5-p3-upq-Con No. File

ME/EXTC/Sem-I
Microwave Inte circuits. 10/12/10

Con. 5599-10. **BB–7122**

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Out of the remaining **six** questions, attempt any **four** questions.
(3) Assume any **suitable** data wherever **necessary**.
(4) **Figures** to the **right** indicate **maximum** marks.
(5) Answers to a question should be **grouped** and written **together**.
(6) Wherever **required**, **illustrate** your answers with **sketches**.

1. Write a short note on the following
   - A). HMICs Vs. MMICs — 05
   - B). Green's Function — 05
   - C). Comparison of properties of Microstrip Lines Vs. Slot Lines & CPW — 05
   - D). Bipolar Transistors — 05

2. A). Describe the key processing techniques used in making HMICs. — 12
   B). A planar resistor has resistive thickness of 0.1 μm, resistive film length as 10 mm, resistive film width as 10 mm and sheet resistivity as 2.44×10^{-8} Ω-m. Calculate the planar resistance. — 04
   C). Describe all the steps needed to fabricate the above mentioned resistance. — 04

3. A). Describe in detail the Doping Techniques used in making MMICs. — 12
   B). Give the basic principle, construction & functioning mechanism of GaAsFET — 08

4. A). What are planar Microstrip lines. Sketch them along with their field distributions. Prove that open microstrip line supports a Non TEM propagation. — 12
   B). An open microstrip line has width as 0.2577 mm, height as 0.635 mm and dielectric constant as 9.0. Find out its characteristic impedance & the effective dielectric constant. — 08

A). What are Coupled Microstrip Lines, derive their wave equations. Find out the values of the propagation constants for the even & odd modes, if the lines are completely symmetrical — 15
B). For a 20 dB power coupling, find out the Voltage Coupling Coefficient. — 05

A). Describe the Galerkin's Method of Analysing a Slot Line in Fourier Transform Domain. — 10
B). What is a CPW. Sketch out various types of CPW. Give the Applications of CPW. — 10

7. Briefly describe the following :
   - A). Bonding of elements in HMICs — 05
   - B). Even & Odd modes & their Electric Field Distribution — 05
   - C). Varactor Diodes — 05
   - D). Conformal Mapping technique for analyzing an open Microstrip line. — 05

ME / EXTC / Sem I

124 2nd half-Exam 10-Mina (a) Error Correction Codes 15/12/10

Con. 5756-10. **BB-7125**

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

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** out of remaining **six** questions.
(3) Assume any **suitable** data wherever **required**.
(4) **Figure** to **right** indicate **marks**.

1. (a) Define :— **20**
   (i) Field
   (ii) Galois Field
   (iii) Ring
   (iv) Vector Space
   (v) Order of Galois F.
(b) For a linear block code over GF (2) prove that either no words have odd weight or half of the word have odd weight.
(c) Explain systematic and non-systematic code.
(d) State different decoding techniques for convolution code. Write the steps of any one Technique.

2. (a) Consider prime field of GF (II) :— **20**
   (i) Construct addition and multiplication table
   (ii) Find the set of all primitive elements.
(b) Determine whether each of the following is primitive in GF (2) $x^3 + x^2 + 1$ and $x^5 + x^2 + 1$.

3. (a) Consider (6, 3) linear code whose generator matrix **20**

$$G = \begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$

Find :—
   (i) All code vector
   (ii) Hamming Weight and distance
   (iii) Draw endcoder diagram.
(b) Consider 4-ary code 'C' defined by following parity check matrix. 'α' is primitive element in GF (4) and $H = \begin{bmatrix} \alpha & \alpha^2 & 1 & 1 \\ \alpha^2 & \alpha & 1 & 0 \end{bmatrix}$
   (i) Find all code vectors
   (ii) Does this code acheive single tone bound.

4. (a) By shortening (15, 7) cyclic code by 3-bits we obtain (12,4) shortened code. The generator polynomial of (15, 7) is $9(x) = 1 + x^4 + x^6 + x^7 + x^8$. Determine :— **20**
   (i) generator matrix and parity check matrix for (12, 4) shortened code.
   (ii) find codewords of (12, 4) shortened code and dim. of shortened code.
(b) If g(x) is a polynomial of degree (n – k) and is a factor of $x^n + 1$ then prove that g(x) generates an (n, k) cyclic code.

