9972

Roll No.: Sr. No. of Question Paper:
Unique Paper Code: 2513010019
Name of the Course: B. Sc. (H) Electronics
Paper Name : Digital Communication System
Semester: VII
Duration: 3 hours Max. Marks: 90

Instructions for candidates: Attempt five questions in all, including Question No. 1, which is compulsory. Use of Scientific Calculator is allowed.

Q 1

(a) What is aliasing? How can it be avoided? (3)

(b) What are frames and time slots in TDM? (3)

(c) Define average information rate of a discrete memoryless source (DMS) (3)

(d) Distinguish between sample space and ensemble. (3)

(e) Determine the bandwidth and baud for an FSK signal with a mark frequency of 99 kHz, a space frequency of 101 kHz, and a bit rate of 10 kbps. (3)

(f) What are the error detection and correction capabilities of hamming codes? (3)

Q2

(a) Explain the generation of flat-top PAM with a neat block diagram. (6)

(b) Draw and explain the transmitter and receiver block diagram of a complete TDM-PAM system. (6)

Discuss:

- Synchronization
- Frame alignment
- Clock recovery
- Guard time

Provide neat diagrams and waveforms.

(c) Discuss the application of PAM? What are the advantages of Digital communication? (6)

Q3

(a) Define auto-correlation and cross-correlation. What these two relations indicate? Derive the relation between auto-correlation and average power. (4)

(b) A DMS X has five symbols x_1, x_2, x_3, x_4, and x_5 with $P(x_1) = 0.4$, $P(x_2) = 0.19$, $P(x_3) = 0.16$, $P(x_4) = 0.15$, and $P(x_5) = 0.1$. (8)

(i) Construct a Shannon-Fano code for X, and calculate the efficiency of the code.

(ii) Repeat for the Huffman code and compare the results.

(c) State and explain Hartley's Law and Shannon–Hartley theorem. Given that B=10 KHz and C=100kbps what would be the value or SNR. (6)

Q 4

(a) Calculate the probability of error for a matched filter. (6)

(b) The binary data 1000110101 is transmitted over the baseband channel. Draw the waveform in unipolar NRZ, polar RZ, bipolar RZ and Split Manchester format (6)

(c) Derive the power spectral density of NRZ unipolar and Manchester format. (6)

Q 5

(a) Explain the principle of Amplitude Shift Keying (ASK). Draw and describe the block diagram of ASK transmitter and receiver. (6)

(b) Describe the working of Frequency Shift Keying (FSK). Explain its generation using suitable block diagrams. (6)

(c) Compare ASK, FSK in terms of: (6)

(i) Bandwidth requirements

(ii) Power efficiency

(iii) Complexity of transmitter/receiver

Q6

(a) What is Phase Shift Keying (PSK)? Explain the binary PSK demodulation process. Discuss the impact of noise on PSK. (6)

(b) Explain Differential Phase Shift Keying (DPSK). Describe the method of encoding and decoding in DPSK with neat block diagrams. How does it differ from PSK? (6)

(c) Describe Quadrature Phase Shift Keying (QPSK). Draw the constellation diagram of QPSK and explain how 2 bits are represented in each symbol. (6)

Q7

(a) Describe the process of converting text data into binary using ASCII and EBCDIC codes. Encode the word "DATA" in both ASCII and EBCDIC and compare the results. (6)

(b) What is an error in digital communication? Explain different types of errors (single-bit, burst error). Discuss why error detection and correction are essential in data transmission. Provide suitable examples. (6)

(c) Explain Vertical Redundancy Check (VRC). Draw the VRC table for a set of 4 data words of your choice and show how VRC detects single-bit errors.