

**6E3089****6E3089**

**B.Tech VI Sem (Main/Back) Exam. April / May 2012**  
**Applied Elect.**  
**6AI4 Digital Communication**  
**Common for 6AI4, 6EI4**

**Time : 3 Hours****Maximum Marks : 80****Min. Passing Marks : 24***Instructions to Candidates:*

Attempt any **five questions**. Selecting **one question** from each unit.  
All Question carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.

Units of quantities used/ calculated must be stated clerly.

Use of following supporting material is permitted during examination.

1. \_\_\_\_\_ Nil \_\_\_\_\_ 2. \_\_\_\_\_ Nil \_\_\_\_\_

### Unit - I

1. (a) Define slope overload and granular noise. 6  
(b) Derive the expression for signal to quantization noise ratio for PCM system that employs linear quantization technique. Assume that input to PCM is sinusoidal signal. 10

Or

1. (a) Explain uniform and non –uniform quantization. 6  
(b) With the help of neat circuit diagram explain T1 Carrier system and calculate its bit rate. 10

### Unit - II

- 2 (a) What is ISI ( Inter Symbol Interference) and how it can be reduced? 6

(b) The bit sequence 10111010 is to be transmitted. Draw the resulting waveform using following formats:

- (i) Unipolar RZ and NRZ
- (ii) Bipolar RZ and NRZ
- (iii) Split phase Manchester [4+4+2=10]

Or

- 2 (a) What is matched filter ? How it is different from Optimum filter ? 6
- (b) The binary data is transmitted as 1101010110. Draw the waveform for transmitted data using following formats:
- (i) Unipolar NRZ
  - (ii) Polar RZ
  - (iii) Split-phase Manchester
  - (iii) Polar quaternary NRZ signalling. [4x2.5=10]

### Unit-III

- 3 (a) What is coherent and non coherent detection of Signal ? Explain. 6
- (b) Derive an expression to show that the probability of error for coherent binary PSK is :

Where  $E_b$  is energy per bit,  $N_0/2$  is two sided noise  
 $P_e = \frac{1}{2} \text{erfc} \sqrt{\frac{E_b}{N_0}}$  and  $\text{erfc}()$  denotes the complementary error function. 10

Or

- 3 (a) (i) Compare the bandwidth of QPSK system with that of BPSK system 2
- (ii) List the major advantages of QPSK 4
- (b) Explain modulation and demodulation of QPSK. 10

## Unit-4

4. (a) What is information ? What is difference between information and uncertainty? How they both are related to each other. [2+3+1]
- (b) Apply Huffman coding procedure for the following message and calculate.

(i) Entropy

(ii) Average length of code

(iii) Coding efficiency

[X] :  $x_0 \quad x_1 \quad x_2 \quad x_3 \quad x_4 \quad x_5 \quad x_6$

[P] :  $1/3 \quad 1/27 \quad 1/3 \quad 1/9 \quad 1/9 \quad 1/27 \quad 1/27$

Consider M= 3 (Ternary code)

10

Or

(a) Verity the equation:  $H(X, Y) = H\left(\frac{X}{Y}\right) + H(Y)$  6

(b) The channel capacity of a white bandlimited Gaussian channel is given by  $C = B \log_2 \left(1 + \frac{S}{N}\right)$  bits/sec.

If the signal power is fixed and white Gaussian noise is present, the channel capacity approaches an upper limit With increase in bandwidth 'B' prove that this upper limit is given as :

$$C_{\infty} = \lim_{B \rightarrow \infty} C = 1.44 \frac{S}{N}$$

10

## Unit - V

5 (a) For the given generator poly nomial  $G(P) = P^3 + P + 1$ , find and the corresponding generator matrix and the code vector for the message 1101. 6

(b) The parity digit of a (6,3) linear code is given as

$$C_4 = M_1 \oplus M_2, C_5 = M_1 \oplus M_2 \oplus M_3 \text{ and } C_6 = M_1 \oplus M_3$$