M.E (Sem I) EXTC 4/12/12

Advanced Digital Signal Processing. Statistical Sig. Analysis

(b) The time elapsed between the claims processed is modeled such that Tk represents the time elapsed between processing the $(k-1)^{th}$ and k^{th} claim where T_1 is the time until the first claim is processed, etc. You are given—

$T_1, T_2, \ldots\ldots$ are mutually independent;

and The pdf of each Tk is

$f(t) = 0{\cdot}1\ e^{-0{\cdot}1t},\ t > 0$

where 't' is measured in half-hours.

(i) Calculate the probability that at least one claim will be processed in the next 5 hrs. **5**

(ii) What is the probability that at least 3 claims processed within 5 hrs ? **5**

4. (a) Write a note on Central Limit Theorem. **5**

(b) Give the classification of Markov states. **5**

(c) A corporate computer centre has two computers of the same capacity. The jobs arriving at the center are of two types, internal jobs and external jobs. These jobs have Poisson arrival times with rate 18 and 15 per hour, respectively. The service time for a job is an exponential random variable with mean 3 minutes.

(i) Find the average waiting time per job when one computer is used exclusively for internal jobs and the other for external jobs. **4**

(ii) Find the average waiting time per job when two computers handle both types of jobs. **6**

5. (a) Consider a random process X (t) that assumes the values ± 1. Suppose that $X(0) = \pm 1$ with probability $\frac{1}{2}$ and suppose that X (t) then changes polarity with each occurrence of an event in a Poisson process of rate α. Find the PMF, mean and variance and the autocovariance of X (t). **10**

(b) Find the optimum causal filter for estimating a signal Z (t) from the observation X (t) = Z (t) + N (t), where Z (t) and N (t) are independent random processes, N (t) is a zero-mean white noise with noise density 1 and Z (t) has power spectral density. **10**

$$S_z(f) = \frac{2}{1 + 4\pi^2 f^2}$$

Find the Wiener optimum filter.

6. (a) Write a note on confidence interval. **5**

(b) Write a detailed note on Kalman filter. **10**

(c) Explain M/9/1 queueing system. **5**

Con. 9801–12. BB–8469

(3 Hours) [Total Marks : 80

N.B. :(1) Q. No. **1** is **compulsory**.
(2) Attempt any **three** questions from the remaining **five** questions.
(3) Assume **suitable** data, if **necessary**.
(4) Use of **Normal Table** is **permitted**.

1. (a) Three types of messages arrive at a message center. Ten percent of the messages are "high priority", 40% are "normal priority" and 50% are "low priority". Find the probability that K out of N messages are not high priority. Also, find the probability that out of 20 messages, 5 are high priority, 10 are normal priority and 5 are low priority. **5**

(b) Consider a random amplitude sinusoid with period T : **5**

$$X(t) = A \cos (2\pi t / T)$$

Is X (t) cyclostationary ? Wide-sense stationary ?

(c) Let the observation Z_n be given by **5**

$$Z_n = X_n + Y_n$$

where X_n is the signal we wish to observe, Y_n is a white noise process with power σ_y^2 and X_n and Y_n are independent random processes. Suppose further that $X_n = A$ for all n, where A is a random variable with zero mean and variance σ_A^2. Thus Z_n represents a sequence of noisy measurements of the random variable A. Find the power spectral density of Z_n.

(d) Write a note on "Elements of Queueing System". **5**

2. (a) A random variable X has pdf.

$$f_x(x) = \begin{cases} C\left(1-x^4\right) & -1 \le x \le 1 \\ 0 & \text{elsewhere} \end{cases}$$

(i) Find C **2**
(ii) Find the cdf of X **4**
(iii) Find P [1 x 1 < ½] **4**

(b) State and prove the Chapman-Kolmogorov equation. **10**

3. (a) The random variables X and Y have the joint pdf. **10**

$$f_{x,y}(x, y) = 2\, e^{-(x+y)} \quad 0 \le y \le x < \infty$$

Find the pdf of Z = X + Y
Note : X and Y are not independent.

