KUMARAGURU college of technology
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Register Number:…………..….

M.E DEGREE EXAMINATIONS: JUNE 2018

(Regulation 2015)

Second Semester

POWER ELECTRONICS AND DRIVES

P15PET203: Advanced Control Theory

COURSE OUTCOMES

CO1: Develop transfer function model for discrete time system, find the stability of the discrete time systems.

CO2: Exposed to analyze the system and find the state space model of any given systems.

CO3: Analyze the stability of non – linear systems

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Assertion (A) : If repeated roots on unit circle leads to response grows without bound. Reason(R): System is unstable if $\sum g(k)$ is infinite. CO1 [K_2]
   - a) A and R are true but not related
   - b) A and R are true and related
   - c) A is true and R is false
   - d) R is false and A is false

2. Sequence the operations in discrete time system A) plant with controlled output B) Digital to analog operation with control element C) Analog to digital operation with processing of signals D) sensor low frequency signals. CO1 [K_2]
   - a) B)A)C)D)
   - b) C)A)D)B)
   - c) D)C)B)A)
   - d) D)C)A)B)

3. State equation can be obtained from A) transfer function B) differential equation C) signal flow graph. CO2 [K_2]
   - a) Both A and B are true
   - b) Both B and A are true
   - c) Both A and C are true
   - d) All are true

4. Match the following CO2 [K_2]

State variable representation	Purpose
A. Phase variable representation	i. System matrix is the diagonal matrix
B. Physical variable representation	ii. Not available for Measurement and control purpose
C. Canonical variable representation	iii. Available for Measurement and control purpose

b)	A	B	C
a)	ii	iii	i
b)	ii	i	iii
c)	iii	ii	i
d)	iii	i	Ii

5. Assertion (A) : System state model can be converted in to canonical form of state model which is advantageous to the system. CO2 [K_2]
Reason(R): System state equations are independent in canonical form of state model.

a) A and R are true and related
b) A and R are true and but not related
c) A is true and R is false
d) A is false and R is true

6. Arrange the given operation in the design of state observer. A) finding actual characteristic equation B) finding the observer gain matrix C)Finding the desired characteristic equation D) Finding complete observability of the system. CO2 [K_3]

a) D)A)C)B)
b) D)A)B)C)
c) B)D)A)C)
d) D)B)C)A)

7. Match the following CO3 [K_3]

Relay with dead zone(D) and Hysteresis(H)	Conditions
1.Ideal relay	: A. D=H
2.Relay with hysteresis	: B. H=0
3. Relay with dead zone	: C. D=0,H=0

a) 1-B,2-C,3-A
b) 1-A,2-C,3-B
c) 1-C,2-A,3-B
d) 1-B,2-A,3-C

8. Describing function analysis used for finding CO3 [K_3]

a) Stability of non linear system
b) Transfer function of the system
c) Block diagram of the system
d) Stability of linear system

9.	For the system is to be stable , it's simple scalar equation have	CO1	[K_2]

a) Zero Constant value and constant solutions

b) Negative Constant value and constant solutions.

c) Positive Constant value and constant solutions.

d) Zero Constant value and zero constant solutions.

10.	For asymptotic stability ____ is required	CO1	[K_2]

a) Negative definite

b) Negative indefinite

c) Positive definite

d) Positive indefinite

PART B (10 x 2 = 20 Marks)

11.	What is the use of Anti-aliasing filter?	CO1	[K_2]
12.	State sampling theorem.	CO1	[K_2]
13.	Find the canonical form of system matrix for the system s /s^2+4s+4.	CO2	[K_3]
14.	Find the system transfer function if the system equation is y(k+2)+5y(k+1)+6y(k)=u(k) .	CO2	[K_3]
15.	What are the disadvantages of physical variable form of state model?	CO2	[K_2]
16.	Write the Ackermann's formulae.	CO2	[K_3]
17.	List the types of Non linearities.	CO2	[K_2]
18.	Draw the output and input waveform for saturation nonlinearity with sinusoidal input.	CO3	[K_2]
19.	State Lyapunov functions for linear systems.	CO3	[K_2]
20.	Write the advantages of Lyapunov's method compared to other stability analysis.	CO1	[K_2]

PART C (6 x 5 = 30 Marks)

21.	Test the stability using jury stability criterion. $Z^5+0.2Z^4+Z^3+0.5Z^2-0.1=0$	CO1	[K_3]
22.	Obtain the state model of the system whose transfer function is $Y(S)/U(S)=10 / s^3+4S^2+2S+1$	CO2	[K_3]
23.	A linear time invariant system is characterized by homogenous state equation $\begin{bmatrix}\dot{x_1}\\ \dot{x_2}\end{bmatrix} = \begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}$ compute the solution of the equation assuming initial state vector $x_0=\begin{bmatrix}1\\ 0\end{bmatrix}$.	CO2	[K_3]
24.	Check the observability of the system with A= $\begin{bmatrix}0 & 0 & 1\\ -2 & -3 & 0\\ 0 & 2 & -3\end{bmatrix}$ and C=[1 0 0] using Kalman's Test.	CO2	[K_3]

25. Derive the describing function of dead zone. CO3 [K_2]

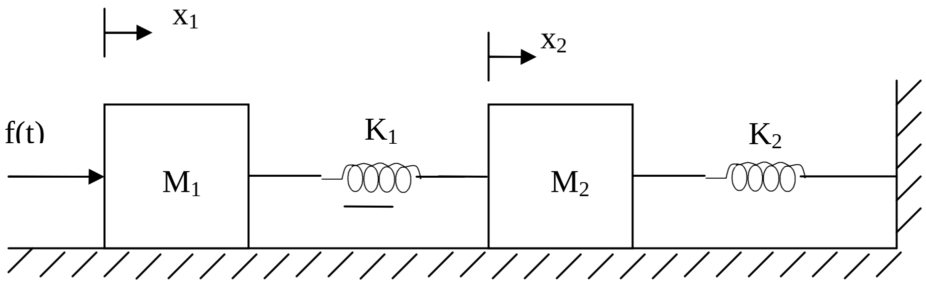
26. Explain the operation of Modal Reference Adaptive system with need of its each component. CO3 [K_2]

Answer any FOUR Questions
PART D (4 x 10 = 40 Marks)

27. Evaluate y(k) for the equation CO1 [K_4]

r(k)=1;for k even
=0; for k odd

28. CO2 [K_3]



Construct the state model of the given system.

29. Convert the following system matrix in to canonical form. CO2 [K_3]

30. Design a state regulator using Ackermann's formulae for the given model for given closed loop poles are placed at -4 j4. CO2 [K_3]

31. Derive describing function for the system with saturation and dead zone. CO3 [K_3]

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