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5. A generator polynomial $g(x)$ for a tripple error correcting BCH code of length 15 is $g(x) = 1 + x + x^2 + x^4 + x^5 + x^8 + x^{10}$. Find the error locator polynomial and corresponding code vector using Berlekamp's algorithm when the received polynomial is $r(x) = x^3 + x^5 + x^{12}$. **20**

6. For the (3, 1) convolutional code with $m = 2$ suppose that generator sequence given by $g^1 = 110$, $g^2 = 101$, $g^3 = 111$. **20**
   - (a) Construct state table for this code.
   - (b) Draw state diagram
   - (c) For a Bsc with $P = 0{\cdot}05$ find the integer metric table
   - (d) Draw the tree diagram for information sequence of length $L = 5$.
   - (e) Decode the received sequence R = (111, 110, 010, 110, 010, 110, 011) using stack algorithm.

7. Write notes on (any **two**) :— **20**
   - (a) Perfect and quasi perfect code
   - (b) Berlekamp-Massey algorithem
   - (c) Reed-Muller code
   - (d) Goppa code.

P4-Con No. .0

ME (EXTC) Sem II. Nov-2010 (EX: M)
Statistical Theory of Communication ✓

Con. 5712-10. **BE -7116**

(3 Hours) **[Total Marl s : 100**

N.B. : (1) Question No. **1** is **compulsory**. Attempt any **four** of remaining **six**.
(2) **All** questions carry **equal** marks.
(3) Assume **suitable** data if **necessary** and **state** them **clearly**.

Q.1 (a) Write short notes, explaining the basic concepts of 12
(1) Classical Brownian motion
(2) Strict Sense Stationary Random Signal
(3) White Noise, in strict sense and strong white noise
(4) Markov Signal
(b) State and prove Schwartz inequality for two real random variables 8

Q. 2 (a) Define (i) Sample Space (ii) Events space (iii) Probabilty measure stating the axioms of probability. 6
(b) Two dice are rolled. One of them is a fair die i.e. shows faces 1, 2, 3, 4, 5*or*6 with equal probability. The second die can only show the faces 1, 2, 3*or*4 which are equally likely. Find the probability distribution for the sum of their face values 14

Q.3 (a) Define Conditional probability and state and prove Baye's Theorem 8
(b) Given three events A, B and C in a sample space S and the condition $P(A \cap B \mid C) = 1$, which of the following statements are true or false (give reasons) 12
(i) $P(A \cap B) = 1$
(ii) $P(A \cap B \cap C) = P(C)$
(iii) $P(A^c \mid C) = 0$
(iv) $C = S$

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Q. 4. (a) What are (i) Poisson Process (ii) Poisson points and (iii) Shot Noise. Define the random signal $X(t)$ for all three cases. Find the probabilty for the Poisson Process signal $X(t) = n$ and find its correllation function. 10

(b) A particle is undergoing one dimensional random walk, taking a step $+a$ with probability p and $-a$ with probability $q = 1 - p$. Find the probability for (i) return to origin after $2N$ steps (ii) first return to origin after $2N$ steps. 10

Q. 5. (a) 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 wide sense stationary. If A were to be a random variable, what should be the condition on A that the signal is wide sense stationary? 10

(b) Find the powers spectrum $S_Y(\omega)$, of the signal $Y(t)$ which is the solution of the differential equation 10

$$\sum_{k=0}^{\infty} a_k \frac{d^k Y}{dt^k} = X(t)$$

where the signal $X(t)$ is known to be white and the coefficients a_k are constants.