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ME / EXTC / IT / R

10/12/11

Optical Fiber Communication

5 : 2nd half.12-AM(n)

Con. 10170-12.

BB-8367

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **three** out of **five** questions.
(3) Assume suitable **data** wherever **necessary**.

1. (a) What is normalized frequency of the fiber on the basis of this differentiate between single and multimode fiber. **20**
   (b) Explain non-linear effects in optical communication.
   (c) State the effect of SPM in optical transmission.
   (d) What are the various losses in optical fiber ?

2. (a) Discuss the operation of Vertical Cavity Surface Emitting Laser (VCSEL). Briefly indicate the methods to provide wavelength tunning for a VCSEL. **20**
   (b) Explain any one fiber fabrication process with neat diagram.

3. (a) Derive the wave guide equation for an optical fiber. **10**
   (b) With a neat sketch explain the working of an optical modulation. **10**

4. (a) Sketch the physical layout of RCEPD device and briefly explain its operation. **10**
   (b) Calculate the available bandwidth of an RCE Photodetector diode based on Photon lifetime and for the following parameters **10**

   $R_1 = 0 \cdot 7$
   $R_2 = 0 \cdot 99$ } mirror reflectivity

   ad = absorption coefficient = 0·1
   Total roundtrip = 40 fs

5. (a) Explain the gain process in a Raman fiber amplifier and state its application. **20**
   (b) Compare SOA, EDFA and RFA.

6. Write short notes on the following :— **20**
   (a) Soliten
   (b) SONET
   (c) Photonic Switching
   (d) DWDM network.

M.E EXTC sem I (Rev) Dec-2012
Sub:- DSP & IA 14/12/12

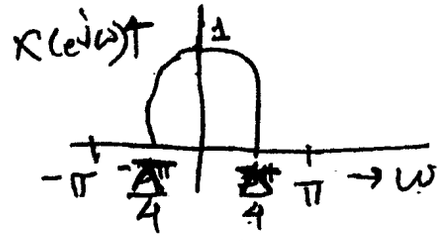
ws-Sept, 2012 (c) 117
Con. 10769–12.

BB–8370

(3 Hours) [Total Marks : 80

N. B. : (1) Question No. 1 is **compulsory**.
(2) Solve any **three** questions from the remaining.
(3) Assume **suitable** data if **required**.

1. (a) How is fast data access and fast computation achived in digital signal processors ? 5
(b) The spectrum of a discrete time signal is shown below : 5



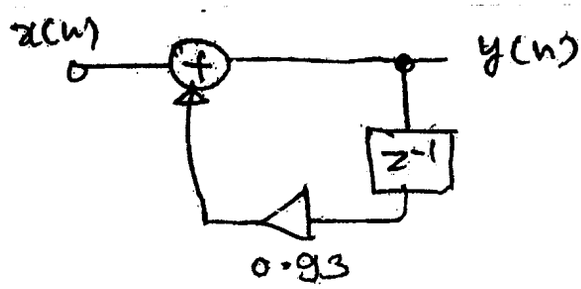
Draw the spectrum of decimated signal when decimated by D = 6.
(c) Explain zero input limit cycles and overflow limit cycles. 5
(d) Discuss use of DFT in power spectrum estimation. 5

2. (a) Design a linear phase FIR filter with low pass characteristics using 11 samples of ideal frequency response and cut off frequency of 0·5 π rad/sample. Use frequency sampling method. 10
(b) For eight point sequence x(n) = {2, 1, 2, 1, 1, 2, 1, 2} Compute 8 point DFT using DIT-FFT and DIF-FFT. 10

3. (a) Discuss various architectures for digital signal processors. 8
(b) Determine the frequency resolution, variablity, and figure of merit of Welch (50%) overlap and Blackman Tuckey method of power spectrum estimations when x(n) has 800 samples and quality factor is 16. 12

