E/Sem-I (CBSGS)/EXTC/Statstical Signal Analysis/May'16

**QP Code : 14195**

Duration: 03 Hours — Total Marks assigned to the paper 80

N.B. 1) Attempt any **Four** questions from the **Six** questions
2) Assumptions made should be clearly stated.
3) Figures to the right indicate full marks.
4) Illustrate answer with sketches wherever required.
5) Use of **Normal** table is permitted.

| | | |
|---|---|---|
| Q.1>(a) | Define and prove Bayes theorem .Give its practical application. | (5) |
| (b) | What is Strict sense stationary process and wide sense stationary process? | (5) |
| (c) | Find the power spectral density of random process which has autocorrelation function $R_{xx}=e^{-\alpha\tau^2}$. | (5) |
| (d) | Explain M/M/1 queuing system in detail . | (5) |
| Q.2>(a) | If X and Y are exponential distributions with unity parameter , find the probability distribution function of<br>U=X+Y<br>V=X/(X+Y) | (10) |
| (b) | Consider a random process X(t)=A cos $(2\pi ft+\theta)$ where $\theta$ is uniform ally distributed random variable in $(0, 2\pi)$.Find the power spectral density of X(t).Find whether the random process is WSS and ergodic ? | (10) |
| Q.3>(a) | What is function of one random variable?<br>If $f_X(x)=\frac{2x}{\pi^2}$ $0\le x\le\pi$.<br>Find PDF of Y ($f_Y(y)$) where Y=sin(x).Prove the relation equation used. | (10) |
| (b) | Consider random process X(t) that assumes value ±1 .Suppose that X(0)= ±1 with probability 0.5 and suppose that X(t) changes polarity with each occurrence of an event in a poison process at rate α. Is this a continuous type Markov Process? Justify your answer. | (10) |
| Q.4(a) | State and prove central Limit Theorem. | (5) |
| (b) | Let the observation Zn is given By $Z_n=X_n+Y_n$, where $X_n$ is the signal we wish to observe, $Y_n$ is a white noise process with power $\sigma^2_Y$, and $X_n$ and $Y_n$ are dependent. Suppose that $X_n=A$ for all n, where A is a random variable with zero mean and variance $\sigma_A$. Find the power spectral density of $Z_n$. | (10) |
| (c) | A concentrator receives messages from a group of terminals and transmits them over a single transmission line. Suppose the messages arrive in Poisons process with one message every 4 milliseconds and suppose that message transmission time is exponentially distributed with mean 3 ms, Find the mean number of massages in system and mean total delay in the system. What percentage increases in arrival rate will double the mean total delay? | (5) |
| Q.5>(a) | What is Poisons Random Process? Is it continuous or Discrete Random process? Also find the autocovarince of the process. | (10) |
| (b) | Find the transfer function for the optimum filter for estimating Z(t) from X(α)=Z(α)+N(α) , α(-∞,+∞) where Z(α) and N(α) are independent ,zero mean random processes. | (10) |
| Q.6>(a) | Find the PDF of sum of n independent random variables , all exponentially distributed with parameter α . | (5) |
| (b) | Explain Kalman Filter and its applications in communication systems. | (10) |
| (c) | What are 'Elements of queuing systems'? | (5) |

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E/Sem-I (CBSGS)/EXTC/Optical Fiber Communication/
May-2016.

**QP Code : 14199**

(Time: 3 Hrs) [Max.Marks:80

Note: Question No.1 is compulsory
Answer any three questions form remaining five questions
All questions carry equal marks
Assume suitable data wherever necessary and justify the same.

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Q.1 a) Explain the use of Non Zero Dispersion Shifted Fibers in optical communications. [05]
b) Explain the working of multimode interferer coupler in detail. [05]
c) What is meant by cross phase modulation and explain its importance in brief. [05]
d) Explain the working of SONET and also mention their merits and demerits. [05]

Q.2 a) What are different network topologies? Explain the performance of mesh architecture. [10]
b) Explain the principle of a LASER generation and discuss Vertical Cavity Surface Emitting Laser (VSCEL). [10]

Q.3 a) Explain the different phenomena responsible for signal degradation as the light wave propagates through an optical fiber. [10]
b) A lithium Niobate modulator designed for operation at wavelength of 1.3 μm is 3cm long with a distance between the electrode of 22 μm. Determine the voltage required provide a phase change of $\pi/2$ radians given that the electro optic coefficient for lithium Niobate is $30.8 \times 10^{-12}$ $mv^{-2}$ and its Refractive index is 2.1 at 1.13 μm. [10]

Q.4 a) What are different types of non linearity? Explain any two. [10]
b) State the principal of EDFA and state its application. Draw neat labeled diagram. [10]

Q.5 a) Derive the wave guide equation for an optical fiber. [10]
b) Explain the principle of resonant cavity enhancement detector? Compare RCE schottky photodiode and RCE avalanche photodiode. [10]

Q.6 Write short notes on any two:- [20]
a) Optical switch
b) Photonic crystal fibers
c) Optical MEMS

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M.E - E.T.

