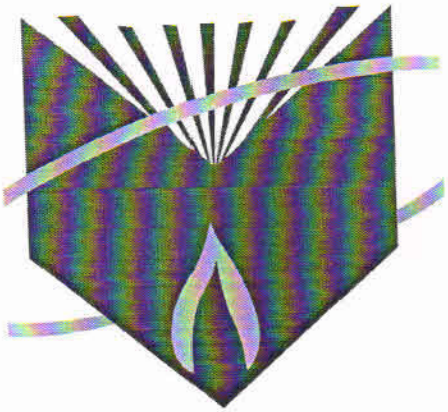

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QUESTION PAPERS

1^{st}.2^{nd} & 4^{th}.SEMESTER

M.TECH

ELECTRONICS & COMMUNICATION

DEC.2018/JAN2019

INDEX

CBCS SCHEME

USN | | | | | | | | | | |

18ECS12

First Semester M.Tech. Degree Examination, Dec.2018/Jan.2019
Advanced Digital Signal Processing

Time: 3 hrs. Max. Marks: 100

Note: ***Answer FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Derive an expression for spectrum of decimator output sequence. **(10 Marks)**

b. Explain the implementation of sampling rate conversion using poly phase structures. **(10 Marks)**

OR

2 a. Explain two channel QMF bank with neat block diagram and equations. **(10 Marks)**

b. The polyphase matrix for a Three channel QMF bank is

$$p(z^3) = \begin{bmatrix} 1 & 1 & 2 \\ 2 & 3 & 1 \\ 1 & 2 & 1 \end{bmatrix}$$

Draw the analysis and synthesis filters in QMF bank. **(10 Marks)**

Module-2

3 a. Define Random process. Explain
- i) Ergodic process
- ii) Autocorrelation function
- iii) Power density spectrum of a random process. **(10 Marks)**

b. Explain forward prediction. Derive an expression for Minimum Mean Square Error (MMSE) of forward prediction process. **(10 Marks)**

OR

4 a. Obtain the solution for normal equations for prediction coefficients and MMSE using Levinson – Durbin algorithm. **(10 Marks)**

b. List the properties of linear prediction error filters. **(10 Marks)**

Module-3

5 a. Explain with a block diagram adaptive channel equalizer to reduce the distortion in transmission channel. **(10 Marks)**

b. Explain linear predictive coding to encode speech signal. **(10 Marks)**

OR

6 a. Explain LMS algorithm based on minimum mean squared error criterion. **(10 Marks)**

b. Explain RLS algorithm and mention its advantages over LMS algorithm. **(10 Marks)**

Module-4

7 a. Explain power spectral estimation using Barlett method. **(10 Marks)**

b. Explain Welch method for spectrum estimation. **(10 Marks)**

OR

8 a. Explain Burg method for AR model parameter estimation. **(10 Marks)**

b. What are the limitation of Nonparametric methods of power estimation and how they are overcomed in parametric methods? **(10 Marks)**

Module-5

9 a. Explain short time Fourier transform and explain how it overcomes the limitations of Fourier transform. **(10 Marks)**

b. Discuss the applications of wavelet transform. **(10 Marks)**

OR

10 a. Write a note an Daubechies wavelet transform. **(10 Marks)**

b. Explain Haar wavelet function and scaled Haar wavelet functions. **(10 Marks)**

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M.Tech EC

CBCS SCHEME

USN | | | | | | | | | | |

18HCE/ECS/ELD/EIE/ESP/EVE11

First Semester M.Tech. Degree Examination, Dec.2018/Jan.2019
Advanced Engineering Mathematics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Show that the set $V = \{(x, y, z) / x, y, z \in R\}$ is a vector space over R. **(07 Marks)**

b. Define a linear transformation. Show that $T : R^2 \to R^2$ defined by $T(x, y) = x - y$ is a linear transformation. **(07 Marks)**

c. Find the coordinate vector of (10, 5, 0) relative to the vectors (1, -1, 1), (0, 1, 2) and (3, 0, -1). **(06 Marks)**

OR

2 a. Define a sub space. Prove that the set $W = \{(x, y) / x, y \in F \text{ and } 13x + 4y = 0\}$ is a subspace of $V_2(F)$. **(07 Marks)**

b. Let W be the subspace of R^5 spanned by S = {(1, 2, -1, 3, 4), (2, 4, -2, 6, 8), (1, 3, 2, 2, 6), (1, 4, 5, 1, 8), (2, 7, 3, 3, 9)}. Find a subset of S that form a basis of W. Hence find dimension of W. **(07 Marks)**

c. If $T : R^2 \to R^2$ is a linear transformation such that T (2, 3) = (1, 0) and T (3, 2) = (1, -1). Find the matrix representation of T. **(06 Marks)**

