Register Number: …….

B.E DEGREE EXAMINATIONS: APRIL/MAY 2012

Sixth Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

EIE111: Digital Control System

(Provide semi log graph and ordinary graph)

Time: Three Hours **Maximum Marks: 100**

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

1. The sampling process is represented as _____

a) X (t) δ (t-nT) b) X (t) δ (t-n) c) X (t) δ (t) d) X (t) δ (t+nT)

2. The transfer function of zero order hold is _____

a) $1-e^{-ST}/S$ b)$1+e^{-ST}/S$ c)$1-e^{ST}/S$ d)$1+e^{ST}/S$

3. For stability of a system in a S-plane the poles of S-domain transfer function should lie on the_____

a) Right half of the S-plane b) left half of the S-plane

c) inside the unit circle d) outside the unit circle

4. While determining the stability of system by the bilinear transformation the elements of first column of routh array should be _____

a) Positive b) negative c) no sign change d) sign change

5. A set of possible values which the state X(t) can assume at time t form a _____ of the system

a) State space b) state transfer c) transfer function d) state function

6. The lyapunov stability analysis is based upon the concept of _____

a) Energy b) power c) energy and power d) neither energy nor power

7. The sensitivity problem may be _____ by implementing the transfer function D (Z) as a cascade connection of first or second order transfer function.

a) Enlarged b) reduced c) nullified d)magnified

8. The matrix _____ is called state transition matrix

a) e^{At} b) e^{-At} c) 1 d) 0

9. D (Z) is representing _____of the system

a) Control algorithm b) State variable c) Process d) poles of the system

10. In _____ algorithm the system is protected from the power failure.

a) Position form b) PID form c) velocity form d) acceleration form.

PART B (10 x 2 = 20 Marks)

11. Define sampling process.
12. Determine z-transform of unit ramp function.
13. Write the necessary and sufficient condition for jury's stability and bilinear transformation?
14. State the methods that are available for analysis stability in sampled data control system.
15. Draw the general state diagram for a digital control system.
16. Write the advantage of pole placement technique over root locus diagram.
17. Define lead compensation.
18. What are the advantages of cascade compensation?
19. Define system model and control algorithm.
20. Draw the block diagram for microprocessor based position control system.

PART C (5 x 14 = 70 Marks)

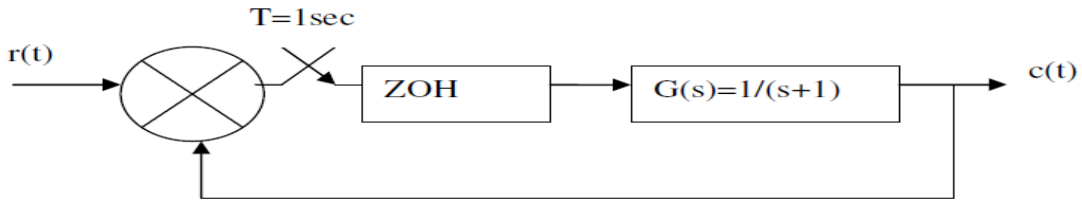
21. a) (i) Find the one –sided Z-transform for $\sin\omega t$ (7)

(ii) Find the inverse z-transform of $F(Z)=1/1-1.5Z^{-1}+0.5Z^{-2}$ (7)

(OR)

b) (i) Derive the relation between Z and S-domain. (4)

(ii) For the sampled data control system shown in fig find the response to unit step input



(10)

22. a) Check the stability of the system by bilinear transformation and jury's stability method $Z^3-0.2Z^2-0.25Z+0.05=0$

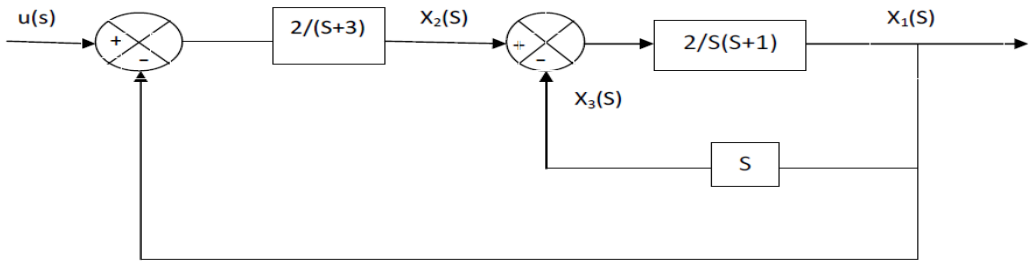
(OR)

b) A unity feedback control system has an open-loop transfer function G(s) = K/S $(S^2+4S+13)$. Sketch the root locus.

23. a) Consider a process with the transfer function G(s)=K/S(S+2) which when preceded by a zero-order hold (T=0.2sec), has the discrete-time transfer function.

(OR)

b) Write the state equation for the system shown in figure .in which X1, X2, X3 constitute the state vector .determine whether the system controllable and observable



24. a) Design a digital dead beat control algorithm for $Gp(s)=e^{-0.8s}/0.6s+1.T=0.4$ sec

(OR)

b) Consider the unify feedback control system is described by the transfer function G(s) = K/S(S+5)

Design a digital control scheme for the system to meet the following specification

(i) the velocity error constant $K_v>=10$;

(ii) Peak overshoot Mp to step input <=25% and

(iii) Settling time t_s(2% tolerance band)<=2.5sec.

25. a) Write about implementation of microprocessor based temperature control system.

(OR)

b) Write about stepper motor and their control and interfacing with micro processor.

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