Nov – 2018.

ME – 1st Electronics & Telecommunication sem: 1 – [choice Based]

Q.P. Code: 39197

[Time: Three Hours] [Marks:80]

Please check whether you have got the right question paper.

N.B: 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 20
(a) State and explain the four fundamental subspaces for an m x n matrix of rank r.
(b) The distribution function for a random variable X is

$$F(x) = \begin{cases} 1 - e^{-2x}, & x \geq 0 \\ 0, & \text{otherwise} \end{cases}$$

Find i) the density function ii) the probability that X > 2
(c) Define and explain following terms as related to estimators
i)Bias ii) Variance iii) Efficiency iv) Consistency
(d) State and explain the properties of autocorrelation sequence (function)of stationary process.
(e) Let x be a random vector with mean μ_x and autocorrelation R_x Show that $y = Q^T$ x transforms x to an uncorrelated component vector y if Q is the eigenmatrix of R_x.
(f) State and explain Kalman filtering problem using underlying state variable system.

Q.2. (a) Find column space and null space of matrix 10

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

(b) Explain Gram-Schmidt orthogonalization procedure and state its applications. 6
(c) "If A and B are n x n matrices and AB=0, then either A=0 or B=0." Is this a true statement? 4
Explain with example.

Q.3. (a) State the important properties of P SD. Determine the PSD of a zero mean WSS process $x[n]$ with $r_x(l) = a^{|l|}, -1 < a < 1$.
(b) Explain the Kalman .filtering algorithm using suitable equations 10

Q.4. (a) Let $x[n] = A + w[n], n = 0,1,\ldots,N - 1$ It is desired to estimate the value of a DC 10
level A in WGN $w[n]$ where $w[n]$ is zero mean and uncorrelated and each sample has variance $\sigma^2 = 7$. Consider the two estimators

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

ii. $\check{A} = \frac{x[0]+x[N-1]}{2}$

Find the mean and variance of each estimator. State whether these estimators are unbiased .
Which one is better according to variance?

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(b) Consider the multiple observations $x[n]= A+w[n]$ $n=0,1, \dots , N-1$ where $w[n] \sim N(0, \sigma^2)$. Determine the CRLB for A. **10**

Q.5 (a) Consider following random processes **10**

i) $X(t) = A$ where A is a random variable uniformly distributed between 0 and 1

ii) $X[n] = A \cos(wn)$ where A is a Gaussian random variable with mean 0 and variance 1

Determine whether these random processes are WSS or not.

(b) The exponential density function is given by $f_x(x) = e^{-x}u(x)$ where $u(x)$ is a unit step function. Let $x1$ and $x2$ be two IID random variables with exponential pdf. Let $y = x_1 + x_2$ Determine and plot pdf of y **10**

Q.6. (a) Consider a linear transformation $y = Ax$ where **10**
Find i) Mean vector μ_x ii) Autocorrelation matrix Ry

$$\mu_x = \begin{bmatrix} 1 \\ 2 \end{bmatrix}, \quad R_x = \begin{bmatrix} 4 & 0.8 \\ 0.8 & 1 \end{bmatrix}$$

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

(b) Explain application of DKLT (Discrete Karhunen-Loeve Transform) in signal coding using block diagram. Explain scheme for selection of optimal reduced basis. **6**

(c) Write a short note on SVD **4**

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[Time: Three Hours]   [Marks:80]

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

(2)   Solve any three questions from the remaining five questions

(3)   Figures to the right indicate full marks

(4)   Assume suitable data wherever necessary, with proper justification.

Q.1   Attempt any 5 questions   [20]
a) Explain three operating windows in optical communication.
b) Define – Group Velocity Dispersion (GVD)
c) What is fiber Bragg grating? Explain its application.
d) Explain self-phase and cross phase modulation
e) Compare stimulated Raman scattering and stimulated Brillouin scattering.
f) What are the three topologies used for fiber optical network?

Q.2   a) Explain different phenomena responsible for signal degradation as the light   [10]
wave propagates through an optical fiber.

b) Explain working of vertical cavity surface emitting laser.   [10]

Q.3   a) Lists properties of solitons and explain Loss managed solitons in detail   [10]

b) Lists the advantages of optical amplifier also explain the working of EDFA.   [10]

Q.4   a) Explain dispersion compensating fiber in details.   [10]

b) Explain first passage model and blocking model for statistical wavelength   [10]
routing network.

Q.5   a) Compare SONET and OTN network.   [10]
b) List and explain different Light path topologies, and write the equations for [10]
number of wavelength needed to support the traffic and router ports
required.

Q.6   Short notes on: (Attempt any two)   [20]
a) Optical MEMS
b) Unidirectional and bi directional WDM system.
c) Metro network
d) Optical switching.

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ME / sem-I - choice based.

Maximum Marks: 80

Time: 3 hrs.

N. B.
1. Q.1 is compulsory.
2. Answer any **three** out of the remaining five questions.
3. Figures to the right indicate marks.
4. Answer to the questions should be grouped and written together.