Module-2

3 a. Use the Given's method to find the eigen values and the eigen vector corresponding to the largest eigen value of the matrix $A = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix}$. **(10 Marks)**

b. Apply the Gram-Schmidt orthogonalization process to find an orthonormal basis for the subspace of R^4 spanned by the vectors (1, 1, 1, 0), (-1, 0, -1, 1) and (-1, 0, 0, -1). **(10 Marks)**

OR

4 a. Use the Given's method to find the eigen values and eigen vectors of the matrix $A = \begin{pmatrix} 1 & 2 & 4 \\ 2 & 1 & 2 \\ 4 & 2 & 1 \end{pmatrix}$. **(10 Marks)**

b. Show that the set $S = \{V_1=(1, 1, 0, -1), V_2=(1, 2, 1, 3), V_3=(1, 1, -9, 2), V_4=(16, -13, 1, 3)\}$ is an orthonormal basis of R^4. **(10 Marks)**

Module-3

5 a. Derive Euler's equation in the form $\frac{\partial f}{\partial y} - \frac{d}{dx}\left[\frac{\partial f}{\partial y'}\right] = 0$. **(07 Marks)**

b. Find the extremal of the functional $I = \int_{x_1}^{x_2} (y'^2 + ky^2)\,dx$. **(07 Marks)**

c. Find the extremal of the functional $\int_0^1 [1 + (y'')^2]\,dx$, subject to the end conditions $y(0) = 0$, $y(1) = 1$, $y'(0) = 1$ and $y'(1) = 1$. **(06 Marks)**

OR

6 a. Test for an extremum of the functional $V[y(x)] = \int_0^1 (xy + y^2 - 2y^2y')\,dx$, given that $y(0) = 1$ and $y(1) = 2$. **(07 Marks)**

b. Determine the extremal of the functional $V[y(x)] = \int_0^1 (1 + (y'')^2)\,dx$, given that $y(0) = 0$, $y(1) = 1$, $y'(0) = 1$ and $y'(1) = 1$. **(07 Marks)**

c. Find a function f(x) for which $I = \int_0^x (y'^2 - y^2)\,dx$ is stationary, given that $\int_0^x y\,dx = 1$, $y(0) = 0$ and $y(\pi) = 1$. **(06 Marks)**

Module-4

7 a. A random variable X has the following probability distribution:

x :	-2	-1	0	1	2	3
p(x) :	0.1	k	0.2	2k	0.3	k

Find the values of K, mean, μ_3 and μ_4. **(07 Marks)**

b. Find the characteristic function of the Poisson distribution and hence find the values of the first four central moments. **(07 Marks)**

c. The potential difference between two points is found to be a normally distributed random variable with mean 12 and standard deviation 0.20. What is the probability that an arbitrary measurement is i) between 11.92 and 12.27, ii) Greater than 12.45, iii) Less than 11.70. Given: ϕ (z = 0) = 0.1554, ϕ (z = 1.35) = 0.4115, ϕ (z = 2.25) = 0.4878, ϕ (z = 1.50) = 0.4332. **(06 Marks)**

OR

8 a. A random variable X has the probability function $f(x) = \frac{1}{2^x}$, x = 1, 2, 3,..... Find its i) Moment generating function, ii) Mean. **(07 Marks)**

b. Find the characteristic function of the Erlong distribution given by $f(x) = \frac{\lambda^n x^{n-1} e^{-\lambda x}}{\lfloor n-1} U(x)$. Hence find its mean. **(07 Marks)**

c. In a normal distribution, 7% of the items are under 35 and 89% are under 63. Find the mean and standard deviation. Given $\phi(1.23) = 0.39$, $\phi(1.48) = 0.43$. **(06 Marks)**

Module-5

9 a. Show that the random process $X(t) = A \cos [wt + \theta]$ is wide sense stationary where A and θ are constants and θ is a uniformly distributed random variable in $(0, 2\pi)$. **(07 Marks)**

b. If X(t) is a Gaussian process with $\mu(t) = 10$ and $C(t_1, t_2) = 16\ e^{-|t_1 - t_2|}$. Find the probability that i) $X(10) \leq 8$ ii) $|X(10) - X(6)| \leq 4$. Given $\phi(0.5) = 0.1915$, $\phi(0.7137 = 0.2611$. **(07 Marks)**

c. Define: i) First order stationary process, ii) Second order stationary process, iii) Wide-Sense stationary process. **(06 Marks)**

OR

10 a. If the wide-sense stationary process X(t) is given by $X(t) = 10 \cos [100t + \theta]$, where θ is uniformly distributed over $(-\pi, \pi)$, prove that $\{x(t)\}$ is correlation ergodic. **(07 Marks)**

b. In the fair coin experiment, $\{X(t)\}$ is defined by $X(t) = \begin{cases} \sin \pi t\ ; & \text{if Head occurs} \\ 2t\ ; & \text{if Tail occurs} \end{cases}$.

