M.E. (EXTC) - ~~Rev CBGS~~ (old) - Sem-I -

Fiber Optic communication.

Q P Code : BB-11089

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

N.B. : (1) Question **No. 1** is **compulsory.**
(2) **Attempt** any **four** questions from remaining **six** questions.
(3) **Assume** suitable data if necessary and justify the same.

1. (a) State the difference between coherent and non-coherent sources. **5**
   (b) Obtain an expression for material dispersion. **5**
   (c) Explain the non-linear effects in optical communication. **5**
   (d) State the difference between the dispersion shifted and dispersion compensated fibers. **5**

2. (a) Derive the waveguide equation for optical fiber. **10**
   (b) Derive the expression for numerical aperture of optical fiber in terms of refractive indices. A step index fiber with a large core diameter has a acceptance angle in air of 20° and a relative refractive index difference of 1%. Estimate the numerical aperture and critical angle at the core-cladding interface of the fiber. **10**

3. (a) Explain the various phenomena responsible for signal degradation as the lightwave protogates through an optical fiber support your answer with proper illustration. **10**
   (b) Explain the MCVD fiber fabrication method. **10**

4. (a) Explain the link power badget and the rise time badget for optical link design. **10**
   (b) What are linearly polarized (LP) modes? How are they related to EH and HE hybrid modes? **10**

5. (a) With the help of device structure explain the working of LED and LASER with the emphasis on spontaneous and stimulated emission. **10**
   (b) Explain various modulation techniques along with WDM and TDM. **10**

6. (a) Discuss the various types of noises in photo-detector. **10**
   (b) Explain the techniques for measurement of attenuation, dispersion, refractive index and numerical aperture of a fiber. **10**

7. Write short notes on any four :— **20**
   (a) Optical directional coupler
   (b) Optical network
   (c) Optical amplifier
   (d) OTDR
   (e) EDFA.

30/5/2014

M.E. (EXTC) old

Sem – I

Error Correchy Codes

QP Code : BB-11087

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

N. B. : (1) Question **No. 1** is **compulsory**.
(2) Attempt **any four** questions from remaining.
(3) Assume suitable data if necessary and state them clerarly.

1. (a) Describe perfect and quasi perfect code. **20**
   (b) State different decoding techniques for convolution code. Write the steps of any one technique.
   (c) Consdier prime field of GF (8) construct addition and multiplication table.
   (d) Compute:
   (i) $\alpha^7 + \alpha^3 + 1$ (ii) $(\alpha^6 + \alpha^4)(\alpha^5 + \alpha^3)$

2. Consider a (7, 4) cyclic code generated by $g(x) = 1 + x + x^3$.
   (a) Design an encoder using shift registers and using this encoder, find out the code word for the message (1 1 0 1). **6**
   (b) If the received vector r = (1 0 0 1 1 1 1), find the syndrome usign syndrame circuit. **6**
   (c) Explain encoder and decoder for shortened cyclic code. **8**

3. (a) What are Reed Muller (RM) code. **8**
   (b) For a double error correcting narrowsense RS code with length 7 over GF (8) with generator polynomial $g(x) = x^4 + \alpha^3x^3 + x^2 + \alpha x + \alpha^3$, if the received code word is $r(x) = \alpha^2x^6 + \alpha^3x^4 + x^3 + \alpha^5x^2$, find the error locater polynomial. **12**

4. (a) Determine whether each of the following is primitive in GF (2), $x^3 + x^2 + 1$ and $x^5 + x^2 + 1$ **10**
   (b) Consider (6, 3) linear code whose generate matrix **10**

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

find (i) Codevectors (ii) Draw encoder diagram.

5. (a) Consder (3, 1, 2) convolution code with $g^{(1)} = 1\ 0\ 1$, $g^{(2)} = (1\ 1\ 0)$, $g^{(3)} = (0\ 1\ 1)$. Draw the Trellis diagram with minimum four stages. Using this diagram, find the code word for tni information sequence (1 1 1 1 1 0 1). **12**

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(b) If g (x) is a polynomial of degree (n – k) and is a factor of $(x^n + 1)$, the prove that g (x) generates an (n, k) cyclic code. 8

6. (a) Define (i) BCH bound (ii) Design Distance 10
Explain BCH desing procedure and R. S. design rule (frequency domain).
Why R. S. Code perform wellinnois?

