

ME EXT C | sem I | CBCS | FH 2019

Q. P. Code: 27001

24/05/19

(03) Hours

Total Marks 80

NB:

1. Question No.1 is compulsory.
2. Attempt any three questions from remaining five questions.
3. Assume suitable data if necessary and state it clearly.
4. Figures to right indicates full marks

- Q.1 Solve any five questions 20
- (a) What is linear transformation? Define kernel and range as applied to linear transformation.
 - (b) Define skewness and kurtosis with example.
 - (c) What is correlation matrices of stationary process?
 - (d) What is Unbiased Estimator?
 - (e) How Discrete Karhunen- Loeve Transform used in data compression?
 - (f) What is kalaman filtering?
- Q.2 (a) Check whether following vectors are linearly independent 8
 $1) P_1 = [2, -3, 4]^T$ $2) P_2 = [-1, 6, -2]$ $3) P_3 = [1, 6, 2]^T$
- (b) State and explain Orthogonality Principal? 5
 - (c) What is pseudo inverse and state its properties. 7
- Q.3 (a) Let $x(n)$ be a real -valued random process generated by the system 8

$$x(n) = ax(n - 1) + w(n) \quad n \geq 10 \quad x(-1) = 0$$
 Where $w(n)$ is a stationary random process with mean μ_w and $r_w(l) = \sigma_w^2 \delta(l)$
 .Determine μ_x of $x(n)$ and comment on its stationarity.
- (b) Describe stationary process in frequency domain? 7
 - (c) Find mean and variance of Uniform Random Variable 5
- Q.4 (a) Derive the transfer function of an LTI system. 7
- (b) What do you mean by whitening and innovative representation? 5
 - (c) Compare orthogonal and triangular decomposition for zero mean random variable. 8

(P.T.O)

Q.5 (a) Consider the observation 8

$$x[n] = A + w[n] \quad n = 0, 1, \dots, N-1$$

Where $w(n)$ is WGN. The estimator for average value of $x[n]$ is

$$\hat{A} = \frac{1}{N} \sum_{n=0}^{N-1} x[n]$$

Find the mean of estimator. Is the estimator biased?

(b) State CRLB theorem. 6

(c) State the minimum variance criteria for the estimator. 6

Q.6 (a) Describe Kalman filter I - Bayes approach. 8

(b) State the uses of Gram-Schmidt orthogonalization procedure? 5

(c) What are the applications of Estimation theory? 7
