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SF-8333

B. E. - III (Sem. - VI) (EC) Examination

May/June – 2011

Digital Communication

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. - 3 (SEM. - 6) (EC)**

Name of the Subject :

☛ **DIGITAL COMMUNICATION**

☛ Subject Code No. : **8 3 3 3** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

1 (a) Do as directed : **10**

(i) Prove the statement "If a receiver knows the message being transmitted, the amount of information carried will be zero."

(ii) What do you mean by non uniform quantization ? Why it is required ?

(iii) What are advantages of DPCM over PCM ?

(iv) For binary data 110101 draw the line coding waveform with Manchester coding.

(v) Determine the Nyquist sampling rate for signal $g(t) = \text{sinc}(100\pi t)$.

(b) A discrete memory less source X has four symbols x_1, x_2, x_3 and x_4 with probabilities $P(x_1)=0.4$, $P(x_2)=0.3$, $P(x_3)=0.2$ and $P(x_4)=0.1$. Calculate the entropy, coding efficiency and redundancy using Huffman coding. **6**

(c) The American Standard Code for Information Interchange (ASCII) has 128 characters, which are binary-coded. If a certain computer generates 100000 characters per second, determine the following : **4**

(i) The number of bits (binary digits) required per character.

(ii) The number of bits per second required to transmit the computer output, and the maximum bandwidth required to transmit this signal.

2 (a) Explain Tchebysheff's inequality. 7

(b) What do you mean by Delta modulation ? Explain it with transmitter and receiver block diagram. Discuss Granular noise and Slope overload distortion. 8

OR

2 (a) Explain and draw Rayleigh probability density. 7

(b) What do you mean by quantization ? Considering a generalized input signal and uniform quantization derive the expression for signal to quantization noise ratio (SQNR). 8

3 (a) State sampling theorem and prove it for bandlimited signal. 8

(b) What do you mean by M-ary carrier communication ? Why are its advantages and disadvantages compared to binary carrier communication ? 7

OR

3 (a) Explain Nyquist First Criteria for zero ISI. 8

(b) Explain T1 digital carrier hierarchy. 7

4 (a) Do as directed : 10

(i) What is the match filter ?

(ii) Draw the block diagram of FHSS system.

(iii) State the difference between block codes and convolution codes.

(iv) For (6,3) code, the generator matrix G is

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

Find the code words for the data words 111 and 101.

(v) Draw the block diagram of ASK transmitter.

(b) Draw and explain block diagram of BPSK transmitter and receiver. Why non-coherent reception for BPSK is not possible ? 5

(c) Write and drive the equation of Hamming bound condition. What is Hamming code ? 5

5 (a) Explain QPSK transmitter and receiver with necessary block diagrams. 8

(b) Explain Direct Sequence Spread Spectrum. 7

OR

5 (a) Explain QAM transmitter and receiver with necessary block diagrams. 8

(b) Explain cyclic code and its characteristic. 7

6 Attempt any **three** : 15

(a) In a binary PCM if '0' occur with probability 0.25 and '1' occur with probability equal to 0.75, calculate the amount of information carried by each bit.

(b) Define and explain concept of entropy, information and information rate.

(c) Explain FSK transmitter with necessary block diagrams and state its applications.

(d) State desirable properties of line coding.

(e) Explain basic convolution encoder.