*Seat No.: _____* *Enrolment No._____*

# GUJARAT TECHNOLOGICAL UNIVERSITY

**M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013**

**Subject code: 714102N** **Date: 26-12-2013**

**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 mark.**

| | | | |
|---|---|---|---|
| **Q.1** | **(a)** | A coin is tossed 4 times in succession in a trial of a random experiment. If a random variable X denotes the no. of tails appeared in the trial, then determine CDF of X. Also show that it is a non decreasing function. | **(7)** |
| | **(b)** | What is PDF? State its significance in the field of communication based on its properties. Describe Gaussian PDF in detail. | **(7)** |
| **Q.2** | **(a)** | Explain GSM architecture. | **(7)** |
| | **(b)** | Explain interferences in mobile communication. | **(7)** |
| | | **OR** | |
| | **(b)** | A source emits 7 messages with probabilities as 1/64, 1/2, 1/4, 1/64, 1/8, 1/32 and 1/16 respectively. Design Huffman binary source code and hence determine source entropy, average codeword length, code efficiency and code redundancy. | **(7)** |
| **Q.3** | **(a)** | Explain briefly: path loss, shadowing, diffraction. | **(7)** |
| | **(b)** | For hexagonal cell geometry prove that $Q= \sqrt{3}N$, where $N= i^2+ij+j^2$. | **(7)** |
| | | **OR** | |
| **Q.3** | **(a)** | Describe the concept of cell spitting with its limitations. | **(7)** |
| | **(b)** | Explain 2 ray reflection model for large scale propagation. | **(7)** |
| **Q.4** | **(a)** | Discuss bandwidth efficiency of MPSK systems and show that they are better than MFSK systems. | **(7)** |
| | **(b)** | Construct a systematic cyclic code (7,4) using generator polynomial $g(x) = x^3+x^2+1$. What will be the corresponding transmitted data word if received data word r=1101101? | **(7)** |
| | | **OR** | |
| **Q.4** | **(a)** | How do the convolution codes differ from linear block codes? Explain convolution code with example of ½ convolution encoder. | **(7)** |
| | **(b)** | Describe BPSK and discuss about its constellation diagram and BER performance. | **(7)** |
| **Q.5** | **(a)** | Explain Rake receiver in detail. | **(7)** |
| | **(b)** | Describe coherence bandwidth and Doppler spread in detail. | **(7)** |
| | | **OR** | |
| **Q.5** | **(a)** | Explain okumura model for large scale propagation with equations. | **(7)** |
| | **(b)** | Describe different diversity techniques in detail. | **(7)** |

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