Find: i) $E\{x(t)\}$ ii) E(x, t) when $t = 0.25$. **(07 Marks)**

c. The auto-correlation function for a stationary ergodic process with no periodic component is $R_{xx}(\tau) = 25 + \left(\frac{4}{1 + 6\tau^2}\right)$. Find the mean and variance of the process X(t). **(06 Marks)**

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CBCS SCHEME

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16/17ELD/ECS/EVE/EIE/ESP11

First Semester M.Tech. Degree Examination, Dec.2018/Jan.2019
Advanced Engineering Mathematics

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Define vector spaces, sub spaces. Show that the set S = {(1, 0, 1), (1, 1, 0), (−1, 0, −1)} is linearly dependent in $V_3(R)$. **(08 Marks)**

b. Let T:V→W be a linear transformation defined by T(x, y, z) = (x+y, x−y, 2x+z). Find the range, null space, rank and nullity. Also verify the rank-nullity theorem. **(08 Marks)**

OR

2 a. Find the matrix representation of linear transformation $T:R_2 \to R_3$ such that T(-1, 1) = (-1, 0, 2), T(2, 1) = (1, 2, 1). **(08 Marks)**

b. Find the linear transformation T: $R^3 \to R^3$. Such that T(1, 1, 1) = (1, 1, 1); T(1, 2, 3) = (-1, -2, 3); T(1, 1, 2) = (2, 2, 4) **(08 Marks)**

Module-2

3 a. Use Given's method to find eigen values of the symmetric matrix.

$$A = \begin{bmatrix} 1 & 2 & 4 \\ 2 & 1 & 2 \\ 4 & 2 & 1 \end{bmatrix}$$ **(08 Marks)**

b. Find the singular value decomposition of

$$A = \begin{pmatrix} 2 & 2 & -2 \\ 2 & 2 & -2 \\ -2 & -2 & 6 \end{pmatrix}$$ **(08 Marks)**

OR

4 a. Use the Gram-Schmidt orthogonalization process to construct an orthogonal set of vectors form the linearly independent set $\{x_1, x_2, x_3\}$ where $x_1 = \begin{bmatrix} -4 \\ 3 \\ 6 \end{bmatrix}$, $x_2 = \begin{bmatrix} 2 \\ -3 \\ 6 \end{bmatrix}$, $x_3 = \begin{bmatrix} 2 \\ 3 \\ 0 \end{bmatrix}$. **(08 Marks)**

b. Construct a QR decomposition for the matrix

$$A = \begin{pmatrix} -4 & 2 & 2 \\ 3 & -3 & 3 \\ 6 & 6 & 0 \end{pmatrix}$$ **(08 Marks)**

Module-3

5 a. Derive Euler's equation in the form $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$ and deduce $\frac{d}{dx}\left(f - y'\frac{\partial f}{\partial y'}\right) - \frac{\partial f}{\partial x} = 0$. **(08 Marks)**

b. Find the extremals of the functional $\int_0^{\pi} \left[(y')^2 - y^2 + 4y\cos x\right]dx$ satisfying $y(0) = 0$; $y(\pi) = 0$. **(08 Marks)**

OR

6 a. Find a function y(x) for which $\int_0^1 [(y')^2 + x^2]dx$ is a stationary function given that $\int_0^1 ydx = \frac{1}{6}$; $y(0) = 0$; $y(1) = 0$. **(08 Marks)**

b. Find the shortest distance between parabola $y = x^2$ and straight line $x - y = 5$. **(08 Marks)**

Module-4

7 a. A random variable x has the following probability function:

x	0	1	2	3	4	5	6	7
p(x)	0	k	2'k	2k	3k	k^2	$2k^2$	$7k^2+k$

i) Find the value of the k.

ii) Evaluate: (1) $p(x < 6)$ (2) $p(x \geq 6)$ (3) $p(0 < x < 5)$

iii) Mean and variance of the distribution. **(08 Marks)**

b. Find the moment generating function of the exponential distribution

$$f(x) = \frac{e^{-\frac{x}{c}}}{c}; \quad 0 \leq x \leq \infty, c > 0$$

Hence find mean and standard deviation. **(08 Marks)**

OR

8 a. The length of telephone conversation in a booth has been an exponential distribution and found on an average to be 5 minutes. Find the probability that a random call made from this booth: (i) Ends less than 5 minutes (ii) Between 5 and 15 minutes. **(08 Marks)**

b. The mean weight of 500 students is 151 kg and standard deviation 15 kg. Assuming the weights are normally distributed. Find how many students weight:
(i) Between 120 and 150 (ii) Less than 150 (iii) More than 151 **(08 Marks)**

