

QP Code : 1767

(3 Hours)

[Total Marks :100]

- NR :** (1) Questions No. 1 is compulsory.
(2) Assume suitable data if necessary.
(3) Answer any three from the remaining five questions.

1. Briefly explain any four 20
(a) Euclidean space
(b) Eigen value
(c) QR decomposition
(d) Linear combination of vectors
(e) Similarity Transform

2. (a) Explain the concept of linear independence of vectors. Prove that two vectors are linearly independent if and only if, one is a scalar multiple of the other. 10
(b) Determine whether the vectors 10

$$v_1 = \begin{bmatrix} 1 \\ -2 \\ 5 \end{bmatrix}, v_2 = \begin{bmatrix} 0 \\ 5 \\ -7 \end{bmatrix}, v_3 = \begin{bmatrix} 2 \\ 1 \\ 3 \end{bmatrix}$$

are linearly independent.

3. (a) What do you mean by linear transformation? Explain Range and kernel of the transformation. 10
(b) Show that the following matrix is not diagonalizable. 10

$$A = \begin{bmatrix} 1 & 0 \\ 3 & 1 \end{bmatrix}$$

4. (a) Define column space and null space of a matrix 8
(b) Obtain null space of

$$A = \begin{bmatrix} 1 & -3 & -2 & 4 \\ 1 & -3 & 1 & 1 \\ 0 & 0 & 1 & -1 \end{bmatrix}$$

[TURN OVER]

5. (a) Find conditions on 'a' and 'b' under which the system
 $x+y+z = -2$

$$x+2y-z = 1$$

$$2x + ay + bz = 2, \text{ has}$$

- (i) no solution
- (ii) infinitely many solutions
- (iii) unique solution

12

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(b) Differentiate between

- (i) eigen vector and generalized eigen vector
- (ii) Minimal Polynomial and characteristic Polynomial.

20

6. Write short notes on

- (a) Gram Schmidt process of orthogonalization.
- (b) Singular Value Decomposition

QP Code : 1773

(3 Hours)

[Total Marks : 80

- N. B. :** (1) All questions are compulsory.
(2) Attempt any **three** questions from remaining **five** questions.
(3) Assume suitable data if necessary.

1. Answer the following :- 20
- (a) Give the importance of Integral controller.
 - (b) Explain the term Adaptive control.
 - (c) Differentiate ZOH and FOH.
 - (d) Compare different parameter estimation methods.
2. (a) What are the various methods of building deterministic state controller? Draw the general adaptive state controller scheme and briefly explain it. 10
- (b) Explain tuning of controllers. 10
3. (a) Explain supervision and coordination of adaptive control. 10
- (b) Define MIT rule. Obtain the MIT rule for first order system. 10
4. (a) Explain RCS method of parameter identification for time varying processes. 10
- (b) Write a note on MIAC. 10
5. (a) Derive the adaptive minimum variance control for RLS-MV4. 10
- (b) Consider a process $G(s) = 1/(s+a)$ where a is unknown parameter. 10
- Determine a controller that can give the closed loop system

$$G_m(s) = \frac{w_n^2}{s^2 + 2w_n s + w_n^2}$$

6. Write short notes on:- 20
- (i) Minimum variance control
 - (ii) Non dual adaptive controllers
 - (iii) Square root filtering.

Duration: 03 hrs

Marks: 80 marks

(Question No. 1 is compulsory. Answer any 3 from the remaining 5 questions)

1. A) Explain the Electrode-electrolyte model (05)
B) Explain the principle and working of Nerve stimulators along with the different types of current waveforms (05)
C) Explain the need for subcarriers in Bio-telemetry system (05)
D) Give the design of Image Intensifier system used in X-ray Imaging (05)
2. a) Explain in detail with a neat diagram, each block of EMG signal conditioning system. (10)
b) Explain the various image reconstruction techniques used in CT systems with neat pulse diagram. (10)
3. a) What is an Artificial Pacemaker? List its different types. With a neat schematic explain the working of Standby type pacemaker. (10)
b) What are Isolation Amplifiers? Explain with a neat diagram the working of Opto-isolator type Isolation amplifiers (10)
4. a) What is a Bionic ear? Explain its working comparing with natural ear working. (10)
b) Explain the working of SPECT scanner system with application. (10)
5. a) Explain the working of Multichannel Radio-telemetry system with Frequency Division Multiplexing. (10)
b) Explain the various Grounding techniques used in Biomedical systems for improved performance. (10)
6. Write short notes on: (05 each)
 - a) TENS
 - b) Multichannel DAS
 - c) Bedside Monitor
 - d) Chopper amplifier

E-Sem - I - (Inst {cont}) - Adv. Electronic Circuits (CCBSAS)
for Inst. & Cont. Application.

Q.P. Code : 1793

(3 Hours)

[Total Marks : 80

- N.B. :** (1) Question No.1 is compulsory.
(2) Answer any **Three** from remaining.

1. Solve any **Four** : **20**
- (a) Compare characteristics of Log and Linear amplifier and state their applications.
 - (b) Describe working of chopper stabilized op-amp.
 - (c) Explain need of positive feedback in comparator circuit.
 - (d) Explain need of R.F. shielding in electronic circuits.
2. (a) Explain working of full wave millivolt rectifier circuit with circuit diagram. **10**
(b) Explain working of analog multiplexer and mention its applications. **10**
3. (a) Discuss problems associated with improvement of dynamic range of instrumentation amplifier with A.C. coupling at input. **10**
(b) Explain working of voltage to frequency convertor circuit and mention its applications. **10**
4. (a) Explain working of switched capacitor low pass filter. Mention its advantages over conventional R-C filter. **10**
(b) Explain grounding techniques used in mixed signal processing circuits. **10**
5. (a) Explain various performance parameters for Analog to Digital convertors. **10**
(b) Explain working of Flash ADC, its advantages, disadvantages and various sources of errors in the circuit. **10**
6. Write short notes on any **Two** : **20**
- (a) D. C. to D. C. converters.
 - (b) Delta sigma ADC.
 - (c) Power Management in Electronic circuits.
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(I Sem) (CBSS) (Inst + Control)
Advanced Sensors + Signal Processing Systems

QP Code : 1770

(3 Hours)

[Total Marks : 80

- N. B. : (1) Question no. 1 is compulsory.
(2) Attempt any three out of remaining questions.
(3) Assume suitable data if needed.

1. Attempt the following :- 20
(a) Explain the need of guarding.
(b) Explain the working principles of encoder. Also state its applications.
(c) Explain linearising techniques of capacitive sensor's output.
(d) Draw and explain the equivalent circuit of inductance coil 'L' along with its mathematical equations.
2. (a) Explain with diagram linearity and sensitivity of potentiometric transducer. 10
(b) Compare photovoltaic and photoconductive modes used for operation of photodiode. 10
3. (a) Explain working and use of kelvin sensing system. 10
(b) Explain architecture of strain transducer with its advantages. 10
4. (a) Explain with block diagram basic and auxiliary elements of the measurement systems. 10
(b) Describe signal processing of piezoelectric transducers. 10
5. (a) Discuss the problems because of improper grounding and suggest remedies. 10
(b) Explain signal processing of thermocouple. 10
6. Write short notes on :- 20
(a) Signal processing of high output impedance sensors.
(b) DC to DC converter.