



ENGINEERING & MANAGEMENT EXAMINATIONS, DECEMBER - 2008
DIGITAL COMMUNICATION SYSTEM
SEMESTER - 5

Time : 3 Hours]

[Full Marks : 70

GROUP - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

- i) The frequency spectrum of a square wave or rectangle wave in time domain is
 - a) Impulse function
 - b) Sine function
 - c) Sinc. function
 - d) Gaussian function.

- ii) In quantization has 8 bit code, then SMR will be
 - a) 32 dB
 - b) 16 dB
 - c) 48 dB
 - d) 8 dB.

- iii) In Hofmann coding, the probabilities are arranged in
 - a) ascending order
 - b) descending order
 - c) no specification.

- iv) How many bits would be required to represent a 256 level quantization in PCM ?
 - a) 6
 - b) 8
 - c) 5
 - d) 7.

- v) In PCM, the amplitude levels are transmitted in a 7-unit channel code. The sampling is done at the rate of 10 Hz. The bandwidth preferred minimum should be
 - a) 5 kHz
 - b) 35 kHz
 - c) 70 kHz
 - d) 85 kHz.



- vi) If the quantization has 4 levels which occurs with probability $P_1 = P_4 = \frac{1}{8}$ and $P_2 = P_3 = \frac{3}{8}$, then the information rate is
- a) 1.8 bits/message
 - b) 3.8 bits/message
 - c) 1.6 bits/message
 - d) 2.6 bits/message.
- vii) The Nyquist rate of the composite signal $x(f) = 5 \cos 1000 \pi t \cos 3000 \pi t$ is
- a) 3000 Hz
 - b) 1000 Hz
 - c) 4000 Hz
 - d) 2000 Hz.
- viii) The channel capacity of a band-limited Gaussian channel is
- a) $C = B \log_2 \left(1 + \frac{S}{N} \right)$
 - b) $C = B \log_2 \left(\frac{S}{N} \right)$
 - c) $C = \frac{1}{B} \log_2 \left(\frac{S}{N} \right)$
 - d) $C = \frac{1}{B} \log_2 \left(1 + \frac{S}{N} \right)$.
- ix) Which of the following system is digital ?
- a) pulse-position modulation
 - b) pulse-code modulation
 - c) pulse-width modulation
 - d) pulse-frequency modulation.
- x) PCM generation requires LPF (low-pass filter) at the beginning to
- a) eliminate aliasing effect
 - b) eliminate quantization noise
 - c) eliminate decoding noise
 - d) none of these.
- xi) Spread spectrum scheme increases
- a) processing gain
 - b) spectral efficiency
 - c) transmission gain
 - d) none of these.
- xii) Eye pattern is used to study
- a) ISI
 - b) Quantization noise
 - c) Error rate
 - d) None of these.



GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following.

3 × 5 = 15

- 2. a) What are the proportion of line coding. 2
- b) Draw the Manchester coding and PNRZ coding for $m = 1001011$. 2
- c) Write down the PSD function of PNRZ signal. 1
- 3. a) Explain the advantages of digital communication system. 2
- b) Draw block diagram and explain such a system briefly. 3
- 4. a) What is direct sequence spread spectrum ? 1
- b) Explain the generation of DSSS. 4
- 5. a) What is eye pattern ? 1
- b) How is it generated in CRO. 2
- c) What information we get from it ? 2
- 6. Explain the principle of operation of QPSK modulator. 5
- 7. a) Explain the implication 'aliasing'. 3
- b) How is the 'aliasing' effect removed. 2

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following questions.

3 × 15 = 45

- 8. a) What are the disadvantages of DPSK. 4
- b) What are the disadvantages of BPSK and how is it improved ? 4
- c) What is BFSK ? 3
- d) Describe orthogonal BFSK. 4
- 9. a) State sampling theorem and explain its important. 4
- b) What is Nyquist rate of sampling. 2



- c) Explain how an analogue signal is converted into a digital signal using PCM system. 6
- d) A television signal has a bandwidth of 4.5 MHz. The signal is sampled and converted into PCM signal. Determine the sampling rate if the signal is to be sampled at a rate 20% above Nyquist rate. 3
- 10. a) What is quantization? Classify them. 3
- b) How is non-uniform quantization utilised. 2
- c) Deduce the relation of signal to quantization noise. 4
- d) Calculate the number of quantization levels for the signal $x(t) = 5 \sin(500\pi t + \theta)$ 4
- e) What are the related laws for non-uniform quantization. 2
- 11. a) What do you mean by matched filter for digital reception? 5
- b) Derive an expression for error probability of a matched filter? 3
- c) State and explain Nyquist criterion for zero ISI. 3
- d) What is the role of an equalizer? 4
- 12. a) Define information. 2
- b) Define 'Discrete Memoryless Source'. 2
- c) What is 'Entropy'? 2
- d) Calculate amount of information if binary digits occur with equal likelihood in a binary PCM system. 3
- e) A discrete source emits one of the five symbols once every millisecond with probabilities $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}$ and $\frac{1}{32}$. Determine source entropy and information rate. 6
- 13. Write short notes for the following :
 - a) Compounding 5
 - b) Differential Encoding 5
 - c) Linear Prediction Coder. 5

END