Module-5

9 a. The joint pdf of a two continuous random variables x and y is given by

$$f(x,y) = \begin{cases} \frac{x+y}{3} & 0 \leq x \leq 1;\ 0 < y < 2 \\ 0 & \text{otherwise} \end{cases}$$

Find: i) E(X) ii) E(Y) iii) E(XY) **(08 Marks)**

b. Define:
i) Stationary random process
ii) Ergodic random process
iii) Time auto correlation
iv) Gaussian random process **(08 Marks)**

OR

10 a. Find the probability that (i) $x(10) \leq 8$ (ii) $|x(10) - x(6)| \leq 4$; where x(t) is a Gaussian process with $r(t) = 10$ and $c(t_1, t_2) = 16\ e^{-|t_1 - t_2|}$. **(08 Marks)**

b. Determine: (i) Marginal distribution of x and y (ii) Covariance (iii) Correlation coefficient for the following joint distribution. **(08 Marks)**

x \ y	-3	2	4
1	0.1	0.2	0.2
3	0.3	0.1	0.1

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CBCS SCHEME

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16/17ECS12

First Semester M.Tech. Degree Examination, Dec.2018/Jan.2019
Antenna Theory and Design

Time: 3 hrs. Max. Marks: 80

Note: ***Answer FIVE full questions, choosing one full question from each module.***

Module-1

1 a. Explain antenna performance parameters. **(08 Marks)**

b. Starting from Maxwell's equation, derive the vector wave equation, $\nabla^2 A + W^2 M \in A = -MJ$, where A is vector potential. **(08 Marks)**

OR

2 a. Derive an expression for directivity and gain. **(08 Marks)**

b. Explain antenna polarization with neat diagram. **(08 Marks)**

Module-2

3 a. What is an antenna array? Derive the expression for the normalized array factor for uniformely excited equally spaced linear array of N elements. **(10 Marks)**

b. Explain beam scanning and beam width. **(06 Marks)**

OR

4 a. What is mutual coupling? Discuss the effects of mutual coupling on impedance. **(08 Marks)**

b. Explain formulation of the synthesis problem and synthesis principles. **(08 Marks)**

Module-3

5 a. Explain briefly the folded dipole antenna. **(08 Marks)**

b. Explain Yagi-Uda antennas. **(08 Marks)**

OR

6 a. Explain Traveling–Wave wire antennas. **(08 Marks)**

b. Explain principles of frequency independent antennas. **(08 Marks)**

Module-4

7 a. Explain the principle of parabolic reflector antenna. **(08 Marks)**

b. Explain the axis symmetric parabolic reflector antenna. **(08 Marks)**

OR

8 a. Explain briefly feed antenna used in practice. **(08 Marks)**

b. Explain offset parabolic reflector antenna. **(08 Marks)**

Module-5

9 a. Explain briefly Pocklington's integral equation. **(08 Marks)**

b. Derive the integral equations and Kirchoff's network equation. **(08 Marks)**

OR

10 a. Explain weighted residuals and the method moments with necessary equations and figures. **(08 Marks)**

b. Explain calculation of antenna and scatter characteristics. **(08 Marks)**

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CBCS Scheme

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16/17EMS14

First Semester M.Tech. Degree Examination, June/July 2017
Embedded Systems

Time: 3 hrs. Max. Marks: 80

Note: ***Answer FIVE full questions, choosing one full question from each module.***

Module-1

1 a. Define Embedded System? Explain components of an embedded system hardware. **(10 Marks)**

b. Explain various steps involved in design process of embedded system. **(06 Marks)**

OR

2 a. With a neat diagram, explain the process of converting an assembly language program into the machine codes and finally obtaining the ROM image. **(08 Marks)**

b. Discuss on the difference between CISC and RISC processor. **(04 Marks)**

c. Give the commonly used micro controller in small, medium and large scale embedded system. **(04 Marks)**

Module-2

3 a. Explain the features of ARM processor. **(08 Marks)**

b. Explain flash memory, SRAM, PSRAM and OTP ROM, highlighting their features. **(08 Marks)**

OR

4 a. Give the difference between general purpose processor and DSP processor. **(06 Marks)**

b. Give the processor specific features for an processor selection in an embedded system. **(06 Marks)**

c. Differentiate the Princeton and Harvard architecture. **(04 Marks)**

Module-3

5 a. Write a short note on synchronous and asynchronous communication. **(06 Marks)**

b. Explain parallel port interfacing with touch screen. **(06 Marks)**

c. Explain low serial communication is achieved used UART. **(04 Marks)**

OR

6 a. Explain watchdog Timer. **(08 Marks)**

b. Explain the protocols I^2C and USB Bus. **(08 Marks)**

Module-4

7 a. Describe various program models and give application example of each. **(08 Marks)**

b. Write a short note on process control block. **(08 Marks)**

OR

8 a. Explain various features of UML. **(08 Marks)**

b. What are context, context switching? Explain with the help of diagram. **(08 Marks)**

