M.E./Sem-I/(CBSGS)/EXTC/MAY-2015/SSA

Q.P. Code : 1707

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

N.B. : (1) Attempt any **Four** questions from the **Six** questions.
(2) State **clearly** the **assumptions** made.

1. (a) State the three definitions of probability. **5**
   (b) Differentiate between joint density function and joint distribution function of discrete and continuous random variables, say X and Y. **5**
   (c) Find the mean and variance of Poisson distribution. **5**
   (d) Distinguish between strict sense and wide sense stationary process. **5**

2. (a) State and develop Little's formula for a queuing system. **10**
   (b) State and prove Central Limit Theorem. **10**

3. (a) Inquiries arrive at a recorded message device according to a Poisson process of rate 15 inquiries per minute. Find the probability that in a 1-min period, 3 inquiries arrive during the first 10 seconds and 2 inquiries arrive during the last 15 seconds. Find the mean and variance of the time until the arrival of tenth inquiry. **10**
   (b) Let X_n be art iid random process, Show that X_n is a Markov process and give it's one step Transition probability matrix. **10**

4. (a) Consider a random process $x(t) = A\cos(\omega t + \theta)$, where ω is constant, A is a random variable with mean zero and variance one, and θ is a random variable that is uniformly distributed between 0 and 2π. Assume that the random variables A and θ are independent. Is x(t) a mean - Ergodic process and correlation Ergodic process? **10**
   (b) Show that the Brownian motion process is a Markov process. Find the state transition pdf. **10**

5. (a) Let X be a sequence of iid Gaussian random variables with zero mean and variance σ^2. Find the joint pdf and autocovariance of the corresponding sum process at times n_1 and n_2. **10**
   (b) State and prove Chapman-Kolmogorov equation. **10**

6. (a) Write a detailed note on Kalman filter. **10**
   (b) Explain M/M/1 Queue **5**
   (c) Write a note on power spectral density and it's properties. **5**

ME/Sem-I/CBSGS/EXTC May-2015

DSP & Its Application

QP Code : 1713

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

N. B. : (1) Attempt any **four** questions
(2) Assume suitable data wherever necessary, justify the same
(3) **Figures** to the **right** indicate **full** marks.

1. (a) What is the need for multirate signal processing? Give one example of multirate digital system **4**
   (b) Explain in brief real time DSP system **4**
   (c) Explain the principle behind frequency sampling method. **4**
   (d) Why is a filter required for an interpolator? Draw the spectrum at the output of interpolator and after filter. **4**
   (e) What is the relationship between autocorrelation function and spectral density? **4**

2. (a) For a continuous time signal with equation, $x(t) = \sin(2\pi 1000t) + 0.5 \sin(2\pi 2000t)$. Sample the given signal at 8000 samples/sec and find out 8 point DFT using DIT-FFT algorithm and also plot magnitude and phase response. **10**
   (b) A digital system is characterized by the difference equation shown below with x(n)=0 and initial condition y(-1) = 12. Determine the deadband of the system. **5**

   $y(n) = 0.9y(n-1) + x(n)$

   (c) Explain very long instruction word (VLIW) architecture used for P-DSPs **5**

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 $h(n) = h_d(n) \cdot w(n)$ using Hamming window also determine the filter response $H(\omega)$.

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

[TURN OVER

BB-Con. 10124-15.

(b) Design digital Butterworth transformation filter using bilinear transformation 10

$\omega_p = 0.23\pi$, $\omega_s = 0.43\pi$, $A_p = 2dB$, $A_s = 11dB$, $T = 1sec$

4. (a) With neat diagram and input-output relationship, explain in detail the entire process of interpolation by a factor 'L' 10

(b) The spectrum of discrete time signal is as shown in figure B. Sketch the spectrum of 10

(i) Decimated signal without aliasing for D = 3

OR

(ii) Upsamled or Interpolated signal for L = 3

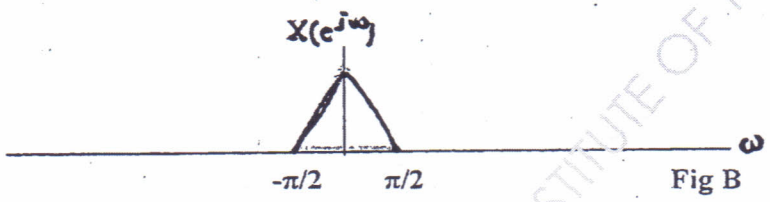

Fig B

5. (a) Define periodogram and explain how DFT and FFT are useful in power spectral estimation 6

(b) What are limitation of non-parametric methods in spectral estimation 6

(c) Discuss power spectrum estimation using Welch method 8

6. Write short notes on any Four 20

(i) Audio applications of DSP

(ii) Telecommunication applications of DSP

(iii) Biomedical applications of DSP

(iv) Power spectrum estimation using parametric methods

(v) Polyphase implementation of Decimator and Interpolator

(vi) Effect of finite word length in digital filters

ME 1st / EXTC / sem I / CBGS / MAY-2015

Advanced satellite communication.