Q. 6 (a) On an average a working communication equipment fails once in a month. Average repair time is 5 days. If the equipment is working at time $t = 0$, find the probability that it is working at a later time t, assuming constant failure and repair probabilities in a time dt. 10

(b) If the above problem is applied to 5 identical equipments, working at time $t = 0$, find the probability for (i) all 5 working at a later time (ii) 3 out of 5 working at a later time. Assume that equipments are independent of each other for their failure and repair. 10

Q. 7 (a) State and prove the Orthogonality principle for obtaining the LMMSEE of a random Signal $Y(t)$ on the basis of another measured Signal $X(t)$. 10

(b) Use the above principle to find the optimum Wiener filter for removing zero mean, additive noise from a Wide Sense Stationary signal $Z(t)$. 10

Communication Networks . 3-12-10

Con. 5840–10. (REVISED COURSE) BB–7119

(3 Hours) [Total Marks : 100

M.E. - EXTC

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) Discuss the various delay components in the communication network. 5
(b) How does the transport layer differ in connection oriented versus connectionless approach in design of computer network. 5
(c) Explain the role of a ATM adaptation layer in ATM network 5
(d) Explain the role of IGMP and ARP protocol in TCP/IP. 5

2. a) Explain the subnet addressing with suitable example. [10]

b) Explain the TCP segment with header format.Explain how TCP establish and close the connection [10]

3. Explain the following protocols with their header format: [20]
i) ICMP
ii) UDP
iii) IP v 6
iv) RTP

4. a) Explain in detail M/M/1 Queuing system. Compare the M/G/1 system with M/M/1 system. [10]

b) Explain in detail the architecture of ATM network. [10]

4. a) Explain the features of IP routing protocol OSPF and its operation with the help of common header. [10]
b) Explain the lossless data compression techniques used in communication networks [10]

6. (a) Write a short note on RSVP protocol [10]
(b) Explain various Network Design issues. [10]

7. Write short notes on any **Two** :- [20]
a) DHCP
b) MPLS
c) RSA Algorithm
d) OSI Reference Model.

ME/EXTC/Sem-I

'Fiber optic communication.

Con. 6392-10. BB-7128 21/12/10

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory.**
(2) Answer any **four** questions from remaining questions.
(3) Assume **suitable** data wherever **applicable.**
(4) Std. constant values :—
$C = 3 \times 10^{8}$ m/s $q = 1{\cdot}6 \times 10^{-19}$ C $h = 6{\cdot}625 \times 10^{-34}$ J-S.

1. (a) Explain propagation of optical wave in multimode graded index fiber. **5**
(b) Differentiate the working of GIF and SIF. **5**
(c) Compare and contrast the link-power budget with rise-time budget. **5**
(d) Explain the non-linear effects in optical communication. **5**

2. (a) Derive the waveguide equation for optical fiber. **10**
(b) Obtain the solution of waveguide equation for SIF alongwith the condition of wave propagation (cut-off condition) through the fiber. **10**

3. (a) Derive the relation for numerical aperature of step index fiber and establish the relation with the total mode M entering the fiber. **10**
(b) Explain the polarisation of mode in SIF. **10**

4. (a) What do you mean by modal birefringence in optical fiber ? State the various factors responsible for the same. Also explain how it depends upon the polarisation of light. **10**
(b) A single mode optical fiber has a beat length of 8 cm at 1300 nm. Calculate modal birefrigence and propagation phase constant (B). Comment on the result. **10**

5. (a) Explain basic principles of operation of photo-detector. With the help of these principles, explain the working of PIN diode and APD as photo-detector. Also compare the performances of these photo-detectors. **10**
(b) An InGaAs pin photodiode has the following parameters at a wavelength of 1300 nm :— **10**
$I_D = 4$ nA, $n = 0{\cdot}9$ $R_L = 1$ kΩ
and the surface leakage current is negligible. The incident optical power is 300 nW, and the receiver B.W. is 20 MHz. Find the various noise terms of the receiver.

6. Differentiate the following :— **20**
(a) Attenuation and distortion.
(b) Coherent and non-coherent light source.
(c) Photo-detector with gain and without gain.
(d) WDM and TDM.

7. Write short notes on any **four** :— **20**
(a) Optical amplifier.
(b) Optical directional coupler.
(c) Non-linear optic effect.
(d) Power coupling in optical fiber.
(e) Material used for fabrication of photo-detector.