Module-5

9 a. Describe the kernel services in an OS. **(08 Marks)**

b. Explain I/O subsystem in an typical I/O system in an OS. **(08 Marks)**

OR

10 a. Describe memory managing strategy for a system. **(08 Marks)**

b. Explain the method of saving and optimizing the memory space. **(08 Marks)**

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14ECS23

Second Semester M.Tech. Degree Examination, June/July 2018
Modern DSP

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Draw the block diagram of Analog to Digital converter and explain each block in detail. **(08 Marks)**

b. Consider the analog signal $X_a(t) = 3 \cos 2000\pi t + 5 \sin 6000\pi t + 10 \cos 12{,}000\pi t$.
   i) What is the Nyquist rate for this signal?
   ii) Assume that this signal is sampled at a rate of 5000 samples/sec. What is the discrete time signal obtained after sampling?
   iii) What is the analog signal $Y_a(t)$ that we can reconstruct from the samples if we use ideal interpolation. **(08 Marks)**

c. The discrete time signal $x(n) = 6.35 \cos (\pi/10)^n$ is quantized with a resolution i) $\Delta = 0.1$ or ii) $\Delta = 0.02$. How many bits are required in the A/D converter in each case? **(04 Marks)**

2 a. Consider the following 8 point sequences defined for $0 \le n \le 7$
   i) $x_1(n) = \{1, 1, \mathbf{1}, 0, 0, 0, 1, 1\}$
   ii) $x_2(n) = \{1, 1, \mathbf{1}, 0, 0, 0, -1, -1\}$
   Which sequences have a real 8-point DFT? Which sequences have an imaginary valued 8-point DFT? **(05 Marks)**

b. Let X(k) be a 14 point DFT of a real sequence x(n). The first 8 samples of x(k) are given by : $x(0) = 12$, $x(1) = -1 + j3$, $x(2) = 3 + j4$, $X(3) = 1 - j5$, $X(4) = -2 + j2$, $x(5) = 6 + j3$, $x(6) = -2 - j3$, $x(7) = 10$.
   Determine the remaining samples of X(k). Also evaluate the following functions without computing the IDFT i) X(0) ii) X(7) iii) $\sum_{n=0}^{13} x(n)$ iv) $\sum_{n=0}^{13} |x(n)|^2$ **(11 Marks)**

c. State and prove circular time shift property. **(04 Marks)**

3 a. Find the output y(n) of a filter whose impulse response is $h(n) = \{1, 2, 3, 4\}$ and the input signal to the filter is $x(n) = \{1, 2, 1, -1, 3, 0, 5, 6, 2\}$ using overlap-add method. [Use 6 point circular convolution]. **(10 Marks)**

b. Determine a sequence y(n) such that $y(k) = x_1(k)\, x_2(k)$
   Given $x_1(n) = \{0, 1, 2, 3, 4\}$, $x_2(n) = \{0, 1, 0, 0, 0\}$
   Use DFT properties. **(05 Marks)**

c. State and prove Parseval's theorem. **(05 Marks)**

4 a. A filter is to be designed with the following desired frequency response,

$$H_d(w) = \begin{cases} e^{-j3w}, & 0 < w < \dfrac{\pi}{2} \\ 0, & \dfrac{\pi}{2} < w < \pi \end{cases}$$

   Find the frequency response of FIR filter using Hamming window for N = 7. **(10 Marks)**

b. Compare FIR and IIR filters. **(04 Marks)**

c. Explain the design of FIR differentiators. **(06 Marks)**

5 a. Design a Butterworth filter using Bilinear transformation for the following specifications.
$0.8 \leq |H(e^{jw})| \leq 1$ for $0 \leq w \leq 0.2\pi$
$|H(e^{jw})| \leq 0.2$, for $0.6\pi \leq w \leq \pi$ **(10 Marks)**

b. Explain how an analog filter is mapped on to a digital filter using impulse invariance method. What are the limitations of the method? **(10 Marks)**

6 a. Explain the concept of sampling rate conversion by a factor D and factor I. show the effect of sampling rate conversion on the frequency spectrum of the signal. **(14 Marks)**

b. What is Multirate DSP? Explain the methods of sampling rate conversion. **(06 Marks)**

7 a. Develop polyphase structures for Decimation and Interpolation and explain. **(10 Marks)**

b. Explain the use of Multirate DSP in sub-band coding of speech signals. **(10 Marks)**

8 a. Explain with a block diagram, the application of adaptive filters in channel equalization. **(10 Marks)**

b. Explain the concept of minimum mean square error criterion with relevant equations. **(10 Marks)**

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16/17ECS23

Second Semester M.Tech. Degree Examination, Dec.2018/Jan. 2019
Wireless Communication

