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 : $10 \times 1 = 10$

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 noising 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 $x(t) = 5 \sin (500 \pi + \theta)$ 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 roll 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 likelyhood 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