Q.2 a. Draw the block diagram of digital communication system and explain the function of each block. (2+5)

Answer:

Refer Page Numbers 4 & 5. (Block diagram – 2, Explanation – 5)

b. A discrete memoryless source with source alphabet $\xi = [s_0, s_1, s_2]$ with the following probabilities:-

$p(s_0) = p_0 = \frac{1}{4}$, $p(s_1) = p_1 = \frac{1}{4}$ and $p(s_2) = p_2 = \frac{1}{2}$. Then calculate the entropy of the discrete memoryless source. (4)

Answer:

The Entropy of the discrete memoryless source is given by:

$$H(\xi) = p_0 \log_2\left(\frac{1}{p_0}\right) + p_1 \log_2\left(\frac{1}{p_1}\right) + p_2 \log_2\left(\frac{1}{p_2}\right)$$

$$= \frac{1}{4}\log_2(4) + \frac{1}{4}\log_2(4) + \frac{1}{2}\log_2(2)$$

ENTROPY $= \frac{3}{2} bits$

c. Derive an expression for channel capacity of a discrete memoryless channel. (5)

Answer:

Refer Page Number 35.

Q.3 a. With the help of block diagrams, discuss the reconstruction of a message process from its samples. (10)

Answer:

Refer Page Numbers from 143 to 146. (Block diagram – 3, Explanation – 7)

b. What is PAM? Explain briefly transmission bandwidth requirement of PAM. (6)

Answer:

Refer Page Numbers 161 & 162.

Q.4 a. What is Delta Modulation? What is its main advantage over DPCM? With the help of block diagrams, explain the operation of DM Transmitter and DM Receiver. (10)

Answer:

Refer Page Numbers from 203 to 206. (2+2+2+2+2)

b. Draw the basic elements of a PCM system and explain the function of each element briefly. (6)

Answer:

Refer Page Numbers from 172 to 180.

Q.5 a. Explain briefly the power spectra of discrete PAM signals. (6)

Answer:

Refer Page Numbers 235 – 238. (3+3)

b. Construct the Manchester format for the binary sequence 0110100011. (4)

Answer:

Refer Page Numbers 242.

c. What is the necessity of Eye Pattern? Explain its significance in data transmission system with neat illustrations. (3+3)

Answer:

Refer Page Numbers 261 & 262.

Q.6 a. With the help of neat sketches, explain QPSK transmitter and receiver. (8)

Answer:

Refer Page Numbers 284 – 286. (2+6)

b. Compare the M-ary digital modulation techniques, M-ary PSK, M-ary QAM and M-ary FSK. (5)

Answer:

Refer Page Numbers 324 & 325.

c. List out the non-coherent binary modulation techniques. (3)

Answer:

Refer Page Numbers from 300 to 306.

Q.7 a. Explain the function of correlation receiver with the help of suitable block diagrams. (8)

Answer:

Refer Page Numbers from 84 to 86.

b. What is meant by non-coherent receiver? Compare the differences between quadrature receiver using correlators and quadrature receiver using matched filters. (2+6)

Answer:

Refer Page Numbers from 96 to 99. (2+6)

Q.8 a. Explain Direct Sequence Spread Coherent Binary Phase Shift Keying system with the help of neat block diagrams. (8)

Answer:

Refer Page Number 452. (Explanation – 4, Block diagram – 4)

b. A spread-spectrum communication system has the following parameters:-

Information bit duration, T_b = 4.095 ms, PN chip duration, Tc = 1 μs and bit energy-to- noise density ratio $\left(\frac{E_b}{N_0}\right)$ is10. Then calculate:

(i) Processing gain
(ii) Jamming merging **(2+2)**

Answer:

Given Data: Information bit duration, T_b = 4.095 ms, PN chip duration, Tc = 1 μs and bit energy-to- noise density ratio $\left(\frac{E_b}{N_0}\right)$ is 10.

(i) The **Processing Gain** can be calculated as : $PG = \frac{T_b}{T_c} = \frac{4.095ms}{1\mu s} = 4095.$ 2

(ii) (Jamming Margin)$_{dB}$ = $\left(\text{Pr}oces\sin gGain\right)_{dB} - 10\log_{10}\left(\frac{E_b}{N_o}\right)_{\min}$ 2

= 10 $\log_{10}$ (4095) – 10 $\log_{10}$ (10) = **26.1 dB**

c. Draw the block diagram of maximum length sequence generator and explain briefly. **(4)**

Answer:

Refer Page Numbers 446 & 447. (Block diagram – 2, Explanation – 2)

Q.9 Write short notes on any <u>TWO</u> of the following:-

(i) Light Wave Transmission
(ii) Digital Communications by Satellite
(iii) Multipath Suppression **(2×8)**

Answer:

(i) Refer Page Numbers 225 & 226.
(ii) Refer Page Numbers 354 & 355.
(iii) Refer Page Numbers 468 & 469.

<u>TEXT BOOK</u>

I. Digital Communications, Wiley Student Edition, Simon Haykin