ME | EXTC | Sem-I (R) 15/5/12

SA 1st half 85

Con. 3414-12.

STC

BB-2879

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
(2) Answer any **four** out of remaining **six** questions.
(3) Assumptions made should be **clearly** stated.
(4) Assume any **suitable** data whenever **required** but **justify** the same.
(5) **Figures** to the **right** indicate **full** marks.
(6) Illustrate answers with **sketches** whenever **required.**
(7) Answer to questions should be **grouped** and written **together.**
(8) Use **blue/black ink** pen to write answers. Use of pencil should be only to draw **sketches and graphs.**

1 Answer the following 20

a) Explain concept of a random signal with suitable example.

b) State and prove Baye's theorem.

c) Write a note on Wiener process.

d) Explain Queueing theory & the basic features of queue.

2a) A certain test for a particular cancer is known to be 95% accurate. A person submits to the test and the results are positive. Suppose that the person comes from a population of 100,000 where 2000 people suffer from that disease. What can we conclude about the probability that the person under test has that particular cancer? 10

b) A number is selected at random from {1, 2, ..., 100}. Given that the number selected is divisible by 2, find the probability that it is divisible by 3 **or** 5. 10

3a) Patients arrive at the doctor's office according to a Poisson process with rate $\lambda = 1/10$ minute. The doctor will not see a patient until at least three patients are in the waiting room. 10

i. Find the expected waiting time until the first patient is admitted to see the doctor.

ii. What is the probability that nobody is admitted to see the doctor in the first hour.

b) What are Poisson Process, Poison points, and Shot noise? Define random signal for all the above three cases. 10

4a) Define the terms Sample space and Probability stating the conditions required for probability measure. Prove the result: 10

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

b) What are Bernoulli trials? Find an expression for k successes in N repeated trials when the probability for success in a single trial is p and failure is $q = 1 - p$. 10

5a) Assume that we have a random signal sequence X(n),which is immersed in white noise V[n] of variance σ_v^2, where the signal and noise are uncorrelated and zero-mean. Let the observation be: 10

$$Y[n] = X[n] + V[n].$$

Determine the covariance matrix for Y.

b) Let X1, X2, ..., Xn be jointly Gaussian random variable. Let 10

$$Z = a_1X1 + a_2X2 + \ldots + a_nXn.$$

Show that Z is always a Gaussian random variable.

[TURN OVER

6a) Consider random binary waveform that consists of a sequence of pulses with the following properties: 10

i. Each pulse is of duration Tb.
ii. Pulses are equally likely to be ±1.
iii. All pulses (pulse amplitude) are statically independent.
iv. The pulses are not synchronized: i.e., the starting time T of the 1st pulse is equally likely to be anywhere between 0 to Tb.

Find the autocorrelation and power spectral density function of X(t).

b) Write a note on optimum filtering. 10

7a) A random variable Y is estimated by 10

$$\hat{Y} = \Sigma\, a_i X_i \text{ for } i = 1, \ldots, n$$

where $\mu_Y = \mu_{Xi} = 0$ for $i = 1, \ldots, n$. Assume $E[XiXj] = 0$ for $i \neq j$, $E[X_i^2] = \sigma_i^2$. Compute a_i, $i = 1, \ldots, n$ that minimizes the MSE. Show that $Y-\hat{Y}$ is orthogonal to $\hat{Y}$. Assume real random variables.

b) A signal is given by $X(t) = A\cos(\omega t + \theta)$ where A and ω are constants and θ is uniformly distributed over $(0, \pi)$. Show that the signal is not wss. If A were not to be a random variable, what should be the conditions on A that the signal is wss? 10

ME/EXTC/ Sem-I (Rev) 19/5/2012
Communication Networks.

V-A4-Ex-1-12-F-91

Con. 3809-12. **BB-2882**

(REVISED COURSE)

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

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

1. (a) Explain the role of RARP, BOOTP and DHCP in address allocation. **5**
(b) Explain the difference between transport layer and Data link layer in detail. **5**
(c) Explain ATM interfaces. **5**
(d) Discuss the key factors involved in communication network evolution. **5**

2. (a) Explain the features of IP routing protocol 'OSPF' and its operation with the help of the common header. **10**
(b) Explain the function of ATM adaptation layers. Explain in detail the AAL2 and AAL5 layers. **10**

3. (a) Explain the various phases involved in a connection oriented TCP connection. **10**
(b) Suppose a packet at a router arrives to X.25 network having MTU of 576 bytes. This packet has an IP header of 20 bytes and a data pert of 1448 bytes. Show the fragmentation required for routing the packet and include the pertinent value of the IP header of the original packet and of each fragments. **10**

4. (a) Explain in detail architecture of BISDN network. **10**
(b) Explain M/M/1 Queuing System and explain its application in Communication Network. **10**

5. (a) Explain RSA Algorithm with an example. **10**
(b) Explain the lossless data compression techniques used in communication networks. **10**

6. (a) Compare and contrast IPv4 with IPv6. **10**
(b) Explain MPLS protocol in detail. **10**

7. Write short notes on any **two** :— **20**
(a) RTP (b) Mobile IP (c) RSVP.

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L ME | EXTC | I (REV) 24|5|12
Microwave Integrated circuits.

AGJ 1st half (i) 58

Con. 3801-12. **BB–2885**

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Out of the remaining **six** questions attempt any **four**.
(3) Assume any **suitable** data wherever **necessary**.
(4) **Figures** to the **right** indicate **maximum** marks.

