E- Sem -I Paper / Subject Code: 60201 / Higher Mathematics for Control Engineering / Dec-2019

INST + CONT

- Choice based

Time 3 Hours **Total Marks 80**

1) Question **No.1** is Compulsory
2) Answer **any three** out of the remaining questions.
3) Assume suitable data wherever required.
4) Figures to the **right** indicate **full** marks.

Q. 1		Answer **any four**	20
	a)	Subspaces of a matrix	
	b)	Orthogonal Matrix	
	c)	Rayleigh coefficient	
	d)	Quadratic Form	
	e)	Cholesky decomposition	
Q. 2	a)	Comment on the solution of the following system using Gaussian elimination $2x_1 - 2x_2 - x_3 + 4x_4 = 9, -x_1 + x_2 + 2x_3 + x_4 = -3$	10
	b)	What is a basis vector? Determine whether (1,1,2) (1,2,5)(5,3,4) form a basis of R^3	10
Q.3	a)	What do you mean by rank of matrix? Obtain the rank of matrix A $A=\begin{bmatrix} 1 & 3 & 1 & -2 & -3 \\ 1 & 4 & 3 & -1 & -4 \\ 2 & 3 & -4 & -7 & -3 \\ -3 & 8 & 1 & -7 & -8 \end{bmatrix}$	10
	b)	Consider the following two basis .Obtain change of basis matrix from S to S^1. $S = \{(1,2),(3,5)\}$ $S^1 = \{(1,-1),(1,-2)\}$	10
Q.4	a)	Obtain Eigen value and Eigen vectors of (i)A, (ii) A^T ,(iii) A^{-1}, (iv)A^2 , (v) A^5 and (vi) a non-singular matrix such $D = P^{-1}AP$ is diagonal where $A = \begin{bmatrix} 3 & -4 \\ 2 & -6 \end{bmatrix}$	10
	b)	Identify the matrices which are diagonalizable. Justify your answer. $A = \begin{bmatrix} 5 & 6 \\ 3 & -2 \end{bmatrix}$ $B = \begin{bmatrix} 5 & -1 \\ 1 & 3 \end{bmatrix}$	10
Q.5	a)	Orthogonalize the following set of vectors. $V_1 = (1,1,1,1)$, $V_2 = (1,1,2,4)$, $V_3 = (1,2,-4,-3)$	10
	b)	Explain the concept of orthogonal diagonalization .	10
Q.6	a)	Differentiate between QR decomposition and SVD.	10
	b)	Obtain the trajectory of the following system $\dot{x} = Ax$ where $A = \begin{bmatrix} 0 & 1 \\ -6 & -7 \end{bmatrix}$	10

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Sem-I
ST & CONT.

Dec-2019

Total Marks: 80

(3 Hours)

Note:

1. **Question No.1 is compulsory**
2. **Solve any THREE questions out of remaining FIVE questions.**
3. **Figure to the right indicate full marks.**
4. **Assume suitable data if required.**

Q 1	**Answer the following:**	(20)
a)	Explain advantages and disadvantages of reverse biasing photodiodes.	
b)	Explain importance of bridge circuits.	
c)	State and explain accuracy and precision of transducers.	
d)	Explain why cold junction compensation is required in thermocouples.	
e)	Explain working of gas filled nuclear detector in various regions of operations.	
Q 2 a)	Write short note on Smart transducer interface standard IEEE 1451.	(10)
b)	Explain the working of scintillation detector.	(10)
Q 3 a)	Explain working principle of encoders. Discuss the ways to improve its resolution.	(10)
b)	Explain working of kelvin sensing system.	10)
Q. 4 a)	Draw and explain the block diagram of multi channel analyser.	(10)
b)	What is photolithography? Explain the steps involved in photolithography.	(10)
Q. 5 a)	Explain circuit used for processing signals from capacitive transducers.	(10)
b)	Explain the signal processing of piezoelectric sensors.	(10)
Q. 6	Write short note on :	(20)
a)	Semiconductor temperature transducers	
b)	Biasing modes of Hall effect sensors.	

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ME/Sem-I / **Paper / Subject Code: 60203 / Robust Control.** / Nov-2019

INST+CTL / Choice Based

Duration: 3 Hours **Max. Marks 80**

N.B.

1. **Q.1** is compulsory. Attempt **any three** from the remaining questions.
2. All questions carry equal marks.
3. Figures to the Right indicate full marks.
3. Assume suitable data if necessary

Q.1 Attempt **any four** **20**

a. What is perfect control? Write practical limitations of perfect control.

b. What are the sensitivity and complementary sensitivity functions for the IMC control structure?

c. Write the various reaching laws for the sliding mode control.

d. Write the benefits of QFT design.

e. What polynomial is said to be Hurwitz? Write two properties of the Hurwitz polynomial.

f. Write the advantages and limitation of sliding mode control.

