28 | 05 | 2011

ME EXTC I
Communicatn Networks

P4-Exam.-May-11-78

Con. 3000-11. **(REVISED COURSE)** **BB-4128**

(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**

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1. (a) Discuss Queuing system classification. Explain M/M/1 queuing system and compare it with M/G/1 model [10]

   (b) Explain the features of IP routing protocol 'OSPF' and its operation with the help of the common header [10]

2. a) Explain TCP/IP Protocol suite with function of each protocol. [10]

   b) Explain the function of ATM adaptation layers. Explain in detail the AAL2 and AAL5 layers. [10]

3. a) Explain RSVP protocol in detail with suitable diagrams [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 Little's theorem and Explain its application in Communication Network [10]

5. a) Explain the QoS requirements for ATM network and how they are achieved. [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 and RTCP
   b. Mobile IP
   c. ICMP

ME Sem - I (EXTC)
Statistical Theory of Communication

P4-Exam.-May-11-151
Con. 3097-11. **BB-4125**

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

N.B. : (1) Question 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) Cross Correlation function
(2) Strict Sense Stationary Random Signal
(3) Traffic Intensity
(4) Mean Ergodic Signal

(b) The auto correlation function of a random signal at two instants of time iis $R(t_1, t_2)$. Can it have a power spectrum? Justify your answer. 8

Q. 2 (a) Define the terms:(1) Sample space (2) probability, stating the conditions required for probabilty measure. Prove the result 10

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

(b) Two indistinguishable dice are rolled. Thus the events $(1,3)$ and $(3,1)$ are considered same elementary event. Write down all possible elementary events. If all of them are equally likely, what is their probability? 10

Q.3 (a) Define Conditional probability and state and prove Baye's Theorem 10

(b) A channel carries a coded message with three alphabet, $A.B$ and C. $A.B$ and C. The input A is detected as B or C with equal probability $\frac{\alpha}{2}$. Likewise the input B is detected as A or C with probability $\frac{\beta}{2}$ and Input C gets modified as A or B with probabilty $\frac{\gamma}{2}$. The message contains A 20% times, B 30% and C 50% times. If the received message is a AC is detected, what is the probabilty that AC was input? 10

[TURN OVER

Q.4 (a) What are Bernoulli trials. Find the probability distribution for k successes in N Bernoulli trials and find the (i) mean (ii) variance of the number of successes. 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) 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) State and prove Wiener Khinchin theorem for the spectrum $S(\xi)$ of a wide sense stationary process 10

Q. 6.(a) What is a (i) Markov signal (ii) a Gaussian signal? The transition probability for a Markov process from a state x_k to a state x_m with $m > k$ is denoted by $f(x_m; x_k)$. Let x_n be state at any intermediate stage $k < n < m$. Relate $f(x_m; x_k)$ to $f(x_n; x_k)$ and $f(x_m; x_n)$. 8

(b) An asynchronous binary signal is a continuous signal of square pulses of width T and height $X_n = \pm A$ with equal probability. The signal is mathematically defined as 12

$$X(t) = \sum_{n=-\infty}^{\infty} X_n W(\frac{t - nT - t_0}{T})$$

where the step function $W(x)$ assumes the value 1 if $| x |< 1/2$ and zero otherwise. The starting time t_0 is uniformly distributed in the the interval $(-\frac{T}{2}, \frac{T}{2})$. Find the covariance function $\Gamma(t_2, t_1)$ of the signal $X(t)$. Is it a wide sense stationary process? Justify your answer.

Q. 7. (a) What is Wiener filter? Show that the transfer functiom $H(\omega)$ of an optimum Wiener filter to remove additive noise $\nu(t)$ from a random signal $X(t)$ is given by 10

$$H(\omega) = \frac{\Phi_X(\omega)}{\Phi_X(\omega) + \Phi_\nu(\omega)}$$

$\Phi_X(\omega)$ and $\Phi_\nu(\omega)$ are the power spectra of the signal $X(t)$ and noise $\nu(t)$.

(b) The steady state probabilities in a queuing problem are given by $P_n = 0.6(0.4)^n$. Find (i) the probability that the server is idle (ii) Average number of customers in queue and (iii) Average waiting time per customer. 10

ME EXTC Sem-I
Fiber optic Communication.

Con. 3332-11. **BB-4137**

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.

1. (a) Draw and explain the block diagram of optical fiber communication system. **20**
(b) Explain the non linear effects in optical communication.
(c) How does the optical signal propagate through the fiber. Derive equations for numerical aperture total mode entering the fiber.
(d) State the difference between coherent and non-coherent sources?

2.(a) Draw and explain the structure of Avalanche Photo Diode (APD) along with electrical field profile that exist in the various regions of APD structure. Explain why it is also called reach through APD (RAPD). **10**
(b) Explain the various factors responsible for optical signal attenuation and dispersion while propagating through optical fiber. **10**

3. (a) Explain anyone fiber fabrication process with a neat diagram. **10**
(b) Define modal birefringence in optical fiber. Explain the various factors responsible for the same with its dependence on polarization of light. **10**

4.(a) With necessary equations explain modulation electrical and optical bandwidth. Draw and Edge explain emitter double heterodyne LED structure. **10**
(b) With suitable example explain the process of link power budget. **10**

5. a)Explain various modulation techniques along with WDM and TDM . **10**
b) Draw and explain block diagram of optical receiver with various noise sources and the relevant equations. **10**

6. (a) Explain the techniques for measurement of attenuation, dispersion, refractive index and numerical aperture of a fiber. **10**
(b) Explain the polarization of mode in SIF. **10**

7. Write short notes on any four :- **20**
(a) Rise time budget.
(b) Optical amplifier.
(c) Principle and structures of LASER .
(d) PIN diode.
(e) Waveguide equation for SIF.