1. (a) Prove that Microstrip line observes Non TEM propagation. **5**
   (b) Discuss Ion beam doping technique used for making MICS. **5**
   (c) Explain Green's Function. **5**
   (d) Compare HMICS with MMICS. **5**

2. (a) Describe key processing techniques used in making HMICS. **15**
   (b) Describe all the steps needed to fabricate planar resistor film. **5**

3. (a) Give the basic principle, construction and functioning of varactor diode. **8**
   (b) Derive the dispresion relation for an open microstrip line. **12**

4. (a) Using the spectral domain impedance analysis, derive the relation for characteristic impedance for a covered microstrip line. **10**
   (b) What are coupled microstrip lines, derive their wave equations. **10**

5. (a) Describe CPW. Give in detail the QSA approach of analyzing it by assuming the CPW to be having an infinitely thick substrate. **10**
   (b) Describe the Galerkin's method of analysing a slot line in Fourier Transform. **10**

6. (a) Explain a directional coupling and derive the relations for its coupling coefficients, voltages and the characteristic impedances for the even and odd modes by assuming the lines to be $\lambda / 4$ long. **15**
   (b) Explain in brief LSE and LSM potentials. **5**

7. Write short note on the following (any **four**) :–
   (a) Dielectric Resonators **5**
   (b) Transition of a slot line to coaxial line **5**
   (c) PIN Diode **5**
   (d) Conformal mapping technique for analyzing an open Microstrip line **5**
   (e) For a 20 dB power coupling, find the voltage coupling coefficient. **5**

ME/EXTC/ Sem-I 29/5/2012

AGJ 1st half (j)-Con-Cod 61

Con. 4375-12. **(REVISED COURSE)** **BB–2888**

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

Error Correction codes

N.B. : (1) Question No. **1** is **compulsory**.
(2) Answer any **four** from the remaining **six** questions.

1. Write short notes on any four ; (20)
   a). Groups, fields and rings
   b). Significance of Hamming distance and Hamming Bound
   c). Burst error correcting codes
   d). Golay codes
   e). Conjugacy classes

2. a) Let α be the non zero element of a finite field. Let n be the order of α. Prove that (10)
   i). $\alpha^{q-1} = 1$ ii). n divides q-1
   b). Determine whether the following polynomial $x^{22} + x^{21} + x^{20} + 1$ is primitive or not (10)

3. a). Explain any one algorithm for the decoding of BCH codes (10)
   b). For a 3 bit error correcting BCH code with length 31, the received code is (10)
   $r(x) = 1 + x^9 + x^{11} + x^{14}$. Find the correct code word

4. a). Explain the encoding procedure in Reed Solomon codes (10)
   b). Encode the 3 symbol message (010 110 111) using (7,3) RS code. (10)

5. a). Explain the procedure to find out the codeword for systematic cyclic codes (10)
   b). For a cyclic code using generator polynomial $g(x) = 1 + x + x^3$, the received code word is 1101100. Find the syndrome using the shift register approach. (10)

6. a). Write short notes on Reed Muller codes. (10)
   b). Using R (1,3) code, encode the message (1 0 0 0). (10)

7. a). Explain Fano decoding algorithm for convolution codes. (10)
   b). If g (1) = [1 1 0 1] and g (2) = [1 0 1 1], draw the state diagram and three stages of trellis diagram for the given convolution encoder . (10)

ME | EXTC | sem-I (REV) 2|6|12
Fiber optic Communication

VT-F.H.Exam. April.-12-87

Con. 3220-12. BB-2892

(3 Hours) [Total Marks : 100

N.B. : (1) Question No.**1** is **compulsory**.
(2) Answer any **four** questions from remaining **six** questions.
(3) **All** questions carry **equal** marks.

1. (a) Explain the three operating windows in optical communication. 5
(b) Obtain an expression for material dispersion. 5
(c) State the spectral band designations used in optical fiber communciation. 5
(d) State the difference between the dispersion shifted and dispersion compensated fibers. 5

2. (a) With a neat sketch explain the working of an optical modulator. 10
(b) State the important properties of Lithium Niobate. 5
(c) A lithium Niobate strip modulator designed for operation at wavelength of 1·3 μm is 2 cm long with a distance between the electrodes of 25 μm. Determine the voltage required to provide a phase change of π radians given that the electro optic coefficient for lithium Niobate is $30{\cdot}8 \times 10^{-12}$ mv^{-2} and its refractive index is 2·1 at 1·3 μm. 5

3. Compare :- 20
(a) Single mode fiber and multimode fiber
(b) LED and LASER
(c) PIN and APD
(d) Microbinding and Macrobending.

4. (a) Write down and explain the link design equations in point to point communication link based on power budget and rise time budget considerations. 10
(b) A single mode step index fiber has a core and cladding refractive indices of 1·498 and 1·495 respectively. Determine the core diameter required for the fiber to permit its operation over the wavelength range 1·48–1·6 μm. 5
(c) Explain cutback method for fiber loss measurement. 5

5. (a) Explain frequency chirping in detail. 10
(b) What do you understand by non-linear scattering ? Explain with suitable example. 10

6. (a) State the principle of working of RAMAN amplifier and state its applications. 10
(b) An optical amplifier is operating at 1·3 μm wavelength with input power 0·5 mw and noise figure of 4 dB. What is the receiver bandwith if the SNR at the output is 30 dB. 10

7. Write short notes on any **two** :– 20

(a) DWDM network

(b) SOLITONS

(c) EDFA

(d) FIBER OPTIC CABLE.

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