QPC: RN18001288 AR - 18 Reg. No.

GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

B. Tech Degree Examinations, November – 2021

(Seventh Semester)

BEEPE7041 – ADVANCED CONTROL SYSTEMS

(EEE)

Time: 3 hrs Maximum: 100 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) (2 x 10 = 20 Marks)

Q.1. Answer ***ALL*** questions		[CO#]	[PO#]
a.	Aliasing is caused when:	[CO2]	[PO1]
	(i) Sampling frequency must be equal to the message signal	(ii) Sampling frequency must be greater to the message signal	
	(iii) Sampling frequency must be less to the message signal	(iv) Sampling frequency must be greater than or equal to the message signal	
b.	Inverse z-transform of the system can be calculated using:	[CO2]	[PO1]
	(i) Partial fraction method	(ii)Long division method	
	(iii) Basic formula of the z-transform	(iv) All of the mentioned	
c.	The sum of the Eigen values in the given matrix is:	[CO1]	[PO1]
	(i)The sum of all non-zero components in the matrix	(ii) Sum of the elements of any row	
	(iii)Sum of the elements of any column	(iv)Sum of the principal diagonal elements	
d.	Consider a LTI system described by the given differential equation: $\frac{d^2a(t)}{dt^2} + 3\frac{d\,a(t)}{dt} + 2a(t) = r(t)$ Where a(t) is the output. The Eigen values of the given characteristic equation are:	[CO1]	[PO2]
	(i)2,1	(i)2,-1	
	(i)-2,1	(iv)-2,-1	
e.	State variable analysis has several advantages overall transfer function as:	[CO1]	[PO1]
	(i) It is applicable for linear and non-linear and variant and time-invariant system	(ii) Analysis of MIMO system	
	(iii) It takes initial conditions of the system into account	(iv) All of the mentioned	
f.	The transfer function Y(s)/U(s) of a system described by the state equations dx/dt=-2x+2u and y(t) = 0.5x is:	[CO1]	[PO1]
	(i) 0.5/(s-2	(ii)1/(s-2)	
	(iii)0.5/(s+2)	(iv)1/(s+2)	
g.	A transfer function of control system does not have pole-zero cancellation. Which one of the following statements is true?	[CO1]	[PO1]
	(i) System is neither controllable nor observable	(ii) System is completely controllable and observable	
	(iii)System is observable but uncontrollable	(iv)System is controllable but unobservable	
h.	The analysis of multiple input multiple output is conveniently studied by;	[CO2]	[PO1]
	(i) State space analysis	(ii) Root locus approach	
	(iii) Characteristic equation approach	(iv) Nicholas chart	
i.	Asymptotic stability is concerned with…	[CO3]	[PO1]
	(i)A system not under the influence of the state	(ii)A system under influence of input	
	(iii)A system under influence of the output	(iv)A system not under influence of input	
j.	The capacitance, in force-current analogy, is analogous to	[CO2]	[PO2]
	(i) Momentum	(ii) Velocity	
	(iii)Displacement	(iv)Mass	

PART – B: (Short Answer Questions) (2 x 10 = 20 Marks)

Q.2. Answer ***ALL*** questions		[CO#]	[PO#]
a.	State the condition for controllability by Kalman's Method.	[CO1]	[PO2]
b.	What is bilinear transformation?	[CO3]	[PO1]
c.	What do you understand by discrete time control system? Draw the block diagram of such a system.	[CO3]	[PO2]
d.	Show the relationship between s-plane and z-plane. Is the relationship one-to-one?	[CO2]	[PO1]
e.	The transfer function of a certain system is $\frac{Y(s)}{U(s)} = \frac{1}{5s^3+7s^2+6s+3}$ write down the A,B matrix pair of the equivalent state model	[CO1]	[PO2]
f.	Find the z-transform of the sequence $x[n] = a^n u(-n-1)$	[CO2]	[PO2]
g.	Draw the characteristics of a relay with dead zone and hysteresis. State whether a relay is an incidental or intentional non-linearity	[CO4]	[PO1]
h.	Define z- transform of a ZOH	[CO3]	[PO2]
i.	What is region of convergence?	[CO2]	[PO1]
j.	State initial and final value theorem with regard to z-transform.	[CO3]	[PO2]

PART – C: (Long Answer Questions) (15 x 4 = 60 Marks)

Answer ***ALL*** questions		Marks	[CO#]	[PO#]
3. a.	Explain in details regarding the reconstruction of a signal from sampled signal	8	[CO1]	[PO2]
b.	The linear differential equation of a system is given by : c(k) = r(k+2) - 3r(k+1) +2r(k) Where c(k) = discrete output signal, r(k) = discrete input signal. Determine the stability of the system using Jury's stability test	7	[CO3]	[PO3]
	(OR)			
c.	Determine the inverse Z-transform of following function $\frac{C(z)}{R(z)} = \frac{z}{(1+0.5z)(1+2z)}$ (i) Using partial fraction method (ii) Using Long division Method	8	[CO3]	[PO3]
d.	Explain the properties of Z- transform	7	[CO2]	[PO2]
4. a.	A state variable description of a system is given by: $\dot{x}(t) = \begin{bmatrix} 0 & 5 \\ -1 & -2 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u, \quad y = [1\ 1]x(t)$ Find the state transition matrix of the system. Also draw the state diagram	8	[CO1]	[PO2]
b.	Give a short note on Mapping between s-plane and z-plane	7		
	(OR)			
c.	A linear time-invariant system has a transfer function: $\frac{C(s)}{R(s)} = \frac{4s^2+3s+5}{(s+2)(s+1)^2}$ Obtain the state model in Jordan canonical form.	8	[CO2]	[PO3]
d.	Describe in which aspects the linear system behaves differentially from linear system	7	[CO4]	[PO1]
5. a.	Write short note on: Phase plane method	8	[CO2]	[PO2]
b.	Write short note on Solution of discrete-time state equations	7	[CO2]	[PO2]
	(OR)			
c.	Write short note on Singular points	8	[CO3]	[PO1]
d.	Write short note on Describing function for dead zone Non linearity	7	[CO1]	[PO2]
6. a.	Consider a LTI system described by the given differential equation: $\frac{d^2y(t)}{dt^2} + 3\frac{d\,y(t)}{dt} + 2y(t) = r(t)$ Find the state space representation in diagonal canonical form	8	[CO1]	[PO3]
b.	Explain about pole placement using state feedback	7	[CO2]	[PO2]
	(OR)			
c.	Write the short note on controllability and observability.	8	[CO3]	[PO1]
d.	Explain the procedure of Jury's stability test.	7	[CO1]	[PO2]

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