4. (a) The system transfer function of IIR filter is $H(z) = \dfrac{(1 - z^{-1})^3}{(1 + 4z^{-1})^2}$. 10

Realize the transfer function in transpose of direct form II and lattice structures.
(b) For the recursive filter shown the input x(n) has a peak value of 10, repersented by 6 bits. Compute variance of output due to A/D conversion. 10



[TURN OVER

5. (a) Discuss application of DSP in –
   (i) Speech Processing
   (ii) RADAR. 5

   (b) Design a butterworth digital IIR low pass filter using bilinear transformation by taking $T = 0{\cdot}1$ to satisfy following specifications. 5 10

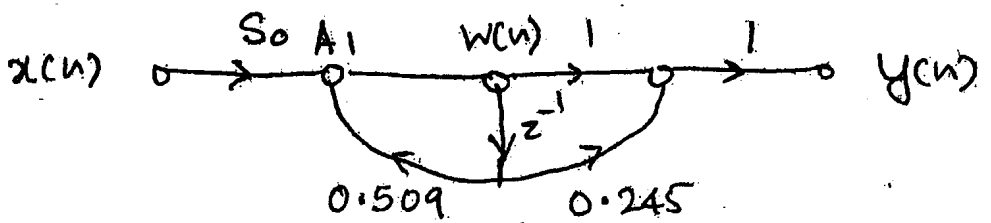
$$0{\cdot}6 \leq |H(e^{j\omega})| \leq 1{\cdot}0 \quad \text{for} \quad 0 \leq \omega \leq 0{\cdot}35\,\pi$$

$$|H(e^{j\omega})| \leq 0{\cdot}1 \quad \text{for} \quad 0{\cdot}7\,\pi \leq \omega \leq \pi$$

6. (a) The transfer function of IIR filter is $H(z) = \dfrac{1+0{\cdot}7z^{-1}}{1-0{\cdot}9z^{-1}}$. 10

   Perform polyphase decomposition into 4 sections.

   (b) For the digital network shown, find the transfer function H(z) and scale factor S_0 to avoid overflow in register A_1. 10



ME/EXTC/I (R.) 22/12/12
Next Generation Networks

P4–Exam–Oct. 2012–ConNo.–5

Con. 11071–12. **(REVISED COURSE)** **BB–8394**

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

N.B. : 1. Question No. **1** is Compulsory
2. All questions carry equal marks
3. Answer any three questions from remaining five questions
4. Figures to right indicate marks

1a) Write in brief about IP network concept used for building NGN. [05]
b) Discuss in brief about the transition of PSTN networks to IP based NGN. [05]
c) Write in brief the requirements of main drivers for NGN. [05]
d) Evolution of NGN [05]

2a) Explain various numbering, naming and addressing schemes used in NGN. [10]
b) Write about the security requirements for NGN using AAA & identity management techniques. [10]

3a) Explain about location-based and content-based services in NGN. [10]
b) Discuss about different service capabilities such as VoIP & IPTV in NGN. [10]

4 a) List the requirements for establishing NGN based control architectures & protocols. [10]
b) Explain about Fixed Mobile Convergence (FMC) requirements in NGN. [10]

5 a) Explain the need for mobility management in NGN. [10]
b) Write in detail about the business and regulatory aspects for building NGN. [10]

6. **Write short notes on the following** : [20]

a) Quality of Service (QoS) & Quality of Experience (QoE) in NGN
b) Transition from IPv4 to IPv6
c) IP Multimedia Subsystem for NGN
d) ITU NGN Standards