SEM I (CBSGS) MAY 16

D. S. P & ITS APPLICATIONS

Q.P. CODE : **14202**

(3 hours) [Total Marks: 80

Note the following instructions.
(1) Attempt any four questions
(2) Assume suitable data wherever necessary, justify the same
(3) Figures to the right indicate full marks.

1.a Explain in brief real time DSP system [5]

1.b List limitation of non-parametric method for power spectrum estimation [5]

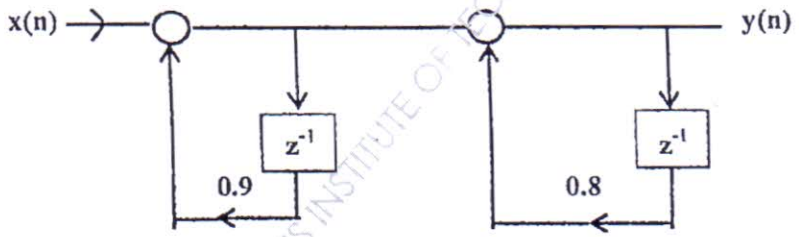
1.c Explain very long instruction word (VLIW) architecture used for P-DSPs [5]

1.d What is the need for multirate signal processing? Give one example of multirate digital system. [5]

2.a Compute 8-point DFT of sequence x(n) = {1, 0, 2, 0, 3, 0, 4, 0 } using DIT-FFT algorithm [10]

2.b A cascade realisation of the two first order digital filter is shown below. The system functions of the individual sections are [10]

$$H_1(z) = \frac{1}{1 - 0.9\,z^{-1}} \text{ and } H_2(z) = \frac{1}{1 - 0.8\,z^{-1}}$$




Draw product quantisation noise model of the system and determine the overall output noise power

3.a The desired frequency response of a low pass filter is given by [10]

$$H_d(\omega) = \begin{cases} e^{-j2\omega} & |\omega| \le \frac{\pi}{4} \\ 0 & \frac{\pi}{4} < |\omega| \le \pi \end{cases}$$

Determine the filter coefficients h(n), if h(n) = $h_d$(n) . w(n) using Hamming window also determine the filter response H(ω).

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$$W_{Hamm} = 0.54 - 0.46\cos\frac{2\pi n}{N-1} \quad for\ 0 \le n \le N-1$$

3.b Design a Butterworth filter using the Bilinear Transformation technique for the following specifications [10]

$0.8 \le |H(e^{j\omega})| \le 1 \qquad 0 \le \omega \le 0.2\pi$

$|H(e^{j\omega})| \le 0.2 \qquad 0.6\pi \le \omega \le \pi$

4.a Implement a two stage decimator for the following specifications [12]

Sampling Frequency = 20 KHz

Decimation factor 'D'=100

Passband = 0 Hz to 40 Hz

Transitionband = 40 Hz to 50 Hz

Passband ripple = 0.02

Stopband ripple = 0.002

4.b The spectrum of discrete time signal is as shown in figure B. Sketch the spectrum of [8]

i. Downsampled or Decimated signal for D = 3

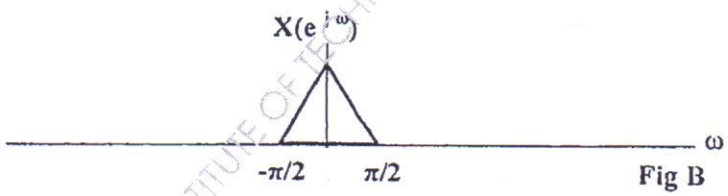


Fig B

5.a Define periodogram and explain how DFT and FFT are useful in power spectral estimation [10]

5.b Discuss power spectrum estimation using Welch method [10]

6. Write short notes on any Two [20]

i. Telecommunication applications of DSP
ii. Biomedical applications of DSP
iii. General purpose digital signal processors
iv. Polyphase implementation of Decimator and Interpolator
v. Effect of finite word length in digital filters

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E/Sem-I (CBSGS)/EXTC/Advanced Satelite Commn/ May-2016.

QP Code : **14214**

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

**N. B. :** (1) Question No.1 is **compulsory**.
(2) Attempt any **three** from remaining.
(3) Assume suitable data if necessary.