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Describe the free space electric field for a fixed transmit and fixed receive antenna. **(08 Marks)**

b. Explain the discrete the baseband model. **(08 Marks)**

OR

2 a. Explain :
i) Delay spread and coherence bandwidth
ii) Doppler spread and coherent time. **(08 Marks)**

b. Describe the wireless channel as a linear time-varying system. **(08 Marks)**

Module-2

3 a. With a neat diagram explain OFDM transmission and reception schemes. **(10 Marks)**

b. Write briefly about transmit diversity space time codes. **(06 Marks)**

OR

4 a. Explain Direct Sequence Spread Spectrum with a neat block diagram. **(10 Marks)**

b. Explain frequency diversity. **(06 Marks)**

Module-3

5 a. With a neat diagram, explain the principle of combining diversity using :
i) maximum ratio combining ii) equal gain combining. **(10 Marks)**

b. Derive the SER in flat fading channel using the classical computational method. **(06 Marks)**

OR

6 a. With a neat diagram explain BER controlled selection diversity principle. **(08 Marks)**

b. Explain spatial diversity. **(08 Marks)**

Module-4

7 a. With reference to the LTI Gaussian channels, explain SIMO, MISO and frequency selective channel. **(12 Marks)**

b. Explain receive diversity in AWCN channel. **(04 Marks)**

OR

8 a. Explain fast fading channel and derive the expression for capacity of the channel. **(08 Marks)**

b. Explain the concept of packing spheres in AWCN channel. **(08 Marks)**

Module-5

9 a. With a neat diagram explain MiMO wireless transmission system **(10 Marks)**

b. How MiMO differs from smart antennas? **(06 Marks)**

OR

10 a. Explain space time block codes(STBC) with necessary diagram. **(08 Marks)**

b. Give the advantages and application of MiMO. **(08 Marks)**

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16/17EMS22

Second Semester M.Tech. Degree Examination, Dec.2018/Jan.2019
Optimal Control Theory

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing one full question from each module.***

Module-1

1 a. What is optimal control problem? Explain :
   i) State constraints
   ii) Control constraints
   iii) Performance measure. **(08 Marks)**

b. Explain dynamic programming applied to a Routing problem. **(08 Marks)**

OR

2 a. Explain the following performance measures :
   i) Minimum time problem
   ii) Minimum control effort problem
   iii) Tracking problem
   iv) Regulator problem **(08 Marks)**

b. For the system given by state equation : $x(k+1) = x(k) + u(k)$ and the performance measure to be minimized,

$$J = x^2(2) + \sum_{k=0}^{1} 2u^2(k)$$

Subject to constraints

$0 \le x(k) \le 1.5 \quad ; k = 0, 1, 2$

$-1.0 \le u(k) \le 1.0 \quad ; k = 0, 1$

Find the optimal control to minimize the given functional. **(08 Marks)**

Module-2

3 a. Derive the optimal control law, for discrete linear regulator problem. **(08 Marks)**

b. Derive Euler's equation. **(08 Marks)**

OR

4 a. Derive Hamilton – Jacobi – Bellman (H – J – B) equation. **(08 Marks)**

b. Explain in brief :
   i) Linearity of a functional
   ii) Increment of a functional
   iii) Variation of a functional
   iv) Optimum of a functional **(08 Marks)**

Module-3

5 a. Explain piecewise smooth external condition with diagram. **(08 Marks)**

b. Find an external curve for the functional

$$J(x) = \int_0^{\pi/4} [x_1^2(t) + 4x_2^2(t) + \dot{x}_1(t)\dot{x}_2(t)]dt$$

Which satisfy the boundary conditions

$$x(0) = \begin{bmatrix} 0 \\ 1 \end{bmatrix} \; ; \; x(\pi/4) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$ **(08 Marks)**

OR

6 a. Derive the necessary condition for the externals of functions with several independent functions. **(08 Marks)**

b. What are the necessary conditions for optimal control? Explain in brief. **(08 Marks)**

Module-4

7 a. Derive matrix differential Riccati equation with variational approach. **(08 Marks)**

b. Explain Pontrygin's minimum principle with relevant diagrams in brief. **(08 Marks)**

OR

8 a. Discuss the state variable in equality constraints. **(08 Marks)**

b. Explain minimum time problem in brief. **(08 Marks)**

Module-5

9 a. Explain optimal control for minimum fuel problem. **(08 Marks)**

b. Explain briefly singular intervals in optimal control. **(08 Marks)**

OR

10 a. Explain minimum energy problem in brief. **(08 Marks)**

b. Consider the system given by
$\dot{x}(t) = -a\,x(t) + u(t)$ is to be transferred from an arbitrary initial state $x(0) = x_0$ to the origin by control that minimizes the performance measure :
$J(u) = \int_0^{t_f} [p + u^2(t)]dt$ and admissible controls are constrained by $|u(t)| \leq 1$, the parameters a and $p > 0$ and t_f is free. Find the optimal control law. **(08 Marks)**