M.E. EXTC Sem I CR(N)/9 Dec-2012
Elective Sub:- VLSI & MSC & S

VT-S.H.Exam. Dec.-12- 111

Con. 10562–12. **BB–6009**

(3 Hours) **[Total Marks : 100**

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

1. Design two stage operational amplifier (OAT) for the following specifications :– **20**
$A_v > 3000$ V/V, $V_{DD} = 2{\cdot}5$ V, $V_{SS} = -2{\cdot}5$ V,
Phase margin = 60°, GBP = 5 MHz,
C_z (load capacitance) = 10 pF,
Slew rate > V/MS,
Vout range = ± 2V
Power dissipation (P_D) ≤ 2 mW,
Input common mode gain (ICMR) = –1 to 2V.
Assume the channel length is to be 1mm,
Explain how nulling resistor can be incorporated in to this design.

2. (a) Explain the analog layout techniques, design rules and verification with the help of suitable example. **10**
(b) Discuss types of PLL and its dynamics. How it affects PLL performance. **10**

3. (a) Explain power management and packaging related problems in AMS design. **10**
(b) Explain the switched capacitive integrator circuits in detail. **10**

4. (a) A cellular telephone incorporates a 900 MHz PLL to generate carrier frequency. If $W_{LPF} = 2 * \pi * 20$ KHz and the output frequency is to be changed from 900 MHz to 901·2 MHz, how long does the PLL output frequency take to settle within 100 Hz of its final value ? **10**
(b) Write a short note on transmission gate and its importance in the field of VLSI. **10**

7. Write short notes on any **three** :– **20**
(a) Merit and demerit of scaling in AMS design.
(b) Compensation and pole splitting techniques to improve the frequency response of OP-AMP.
(c) MOS device models used in simulation.
(d) Short channel effects in the field of VLSI.

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ME EXTC VLSI

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KR-6009

Corrections – Q7 read as Q5 | Total Marks: 80

Q6. (a) Draw a circuit diagram of a CMOS inverter, Explain its transfer characteristics and current drainage from V_{DD} Supply. **10**

Q6. (b) Draw a stick diagram and colour coded mask layout of CMOS Inverter. **10**

M.E Sem I (Rev) Comp.
Advanced Algo & complexity

AGJ-2nd half (m)-12-12

Con. 9804–12.

BB-8358

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **three** from the remaining **five** questions.
(3) Assume **suitable** data wherever **necessary**.

1. (a) Explain Master's Method for solving recurrences to obtain asymptotic 'θ' or '0' bounds. **10**
Solve the given recurrences relation $T(n) = 16T(n/4)\ tn^2$ using Master's Method.
(b) Write Merge sort algorithm and analyze it. **10**

2. (a) Find all pairs shortest path for the given weight matrix using Floyd-Warshall algorithm. **10**

W =

	A	B	C	D	E
A	0	5	8	∞	−3
B	∞	0	∞	2	6
C	2	∞	0	∞	∞
D	2	∞	−4	0	∞
E	∞	∞	∞	3	0

(b) Using dynamic approach solve the following Knapsack problem (maximum profit). **10**
Knapsack capacity M = 25
Profit P = (25, 23, 16)
Weights W = (16, 10, 5)

3. (a) Solve the following Linear Programming using simplex method. **15**
Maximize $-5x_1 - 3x_2$
Subject to $x_1 - x_2 \leq 1$
$2x_1 + x_2 \leq 2$
$x_1, x_2 \geq 0$
(b) Prove that Travelling Sales person is NP-Complete. **5**

4. (a) Determine LCS of (011010110) and (110010100). **10**
(b) Explain with example maximum bipartite matching using Ford-Fulkerson method. **10**

5. (a) Prove that subset sum is NP-Complete. **10**
(b) Find the optimal solution for the given weight matrix using travelling sales person (dynamic programming). **10**

	A	B	C	D
A	∞	11	6	7
B	11	∞	12	6
C	4	8	∞	10
D	11	3	1	∞

6. Write short note on :– **20**
(a) Naive String Matching Algorithm
(b) Genetic Algorithm
(c) K-Server problem
(d) Rabin Karp algorithm.