ME EXTC I (Rev)
Error Correction codes

Con. 3326-11. **(REVISED COURSE)** **BB-4134**

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.

1. Write short notes on any four :-
   a). Binary symmetric channel b). Perfect codes. c). Rings. d). Singleton Bound
   e). Burst error correcting codes (20)

2. a).Find out the minimal polynomials of the elements in GF (16) with respect to GF (4) (12)
   b). Let f(x) be a polynomial with coefficient from GF(2).Let β be an element in GF (2). If β is a root of f(x), then for any $l \geq 0$, prove that β^{2t} is also a root of f(x).(05)
   c) Check for primitive polynomial given $x^6+x^5+x^4+x^3+x^2+x+1$. (03)

3. a). Explain the encoding process for Reed Muller Codes. (08)
   b). Consider a (7,4) cyclic code generated by $g(x) = 1+x+x^3$. Suppose the message is u = (1 0 1 1), find out the code vector using shift register based encoder. If the received vector is r = (0 0 1 0 1 1 0), find out the syndrome and correct codeword. (12)

4. a). Find out the generator polynomial for triple error correcting BCH codes. (10)
   b). Explain Peterson's algorithm for t error correcting codes. (10)

5. a). Discuss Berlekamp Massey Algorithm for Reed Solomon codes. (10)
   b).For a double error correcting narrowsense RS code with length 7 over GF (8) with generator polynomial $g(x) = x^4 + \alpha^3 x^3 + x^2 + \alpha x + \alpha^3$, if the received codeword is $r(x) = \alpha^2 x^6 + \alpha^2 x^4 + x^3 + \alpha^5 x^2$, find the error locator polynomial. (10)

6. For a rate ½ convolution encoder, $g^{(1)} = (1\ 0\ 1\ 1)$ and $g^{(2)} = (1\ 1\ 0\ 1)$. Draw the state diagram. If the received codeword is (1 1 1 1 1 1 0 1 1 1 0 0 1 0), find out the correct codeword if the codeword is transmitted across BSC with p = 0.125 using FANO algorithm. (20)

7. Write short notes on any two :- (20)
   a). The binary Golay codes
   b). Goppa codes
   c). MDS codes
   d). Preparata codes.

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M.E. EXTC - I
Microwave Integrated Circuits

Con. 3316-11. **BB-4132**

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

N.B. : (1) Attempt **five** questions.
(2) Question No. **1** is **compulsory**.
(3) Out of remaining **six** questions, attempt any **four** questions.
(4) Assume any **suitable** data, wherever **necessary**.
(5) **Figures** to the **right** indicate **Max**. Marks.
(6) Make use of Graphs & Smith Charts, wherever **necessary**.

1. Write a short not on the following :
A). Ion Beam Doping Technique used for making MICs 05
B). LSE & LSM Potentials 05
C). Slot Lines & their applications 05
D). PIN Diodes 05

2. A). Describe briefly the procedures used in making MICs 15
B). Write down all the steps needed to make a MOSFET 05

3. A). Derive the dispersion relation for an open microstrip line 15
B). A microstrip line of 20 ohms having height as 0.7 mm, dielectric constant as 9 is to be built. By using Quasi Static Approach (QSA), find out the required width. 05

4. A). Prove that in case of coupled microstrip lines, $\gamma_e = jw\sqrt{(a+b)}$ & $\gamma_o = jw\sqrt{(a-b)}$, for the even & odd modes respectively. γ's are the propagation constants. 10
B). Also prove that Z_{0e} & Z_{0o} in this case are given by $\sqrt{(L_l+L_m)} / \sqrt{(C_{11}-C_m)}$ & $\sqrt{(L_l-L_m)} / \sqrt{(C_{11}+C_m)}$ respectively. Where, Z_{0e} & Z_{0o}, are the characteristic impedances of the even & odd modes respectively. Assume the lines to be symmetrical with L & C being the inductances & capacitances of the system, respectively. 10

5. A). Explain a Directional coupling & derive the relations for its coupling coefficients, Voltages & the characteristic impedances for the even & odd modes by assuming the lines to be $\lambda/4$ long. 15
B). A directional coupler has Z_{0e} & Z_{0o} as 55.587 and 44.974 ohms respectively. Calculate the values of C_c & Z_0 for this coupler. C_c & Z_0 are the voltage coupling coefficient and the characteristic impedance of the system respectively. 05

6. A). Describe in detail the Full Wave Analysis (FWA) of Co Planar Waveguides (CPW) by using Galerkin Method. 15
B). Describe some of the Series CoPlanar Waveguide Line circuits 05

7. Describe in detail the basic principle, construction and application of,
A). GaAs FET 10
B). BJT 10