EE-705C

DIGITAL COMMUNICATION

Time Allotted: 3 Hours | Full Marks: 70

The questions are of equal value.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP A
(Multiple Choice Type Questions)

1. Answer any *ten* questions. $10 \times 1 = 10$

(i) The main advantage of PCM system is

(A) possibility of TDM (B) less channel bandwidth
(C) less transmission power (D) better noise performance

(ii) The use of non uniform quantization leads to

(A) reduction to transmission BW
(B) increase in maximum SNR
(C) increase in SNR for low level signals
(D) simplification of quantization process

(iii) Regenerative repeaters can be used in

(A) analog communication system only
(B) digital communication system only
(C) analog and digital communication systems
(D) none of these

(iv) The spectral density of white noise is

(A) exponential (B) uniform.
(C) Poisson (D) Gaussian

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(v) For generation of FSK the data pattern must be given in

(A) RZ format (B) NRZ format
(C) split phase Manchester (D) none of these

(vi) Which of the digital modulation technique is used for high speed telephone modem?

(A) QAM (B) GMSK
(C) QPSK (D) GFSK

(vii) Eye pattern is used to study

(A) ISI (B) quantization noise
(C) error rate (D) none of these

(viii) Companding is used

(A) to protect small signals in PCM from quantizing distortion
(B) to overcome quantized noise in PCM
(C) to overcome impulse noise
(D) none of these

(ix) The bit rate of a digital communication system is 34 Mbps. The modulation scheme is QPSK, the baud rate of the system is

(A) 68 Mbps (B) 34 Mbps
(C) 17 Mbps (D) 85 Mbps

(x) Guard band increase the BW for

(A) FDM (B) TDM
(C) both (A) and (B) (D) none of these

(xi) Coherent demodulation of FSK signal can be effected using

(A) correlation receiver (B) BPF and envelope detector
(C) matched filter (D) discriminator detection

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(xii) The signal to quantization noise ratio in n bit PCM system

(A) depends upon the sampling frequency employed

(B) is independent of value n

(C) increase with increasing value of n

(D) decreases with the increasing value of n

GROUP B
(Short Answer Type Questions)

Answer any *three* questions. 3×5 = 15

2. What is companding? Why it is needed? 3+2

3. State sampling theorem. And explain its importance. What is Nyquist rate of sampling? 2+2+1

4. What is conditional probability? Explain. 5

5. Define line coding? Write the properties of line coding. 2+3

6. Write the coherent detection technique of an ASK modulation. 5

GROUP C
(Long Answer Type Questions)

Answer any *three* questions. 3×15 = 45

7. (a) Draw and explain the working principle of QPSK modulator and demodulator. 7+4+4

(b) What is the advantage of MSK technique?

(c) What are the advantages of digital communication systems over analog communication systems?

8. (a) With neat block diagram explain the generation and reception of delta modulation. 7+5+3

(b) What are the disadvantages of delta modulation? Explain with diagram.

(c) For a sinusoidal signal ($A\cos \omega t$) find the condition for no slope overload if step size is Δ and sampling period is T s.

9. (a) What do you mean by random process? 2

(b) Explain auto correlation function of a random process and also explain the properties of auto correlation function. 3+3

(c) What do you mean by probability density function (PDF)? Deduce the relation between probability and PDF. 2+3

(d) A three digit message is transmitted over a noisy channel having a probability of error $P(E) = 2/5$ per digit. Find out the probability of receiving a correct digit. 2

10.(a) Explain with a suitable block diagram how an analog signal is converted into digital signal using PCM. 5

(b) Deduce the relation of signal to quantization noise. 3

(c) Prove that for a n bit PCM the signal to quantization noise ratio for a sinusoidal modulating signal is $(S/N)_{dB} = 1.76 + 6.02n$ 5

(d) What is the importance of regenerative repeaters in PCM? 2

11.(a) With a neat block diagram explain the generation and detection of BFSK signal. 7

(b) What are the disadvantages of BPSK and how they can be improved? 4

(c) Given the data stream 11011010 4

Sketch the transmitted sequence of rectangular pulses for each of the following line codes:

(a) Unipolar RZ, (b) Unipolar NRZ, (c) Polar RZ, (d) Manchester

12. Write short notes on any *three* of the following: 3×5

(a) Adaptive delta modulation.

(b) ISI and Eye pattern

(c) Differential pulse code modulation (DPCM)

(d) OQPSK

(e) A law and μ law companding