Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME Semester –I Examination Feb. - 2012

Subject code: 714102N **Date: 13/02/2012**

Subject Name: Modern Digital and Wireless Communication

Time: 10.30 am – 01.00 pm **Total Marks: 70**

Instructions:

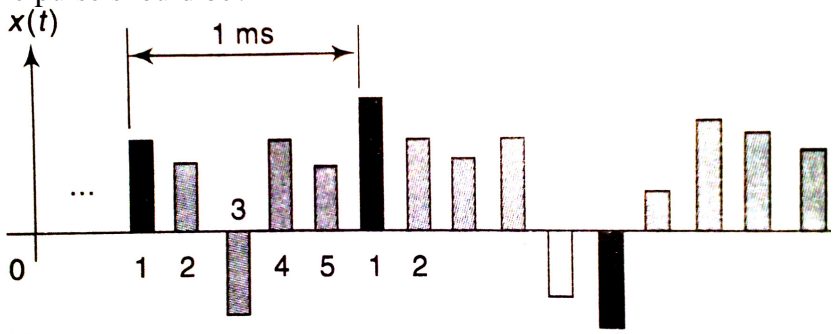
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 (a)

1. What is the role of probability density function in any communication system? Explain Gaussian Probability Density in brief. **(4)**
2. If two dice are tossed, (a) find the probability of 3 and 4 appearing (b) find cumulative distribution function (CDF) for outcome 7 **(3)**

(b)

1. Explain differential pulse code modulation in detail. **(4)**
2. As shown into the figure, in PAM-TDM representation (a) if each pulse is of width 150μs, find the guard time (b) if same guard time is maintained and we want to transmit 10 PAM messages time multiplexed how narrow the pulse should be? **(3)**



Q.2 (a)

1. Give the brief overview of various wireless Local Area Networks. **(4)**
2. If P_t = 10 Watt, G_t = 0dB, G_r = 0dB, and f_c = 900MHz, maximum dimension of the antenna is 1meter. **(3)**
   (a) find far field distance of the receiver
   (b) find P_r in dB at free space distance of 1km

(b)

1. For what distances is the two-ray plane earth loss model valid in a macrocell (h_t=50 meter and h_r=2 meter) and a microcell (h_t = 10 meter and h_r = 2 meter)? Consider the carrier frequency f_c = 900MHz. **(4)**

2. Explain okumura –Hata model in brief. **(3)**

OR

(b) Briefly explain Walfisch – Ikegami (WI) model. **07**

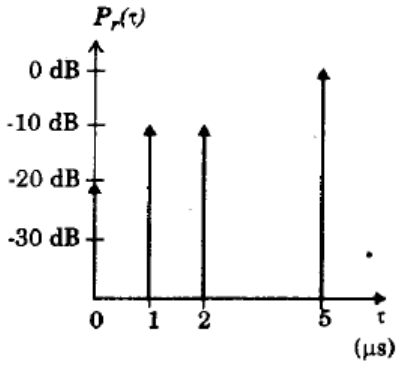
Q.3 (a)

1. Define *fading* and list out various types of small scale fading. **(4)**

2. Consider a transmitter which radiates a sinusoidal carrier frequency of 1850MHz. For a vehicle moving 60mph compute the received carrier frequency if the mobile is moving (a) directly toward the transmitter (b) directly away from the transmitter. (c) in a direction which is perpendicular to the direction of arrival of the transmitted signal. **(3)**

(b)

1. State various parameters of mobile multipath channels and calculate mean excess delay, rms delay spread and the maximum axcess delay (10 dB) for the power delay profile shown in figure. **(4)**



2. Calculate LCRs and AFDs for Rayleigh fading signal at levels of $\rho = 1$ above and below the mean envelope: (a) f = 1GHz, υ = 50km/h **(3)**

OR

Q.3 (a)

1. Explain two path model with Doppler effect. **(4)**

2. Briefly explain various propagation mechanisms. **(3)**

(b)

1. Define Brewster angle and calculate Brewster angle for a wave impinging on Ground of a permittivity of $\varepsilon_r = 3.9$ **(2)**

2. Explain Diversity in Detail **(5)**

Q.4 (a)

1. Briefly explain GMSK modulation technique. **(3)**

2. Calculate the bit rate that can be supported by a 4KHz channel for modulation (a) BPSK (b) QPSK (c) 8PSK (d) 16QAM **(4)**

(b)

1. Briefly explain BPSK modulation technique with suitable diagram. **(3)**

2. Briefly explain Huffman coding with suitable example **(4)**

OR

Q.4 (a)

1. Briefly explain Linear block coding with suitable example **(4)**
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2. Find the 3dB bandwidth for a Gaussian low pass filter used to produce 0.25 GMSK with a channel data rate of R_b = 270kbps. **(3)**

Q.4 (b)

1. Explain Quadrature Amplitude Modulation in detail. **(4)**

2. If the SNR of a wireless communication link is 20dB for GSM based cellular communication system, determine the maximum theoretical data rate that can be supported by the system. **(3)**

Q.5 (a)

1. Write a short note on Direct sequence spread spectrum Communication system **(4)**
2. Briefly explain RAKE receiver **(3)**

(b)

1. State the advantages of 4G over 3G for cellular communication system **(4)**
2. Briefly explain GOLD code sequence. **(3)**

OR

Q.5 (a)

1. Write a short note on Frequency Hopped spread spectrum Communication system **(4)**
2. A DS spread spectrum system of chip rate 10MHz is used for ranging. If the reflected wave is received after 0.1ms, find the probable distance of the target. **(3)**

(b)

1. Draw the Network architecture of 4G Cellular communication system. **(4)**
2. Briefly explain significance of using spread spectrum in communication system. **(3)**

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