Q.P. Code : 1725

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

N.B. : (1) Attempt any **four** questions out of **Six** questions.
(2) Assume suitable additional data whenever necessary but justify the same.

1. (a) Why a satellite communication system is called distance insensitive. What are the various services offered by satellite communication system. **10**

   (b) Compare the performance of two types of repeaters used in satellite communication system. Explain in detail, working of any one type of repeater. **10**

2. (a) What are the various types of propulsion fuels used in satellite launch vehicles. Explain how a satellite is launched in geostationary orbit from earth. **10**

   (b) Why does a satellite's orbit deviate from the prediction of kepler's law. What is the effect of atmospheric drug and non-spherical shape of earth on keplerian orbit ? **10**

3. (a) What is the importance of Telemetry, Tracking and command system in satellite communication system. Why lot bit rate is preferred in TTC. Explain the working of TTC with the help of a block diagram. **10**

   (b) With the help of a block diagram explain the working of a transmit-receive earth station used in telephone traffic. **10**

4. (a) An earth station antenna with gain of 34dB transmits 100W at 14 GHz. The signal is received by satellite antenna of 3 mtr. diameter at 36000 km. Antenna efficiency is 70%. Calculate **10**
   (i) Path loss
   (ii) The received power at the output port of satellite antenna.
   (iii) The gain of satellite antenna
   (iv) Flux density at the receiver

   (b) Derived an expression of combined uplink and down link C/N ratio in terms of uplink $(C/N)_U$ and down link $(C/N)_D$ ratio. Find overall C/N in dB if uplink $\left(\frac{C}{N}\right)_U = 30$ dB and downlink $\left(\frac{C}{N}\right)_D = 18$ dB. **10**

[TURN OVER

5. (a) Compare spin stablization and 3-axis stablization. Explain any one type of stablization with diagram. **10**

(b) Why parabolic reflector antennas are used in satellite communication system. Explain the working of parabolic reflector antenna. What arrangement can be made to avoid operature blockage in a parabolic reflecter antenna. **10**

6. (a) Why LNA is placed closed to antenna of a receiver. **5**
(b) How depolarization is caused by rain **5**
(c) What efforts should be undertaken to increase the reliability of a satellite communication system. **5**
(d) Why a proper thermal centrol is necessary for a satellite. **5**

ME - Sem-I - (CBSGS) – Next Generation Networks.
Extc.

QP Code : 1736

(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 the right indicate full marks.

---

1. a) Explain in detail Control and Signaling protocols for NGN. [10]
   b) With a neat diagram explain functional architecture of NGN. [10]

2. a) Explain the different Types of Identifiers used to identify users in NGN. [10]
   b) Explain the need for mobility management in NGN. [10]

3. a) Discuss with a neat diagram NGN QOS architecture. [10]
   b) Explain in detail IP multimedia subsystem for NGN. [10]

4. a) Discuss in detail various business challenges for NGN. [10]
   b) Explain the various Next generation mobile services with one example each. [10]

5. a) Explain in detail data security mechanism in NGN. [10]
   b) Explain the different Types of Identifiers used to identify users in NGN. [10]

6. Write short notes on the following. [20]
   a) IP multimedia system for NGN.
   b) Location based and content based services in NGN.
   c) Evolution of NGN.
   d) Transition of PSTN network to IP based NGN.

M-B (1 Sem) (CBSGS)(EXTC).
Optical Fibre Communication

QP Code : 1710

Duration: 3 hours (2)

Total marks assigned to the paper: 80

Marks assigned to each question should be stated against each question

Instructions to the candidates, if any:-

N.B.: 1) Attempt any four questions out of six questions

2) Assume suitable data wherever necessary & justify the same

---

Q.1 (a) Derive the wave equation for the circular waveguide (optical fiber) (10)

(b)) Explain Arrayed Wave guide grating. (10)
Consider an NX N waveguide grating multiplexer having Lf=10mm, x=d=5 μm, nc=1.45, and central design wavelength λ=1550nm. For m=1, find the waveguide length difference. If ns=1.45 and ng=1.47 find wavelength separation.

Q.2(a) Explain the outside vapour phase oxidation process and compare it with modified Vapour deposition process of fibre fabrication. (10)

(b) State the working principle of optical modulator. Explain in detail working of Mechzendler interferometer (MZI). (10)

Q.3 (a) Explain the basic working Principle of Hetrojunction laser and also explain vertical Cavity surface emitting lasers. (10)

(b) Explain the working Semiconductor optical Amplifier and compare it with Erbium doped Laser Amplifier and Raman Amplifier. (10)

Q.4(a) Discuss various types of nonlinearities in optical communication and explain Four wave mixing in detail. (10)

(b)Derive the expression for nearest neighbor Power Budget and Largest Distance Power Budget and compare them with the help of diagram. (10)

Q5.(a)Explain linear bus optical fiber network topology. (10)

(b)Explain the various losses in optical communication (10)

Q.6 Write short notes on any three (20)
a) Self phase modulation
b) SONET
c) Electric arc splicing
d) Bionotonics