1. (a) Briefly describe the following **20**
   (i) Why does a satellite in highly inclined elliptical orbit spend most of its orbital period over higher latitude regions? [10]
   (ii) Why is it preferable for a remote sensing satellite to be in Sun synchronized orbits? [12]
   (b) Explain (1) Lobe switching (2) mono pulse tracking (3) step tracking (4) intelligent tracking
   (c) What are the sources of thermal equilibrium on the satellite platform? Briefly describe the techniques used to achieve thermal balance.
   (d) Compare the solid fuel and liquid fuel propulsion systems on the basis of their performance characteristics [8]

2. (a) Explain: **10**
   (i) Why a spin stabilized satellite uses relatively large number of solar cells as icompared to three axis stabilized satellite for the same power requirement?
   (ii) Why nickel hydrogen batteries are preferred over nickel cadmium batteries for super craft applications

   (b) (i) Why double reflectors are used in antenna for large earth station? [10] **10**
   (ii) A dish antenna meant for satellite down link reception has an effective aperture of 1.0m. Compute the gain in dB and 3 dB bandwidth in degress for a down link operating frequency of 11.95 Ghz. [10]

3. (a) Explain T T & C subsystem. Explain the use of multi-tone frequency in tracking system. [20] **10**
   (b) Draw and Explain Regenerative type of repeater for KU-band. **8**
   (c) How the isolation between the stages of repeater is achieved? **2**

[ TURN OVER

4. (a) Discuss the effect of earth's oblateness and the moon and sun on the orbital parameter. **9**

   (b) Why the polar orbits are not used for communication satellite orbit. Justify **5**

   (c) What are the different types of station keeping process? Which one is performed very rarely and why? **5**

5. (a) Why is a Faraday rotation of no concern with circularly polarized waves? Explain how de-polarization is caused by rain. Explain the difference between cross-polarization discrimination and polarization isolation. **10**

   (b) With the aid of block schematic, describe the functioning of a transmit receive earth Station used for telephone traffic. Describe a multidestination carrier. **10**

6. (a) What is the antenna noise temperature? What are the major factors that decides the antenna noise temperature? What is the antenna gain to noise temperature (G/T) ratio? What is the significance of Earth stations antenna gain to noise temperature ratio? **10**

   (b) A 12 GHz receiver consists of an R.F stage with gain G1 = 30. dB and noise temperature T1 = 20K, a down converter with gain G2 = 10 dB and noise temperature T2 = 360K and an IF amplifier stage with gain G3 = 15 dB and noise temperature T3 = 1000 K . Calculate the effective noise temperature and noise figure of the system. Take reference temperature as 290 K. Compute the noise figure specifications of the three stages and then compute the overall noise figure from the individual noise figure specifications. **10**

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Sem I (CBSGS) M.E. - EXTC MAY'16

**QP Code : 14226**

NEXT GEN. NETWORKS

Duration : 3 Hrs Maximum Marks: 80

**Note: i) Question No 1 is compulsory**
**ii) Solve any three out of remaining questions**
**iii) Figure to the right indicate full marks**

| | | | |
|---|---|---|---|
| Q.1 | | Attempt any four questions. | (20) |
| | A | What are QoS performance metrics in NGN? | (05) |
| | B | Draw and explain high level architectural model for ubiquitous networking in NGN. | (05) |
| | C | What is the impact of using IPv6 to NGN? [5] | (05) |
| | D | What are the applications of Location Based Services (LBS)? | (05) |
| Q.2 | A | What should be the user perception of QoS in NGN? What is Quality of Experience? | (10) |
| | B | What are the main drivers to Next Generation Networks? | (10) |
| Q.3 | A | Write a note on Session Initiation Protocol (SIP). | (10) |
| | B | Explain the various naming, numbering and addressing scheme in NGN. | (10) |
| Q.4 | A | What are the security mechanism used in NGN? | (10) |
| | B | Write a note on Fixed Mobile Convergence in NGN. | (10) |
| Q.5 | A | Explain mobile IPTV service with challenges and application. | (10) |
| | B | How transition takes place from IP network to All IP networks? Explain the co-existence of different networks. | (10) |
| Q.6 | | **Write a notes on the followings. (Attempt any two)** | (20) |
| | A | Influences of NGN on overall economic growth | |
| | B | ID's used in TISPAN NGN and their administration | |
| | C | Operating Platform in Carrier Grade Open Environment (CGOE). | |
| | D | Location Based Services (LBS) and Content Based Services (CBS) | |

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**BB-Con. 10372-16.**