Q1 Solve any **four** out of five
a. Compare the LMS and RLS algorithms   5
b. Comparison of Short Time Fourier Transform and Wavelet Transform   5
c. What are the performance measures for QRS detection?   5
d. State the concept of Multi Resolution Analysis (MRA) using Wavelet.   5
e. Describe with suitable diagram adaptive echo canceller   5

2.a Derive the LMS Algorithm ans explain its limitations   10
b. Explain analysis and synthesis filter bank using Wavelet transform with suitable diagram and   10
related mathematics.

3a. Describe hard thresholding and soft thresholding for wavelet based denoising. Also, explain   10
speckle removal using wavelet transform.
b. Explain one method of QRS separation in an ECG signal in detail.   10

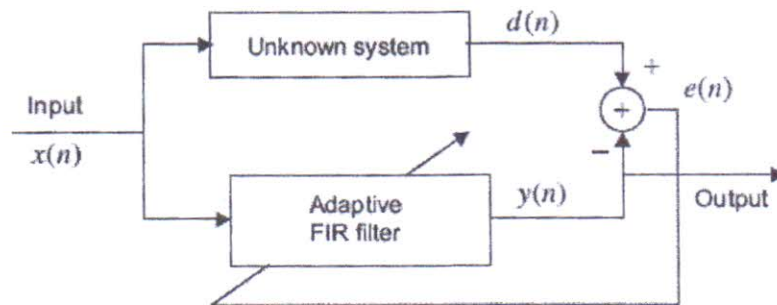4a Given the system modeling described in following Figure 1   10

Figure 1. Adaptive System for unknown system modeling

using a single-weight adaptive filter $y(n) = W. x(n)$ to perform the system-modeling task,

i) Set up the LMS algorithm to implement the adaptive filter assuming that initially
$W = 0$ and $\mu = 0.5$;
ii) Perform adaptive filtering to obtain $y(0), y(1), y(2), y(3)$ given that
$d(0) = 1$; $d(1) = 2$; $d(2) = -2$; $d(3) = 2$
$x(0) = 0.5$; $x(1) = 1$; $x(2) = -1$; $x(3) = 1$,
Comment on the system thus modeled.

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b. With mathematical concept discuss the Yule Walker method for AR models   10

5a. Discuss various sources of Ocular artefacts in EEG signals. Explain the methods for removal and   10
control of ocular artefacts in EEG signal

b. With a neat diagram of linear combiner and Prove the Wiener Hopf Equation and derive the   10
expression for MSE and Minimum value of MSE.

6a. Describe Welch Method and Bartlett method of Power Spectrum Estimation.   10

b. Show that energy density spectrum of a signal equals to Fourier transform of autocorrelation of a   5
signal.

c. Discuss in brief various Time Domain operations in Musical Sound Processing.   5

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Duration: 3 hours   **Max marks: 80**

Note the following instructions.

   (a) Question No.1 is compulsory
   (b) Total 4 questions need to be solved
   (c) Attempt any three questions from remaining five questions.
   (d) Assume suitable data wherever necessary, justify the same

1.a	Explain the concept of FTTP.	[5]
1.b	List down the Major threats to telephone industry in recent years.	[5]
1.c	Compare VoIP V4 vs V6.	[5]
1.d	Specify how IPTV is different from the traditional TV.	[5]
2.a	Explain how EVDO works? Compare EVDO with Wi-Fi.	[10]
2.b	What is Internet of Things? How does IoT works?	[10]
3.a	Explain the concept of VPN and its implementation in Layer2 and layer3.	[10]
3.b	Draw the functional architecture TISPAN NGN and explain.	[10]
4.a	Explain the how Multi-Protocol Label Switching (MPLS) transfers the data using label switching.	[10]
4.b	Explain in detail the challenges of FMC in NGN.	[10]
5.a	List out the challenges in the Migration of PSTN to NGN.	[10]
5.b	What is the role of control and signaling protocols for NGN? Explain the working principle of Diameter protocol.	[10]
6	Discuss:	
	a. IDs used in TISPAN NGN.	[5]
	b. Impact of using IPv6 in NGN.	[5]
	c. AAA.	[5]
	d. Wireline NG technologies.	[5]

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(3 Hours)   [Total Marks : 80

(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.

A Canteen wants to design database with respect to the four dimensions, customer, Food items, category and bill.

a) Design tables 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 schema   5

a) Define Big Data. Explain various characteristics and issues in Big Data.   10

b) Define Functional area Information System. Explain Information system For Human Resource Management.   10

a) Define relational database. Explain its advantages and disadvantages in detail.   10

b) Explain Computer based Information System with its types.   10

a) Explain various threats to information system.   10

b) Explain Data Warehouses and Data Marts with its characteristics.   10

a) Explain Pervasive Computing and the technologies that provide infrastructure For Pervasive Computing.   10

b) Define Business Intelligence. Explain Business Intelligence applications for Data Analysis.   10

Write short notes on any two   20

a) Transaction Processing System

b) Enterprise Resource planning

c) E-Commerce

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