Q.2 A. Write the Kharitonov's theorem for the stability of complex interval polynomial. **10**

B. Write the condition for any real polynomial that satisfies interlacing property. How to check the stability of real polynomial using interlacing properties? **10**

Q.3 A. Design the IMC based PI control for the system, **10**

$$\tilde{G}(s) = \frac{5}{50s+1}$$

B. Design the IMC control for the system with model **10**

$$\tilde{G}(s) = \frac{-0.5s+1}{s^2+5.5s+7}$$

Obtain the unit step response of the system in absence of disturbance if model is perfect.

Q.4 A. Design the sliding mode control for the following system so that sliding motion is characterised by eigen values $-1.5 \pm j1.5$ **10**

$$\begin{aligned} \dot{x}_1 &= x_2 \\ \dot{x}_2 &= 1.5x_3 \\ \dot{x}_3 &= x_1 + x_2 - x_3 + 2u + 2\sin(20t) \end{aligned}$$

Turn Over

Q.4 B. Prove that: $\dot{z} = -k\,\mathrm{sgn}(z) + d$ is finite time stable if $k > \max|d|$. **10**

Q.5 A. Suppose that a nominal polynomial is, **10**

$$P(s) = s^3 + \delta_2 s^2 + \delta_1 s + \delta_0, \text{ with } (\delta_0, \delta_1, \delta_2) = (6, 11, 6).$$

Design robust state feedback control if uncertainty ranges are given by $\Delta\delta_0 = 1$, $\Delta\delta_1 = 1.5$ and $\Delta\delta_2 = 1$.

B. Check the interlacing property of following polynomial **10**

$$P(s) = s^4 + 13s^3 + 56s^2 + 92s + 48$$

Q.6 Write short notes on the following **20**

a. Objectives of QFT design.

b. Equivalent control for undisturbed system with discontinuous right hand side.

E/Sem-I [IST+Cont] Paper / Subject Code: 60204 / Elective I : Advanced Biomedical Instrumentation. Dec-2019

choice based.

Duration: 03 hrs **Marks: 80 Marks**

N.B. 1) Question No. 1 is compulsory.

2) Attempt any 3 questions from remaining 5 questions.

1. a. Explain in brief, about Chopper amplifier and its application. **(05)**

   b. Explain the need of subcarriers in Bio-telemetry system. **(05)**

   c. Write short notes on TENS. **(05)**

   d. Explain in brief, about Telemedicine. **(05)**

2. a. Explain the principle and working of any one type of Isolation amplifier. **(10)**

   b. Explain with a neat diagram, each block of 6-lead ECG signal conditioning system. **(10)**

3. a. Explain the various Image Reconstruction techniques used in CT system with neat diagram. **(10)**

   b. Explain with a neat diagram the working of Short wave Diathermy. **(10)**

4. a. Explain the working and design of Ventricular triggered pacemaker. **(10)**

   b. Explain the principle and working of PET, with a neat diagram. **(10)**

5. a. Explain the working of Lasers and its interaction with tissues. **(10)**

   b. Explain the working of Multichannel Radio-telemetry system, with Frequency Division Multiplexing. **(10)**

6. Write short notes on **(any two):** **(20)**

   a. Endoscopy

   b. Muscle stimulators

   c. Lithotripsy system

58408

Sem-I / Paper / Subject Code: 60210 / Elective II: Management Information System. / Dec-2019

ST & CONT

choice based

Q. P. Code: 50371

Time: 3 Hours **Total Marks: 80**

N.B. :(1) Question **No.1**is **Compulsory.**

(2) Attempt any 3 questions out of rest.

(3) Figure to the right indicate full marks.

(4) All questions carry equal marks.

1.		College wants to design database for examinations system.	
	a)	Design tables (Student, branch, Semester, Subjects, marks) with assuming suitable attributes and normalize the database.	5
	b)	Define primary key, foreign key with its importance in database design. List Primary and foreign key in each table of above tables.	5
	c)	Draw Star schema and Snowflake schema for above design.	5
	d)	Explain difference between star schema and snowflake.	5
2.	a)	Define Customer relationship Management. Explain in detail Operational And Analytical CRM.	10
	b)	Explain Cloud Computing with various types of Clouds	10
3.	a)	Explain various Business intelligence Applications for presenting Results.	10
	b)	Explain Computer based Information System with its types.	10
4.	a)	Explain Big data with its characteristics and issues	10
	b)	What is strategic information system? What strategies can company use to gain competitive advantage?	10
5.	a)	Define Social Computing. Explain Social Shopping and Marketing.	10
	b)	Explain Pervasive Computing and the technologies that provide infrastructure For Pervasive Computing.	10
6.		Write short notes on any two	20
	a)	Transaction Processing System	
	b)	E-Commerce	
	c)	Customer Relationship Management	

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