observer [5]

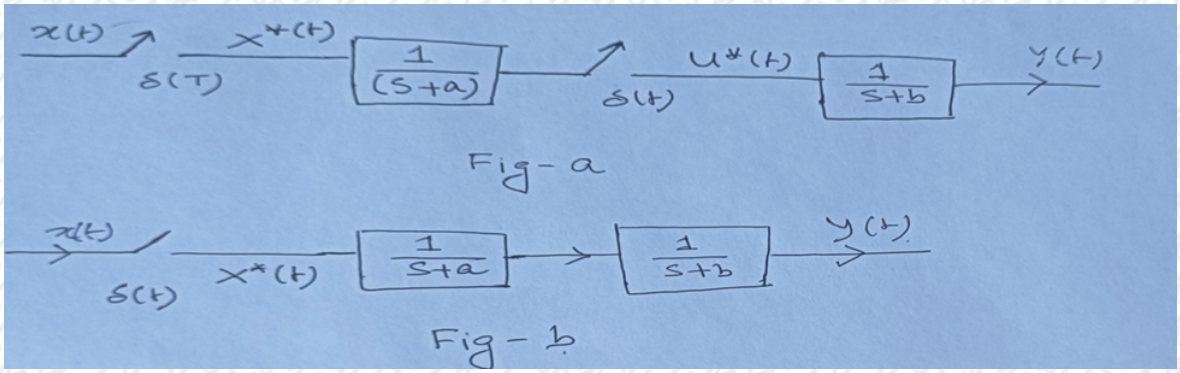
    (c) Why the state observers are used in control system? [5]

11. (a) Define sampling theorem. Write significance of sampling theorem in digital control study. [5]

    (b) Consider the system shown in figure a and b. Obtain the pulse transfer function [10]

$\frac{Y(Z)}{X(Z)}$

for the each of two system.



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