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16/17ECS/EIE/ELD21

Second Semester M.Tech. Degree Examination, Dec.2018/Jan.2019
Advanced DSP

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Explain the concept of sampling rate conversion by a factor I/D. **(08 Marks)**

b. Consider the signal $x(n) = a^n u(n)$, $|a|<|$ i) determine the spectrum x(w) ii) the signal x(n) is applied to a decimeter that reduces the rate by a factor of 2. Find the output spectrum. **(04 Marks)**

c. List the applications of Multi Rate processing. **(04 Marks)**

OR

2 a. Explain the two channel Quadrature Mirror filter bank filter structure. How aliasing is eliminated. **(08 Marks)**

b. The polyphase matrix for a three – channel perfect reconstruction FIR QMF bank is

$$P(Z^3) = \begin{bmatrix} 1 & 1 & 2 \\ 2 & 3 & 1 \\ 1 & 2 & 1 \end{bmatrix}$$. Determine the analysis and synthesis filters in the QMF bank.

(08 Marks)

Module-2

3 a. Explain the innovation representation of a stationary random process. **(08 Marks)**

b. An ARMA process generate by the difference equation
$x(n) = 1.6x(n-1) - 0.63x(n-2) + w(n) + 0.9w(n-1)$.
i) Determine the system function of the whitening filter and its poles and zeros.
ii) Determine the power density spectrum of $\{x(n)\}$. **(08 Marks)**

OR

4 a. Compute the coefficient of 2nd order predictor using Levineon Durbin Algorithm. **(08 Marks)**

b. Consider the AR(3) process generated by the equation

$$x(n) = \frac{14}{24}x(n-1) + \frac{9}{24}x(n-2) = \frac{1}{24}x(n-3) + w(n).$$

i) Determine the system co-efficient of the optimum P = 3 linear predictor.
ii) Determine the auto correlation sequence $f_{xx}(m)$ $0 \le m \le 5$. **(08 Marks)**

Module-3

5 a. With a neat block diagram, explain the echo cancellation in data transmission over telephone channels. **(08 Marks)**

b. A random process $x(n) = g\, v(n) + w(n)$ for $n = 0 \ldots M^{-1}$ with $E(g) = 0$ and $E[g^2] = G$. W(n) is a white noise sequence with $\gamma_{xx}(m) = \sigma^2 \delta(m)$. Determine the co-efficients of a linear estimator for g $\hat{g}(n) = \sum_{n=0}^{M-1} h(n)\ x(n)$ that minimizes the mean square error $\xi = e(g - \hat{g}(n))$.

(08 Marks)

OR

6 a. Explain the time update equation for the RLS algorithm. List the steps in recursive computation of filter co-efficients in RLS algorithm. **(08 Marks)**

b. Determine the co-efficients a_1 and a_2 for the linear predictor shown in fig.Q6(b). Given the auto correlation of the input signal is $\gamma_{xx}(m) = a^{|m|}$ $0 < a < 1$. **(08 Marks)**

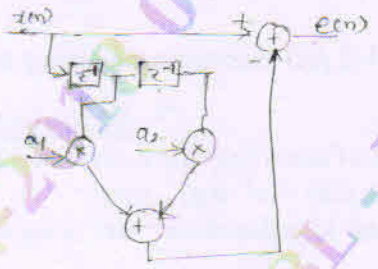

Fig.Q6(b)

Module-4

7 a. Compute the mean and variance of power spectrum. Estimate using Bartlott method. **(06 Marks)**

b. List the computational requirement of Non parametric power spectrum , estimate for Bartlett , Welch and Blackman and Tukey method. **(06 Marks)**

c. Determine the power spectral for the random process generated by the difference equation. $X(n) = -0.81\ x(n-2) + W(n) - W(n-1)$ when $W(n)$ is the noise process with variance σ_w. **(04 Marks)**

OR

8 a. For a AR model, establish the relationship between the auto correlation and model parameters with Yule – Walker equations. **(08 Marks)**

b. For a Random process x(n) with auto correlation function $\gamma_{xx}(m)$ prove that

$$\sum_{m=-N}^{N} \gamma_{xx}(m) e^{-2\pi fm} = \frac{1}{N} \left| \sum_{n=0}^{N-1} x(n) e^{-j2\pi fn} \right|^2 .$$ **(08 Marks)**

Module-5

9 a. Explain the advantages of using Wavelets in wireless communication. List the wavelet applications in communication engineering areas. **(08 Marks)**

b. Write a note on wavelet communities and list different families of wavelets within wavelet communities. **(04 Marks)**

c. Differentiate i) Continuous wavelet transform and discrete wavelet transform.
ii) STFT and FFT. **(04 Marks)**