(b) (i) Find all roots of $f(x) = x^3 + \alpha^6 x^2 + \alpha^9 x + \alpha^9$ in G (2^4). 5

(ii) Explain Distance properties of convolution code. 5

7. Write shortnotes on: 20

(i) Berkcamp - Massey Algorithm

(ii) Goppu code

(iii) Define (a) The order of Golois field element
(b) Soft decision decoding
(c) Mac Williams identity

(iv) Show that:

$$M\mu = A\mu\, B\mu\, A_{\mu}^{t}$$

Where $$M\mu = \begin{bmatrix} s_1 & s_2 & \cdots & s_{\mu} \\ s_2 & s_3 & \cdots & s_{\mu}, s_{\mu+1} \\ \vdots & & & \\ s_{\mu} & s_{\mu+1} & & s_{\mu-1} \end{bmatrix}$$

$M\mu$ is signular if $\mu = v$ and onnsingular if $\mu > v$, where 'v' is the number of errors that have occurred.

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CN (Old)

QP Code :BB-11081

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

N.B. : (1) Question **No.1** is **compulsory.**
(2) Out of remaining questions, attempt any **four** questions.

1. (a) Explain the role of RARP, BOOTP and DHCP in address allocation. **5**
   (b) Explain the flow control at transport layer. **5**
   (c) Discuss the various delay components in the communication network. **5**
   (d) Explain Physical layer functioning of ATM network. **5**

2. (a) Explain OSI reference model describing in brief the different layers. **10**
   (b) Explain different means of IP addressing in IP version 4. **10**

3. (a) Explain the Broadband ISDN reference model. **10**
   (b) Explain the QoS requirements for ATM network and how they are achieved. **10**

4. (a) Explain how Queueing theory can be applied in pratice to networking problems. **10**
   (b) Explain the different approaches for network design and discuss the key factors involve in communication network evolution. **10**

5. Explain the following protocol with their header formats : **20**
   (i) IP version 4 (ii) IP version 6
   (ii) TCP (iv) RTP.

6. (a) Explain the Intergrated services model in the Internet. **10**
   (b) List different queuing models. Explain one in detail. **10**

7. Write short notes on any **two** :- **20**
   (a) RSVP
   (b) Mobile IP
   (c) Routing Information Protocol.

M.E SEM I (EXTC) (Old)
(STC) 13/05/14

QP Code : BB-11077

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

N.B. : (1) Questions No. 1 is **compulsory**.
(2) Answer any **four** out of remaining **six** questions.
(3) Assume **suitable** data if **necessary** with justificattion.

1. Explain following terms clearly giving suitable examples or applications :– 20
   (a) Poisson distribution
   (b) Power spectrum
   (c) Wiener process
   (d) Random signal.

2. (a) Derive the expression for a Binomial probability distribution function. 8
   (b) Derive moment generating function for Binomial distribution. 8
   (c) If the probability of success in one trial is p = 0·4 and probability of failure is q = 0·6. Find the average number of successes in 10 trials. 4

3. (a) Define conditional probability and state and prove Baye's theorem. 10
   (b) A channel carries a coded message with three alphabets A, B, C. The A is detected as B or C with probability $\frac{a}{2}$. Likewise B and C getting detected as A or C and A or B respectively with probability $\frac{b}{2}$ and $\frac{c}{2}$. A message contains A = 40%. B = 20% and C = 40%. If A is detected what is the probability that A was sent (input). 10

4. (a) Define the joint probability density of two random variables and conditional density function. The joint density function of two random variables X and Y is given by :– 10
   $P(X, Y) = A \exp[-|X| - |Y|], \infty - < X, Y < \infty$ where A is a constant. Find the value of A.
   (b) State and prove central limit theorem. 10

5. (a) Define (i) strict sense staionary and (ii) wide sense stationary random signal. Will a wide sense stationary Gaussian signal be strict sense stationary ? Justify your answer. 10

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(b) Define the power spectrum $S(\omega)$ of a wide sense stationary complex random signal. The output y(t) of a linear filter is related to the input random signal x(t) by $y(t) = \int_{-\infty}^{\infty} h(t-t')\,x(t')\,dt$ 10

Find the relation between the correlation functions of input and output.

6. (a) Prove that the limiting form of random walk is the Wiener Process. Find the covariance function of Wiener Process. 10

(b) Show that the optimum Wiener filter transfer function is given by – 10

$$|H(\omega)|^2 = \frac{\phi_{xx}(\omega)}{\phi_{xx}(\omega) + \phi_{nn}(\omega)}$$

where $\phi_{xx}(\omega)$ and $\phi_{nn}(\omega)$ are the power density spectrum of input X(t) and additive noise n(t).

7. (a) On an average a working communication equipment fails once in a month. Average repair time is 3 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 conditions are applied to 5 such equipments working at 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 the equipments are independent of each other. 10

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