M.E. | IMSP. & COMP | SEM-I (C13SGS) | Applied Linear Algebra. May 2025

QP Code : 687600

(3 Hours) **[Total Marks : 80**

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

1. Briefly explain any **four** **20**
(a) Row space
(b) Reduced Row Echelon form
(c) Dot Product
(d) Linear combination of vectors
(e) Singular value

2. (a) Explain the concept of linear independence of vectors. Check whether the following set of vectors are linearly dependent **10**
(1, 0,3), (1, 2, 4) & (1, 4, 5)

(b) Define eigen values and eigen vectors. **10**
Diagonalize the matrix

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

3. (a) Find reduced row echelon form of the matrix A. Identify the linearly independent columns in A. **10**

$$A=\begin{bmatrix}1 & 2 & 0 & 1\\ 2 & 4 & 1 & 4\\ 3 & 6 & 3 & 9\end{bmatrix}$$

(b) Consider a basis B= { (u_1, u_2)& $B^1 = \{u_1^1, u_2\}$ **10**
where $u_1= (1, 0)$, $u_2 = (0, 1)$, $u_1^1 = (1, 1)$ $u_2^1 = (2, 1)$. Find the equivalent vector P of the vector P^1 in B^1 basis $\begin{bmatrix}-3\\ 5\end{bmatrix}$

[TURN OVER]

4. (a) Explain what do you mean by kernel, Range, Nullity and Rank of a linear transformation. **10**

   (b) Obtain null space of the following matrix **10**

$$A = \begin{bmatrix} 1 & 0 & 1 \\ 5 & 4 & 9 \\ 2 & 4 & 6 \end{bmatrix}$$

5. (a) Explain the concept of span of a vector space. Check whether the vectors (1, 1, 2), (1, 0, 1) & (2, 1, 3) span R^3. **10**

   (b) Represent the differential of polynomial as linear transformation choose a suitable numerical example. **10**

6. Write short note on : **20**

   (a) Orthogonalization

   (b) Singular Value Decomposition.

ME/SEM I (CBSGS)/Adaptive Control Theory/May 2017

Q. P. Code : 685601

(3 Hours) [Total Marks: 80]

N. B.: (1) Question No. 1 is compulsory.
(2) Attempt any three questions from remaining five questions.
(3) Assume suitable data if necessary.
(4) Figures to the right indicate full marks.

1. Answer the following: (20)
   a) Explain feedforward adaptive controllers.
   b) Explain discrete time control system with neat diagram.
   c) What is MIT rule?Derive the MIT rule for first order system.
   d) Explain cancellation controller.

2. a) Explain the method of determining dead time. (10)
   b) Describe the characteristics of PI,PD and PID controllers. (10)

3. a) Derive the linear response of a linear system if stationary stochastic signal is applied via estimation of ACF of i/p and CCF of i/p and o/p signal. (10)
   b) Explain MIAC in detail. (10)

4. a) Explain dead beat controller in detail (10)
   b) Explain different methods of DC value estimation. (10)

5. a)How RLS method of parameter estimation is used for stochastic signal model? (10)
   b) Explain with block diagram parameter adaptive state controller. (10)

6. Write short notes on (Any Two): (20)
   a) Difference between ARMAX and LS method
   b) Minimum variance control
   c) Tuning of controllers.

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