OR

10 a. Discuss the uncertainty principle and time – frequency tiling of the continuous wavelet transform. **(08 Marks)**

b. If x(n) = [9 5 0 1 – 6 -5 1 4 0 -5 7 9 0 -1 5 3] and $V_1 = V_0 \oplus W_0$. Perform 2 – level Haar decomposition. **(08 Marks)**

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16/17ECS/ELD252

Second Semester M.Tech. Degree Examination, Dec.2018/Jan.2019
Multimedia Over Communication Links

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Describe telephone networks with relevant diagram. **(08 Marks)**

b. Describe ISDN with relevant diagram. **(08 Marks)**

OR

2 a. Describe circuit switched network with neat schematic diagram. **(08 Marks)**

b. Describe the packet switching network principles for connection oriented and connectionless oriented with schematic diagrams. **(08 Marks)**

Module-2

3 a. Describe the PCM principles of signal encoding and decoding with neat schematic diagram. **(08 Marks)**

b. Derive the bit rate and the memory requirements to store each frame that result from the digitization of both a 525 - line and 625 - line system assuming a 4 : 2 : 2 format. Also find the total memory required to store a 1.5 hour movie/video. Assume 8 bits per sample. **(08 Marks)**

OR

4 a. Illustrate IP multicast and resource reservation protocol (RSVP) with relevant diagram. **(08 Marks)**

b. Discuss on typical structure of an IP n/w with neat block diagram. **(08 Marks)**

Module-3

5 a. Illustrate the digital audio signal processing with neat diagram. **(08 Marks)**

b. Discuss perceptual audio-coder architecture with neat diagram. **(08 Marks)**

OR

6 a. Illustrate the perceptual transform coder and hybrid coder with neat diagram. **(08 Marks)**

b. Illustrate the wavelet decomposition with respect to the audio subcoders in detail. **(08 Marks)**

Module-4

7 a. Illustrate the basic structure of the MPEG-1 in detail with relevant diagram. **(08 Marks)**

b. Discuss the overall audio compression and encoding processes for three layers in MPEG-2 with relevant diagram. **(08 Marks)**

OR

8 a. Discuss MPEG-4 object based architecture in detail. **(08 Marks)**

b. Describe the architecture of MPEG-4 systems with a neat diagram. **(08 Marks)**

Module-5

9 a. Illustrate the packet video and video transmission system with neat diagram. **(08 Marks)**

b. Illustrate the video streaming across the internet with neat diagram. **(08 Marks)**

OR

10 a. Illustrate multiplexing process in ATM network. **(08 Marks)**

b. Write short notes on:
(i) MPEG video error concealment (ii) Video across WATM network. **(08 Marks)**

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16ESP/ECS/ELD423

Fourth Semester M.Tech. Degree Examination, Dec.2018/Jan.2019
Communication System Design using DSP Algorithm

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Draw the Type-1 direct form realization of FIR filter and explain it. **(08 Marks)**

b. Write a C-program segment for an FIR filter with circular buffer. **(08 Marks)**

OR

2 a. Discuss the method of power estimation using FFT. **(10 Marks)**

b. What are the items must be kept in mind while using Assembly functions with C? **(06 Marks)**

Module-2

3 a. Draw the block diagram of a single side band modulator using Hilbert transform and explain it. **(08 Marks)**

b. Explain the operation of a costas loop demodulator. **(08 Marks)**

OR

4 a. Draw the block diagram of an ideal coherent receiver and explain it. **(08 Marks)**

b. Explain the operation of a envelop detector using the Hilbert transform with mathematical equations. **(08 Marks)**

Module-3

5 a. With diagram and mathematical analysis, explain FM discriminator using pre-envelop. **(08 Marks)**

b. Explain the method of generating Pseudo-Random Binary Sequences using linear feedback shift registers. **(08 Marks)**

OR

6 a. What are the properties of maximal length sequences and explain it. **(08 Marks)**

b. Draw the block diagram of a self synchronizing descrambler and explain it. **(08 Marks)**

Module-4

7 a. Draw the block diagram of a basic QAM transmitter and explain it. **(08 Marks)**

b. Explain the method of implementing the transmit filter by an Interpolation filter bank. **(08 Marks)**

OR

8 a. Explain 4 × 4 16-point QAM constellation. **(08 Marks)**

b. Draw the block diagram of a second form of QA Demodulator and explain it. **(08 Marks)**

Module-5

9 a. Explain the operation of a phase-splitting fractionally spaced equalizer with the help of block diagram. **(08 Marks)**

b. Draw the Typical full-duplex dialed telephone line connection without Echo cancellation and explain it. **(08 Marks)**

OR

10 a. Draw the simplified block diagram of an ADSL Receiver and explain the functions of each block. **(13 Marks)**

b. What is forward error correction? **(03 Marks)**

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