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Question Paper Code : 31269

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

3rd - EN

Sixth Semester

Electronics and Communication Engineering

080290039 — DIGITAL COMMUNICATION

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Why do we need Multiplexing?

2. Two analog signals $m_1(t)$ and $m_2(t)$ are to be transmitted over a common channel by means of time division multiplexing. The highest frequency of $m_1(t)$ is $3KHz$ and that if $m_2(t)$ is 3.5 KHz. What is the minimum value of the permissible sampling rate?

3. State the uses of eye patterns.

4. Define Inter symbol Interference.

5. A certain telephone line band width is 3.5 KHz. Calculate the data rate (in b/s) that can be transmitted, if we use binary signaling with the raised–cosine pulses and the roll-off factor $\alpha = 0.25$.

6. What is a Matched Filter?

7. Define Hamming distance of a Block code.

8. Differentiate : Error detection and Error Correction.

9. What are Gold sequences?

10. Mention the advantages of spread spectrum systems.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Elaborate on uniform and Non-uniform Quantitation processes employed in pulse code Modulation techniques. (8)

(ii) In a certain telemetry system, eight message signals having 2 KHz band width each are time division multiplexed using a binary PCM. The error in sampling amplitude cannot be greater than 1 percent of the peak amplitude. Determine the minimum transmission band width required if raised–cosine pulses with roll-off factor $\alpha = 0.2$ are used. The sampling rate must be at least 25 percent above the Nyquist rate. (8)

Or

(b) (i) State and explain sampling theorem. Describe Band Pass sampling. (6)

(ii) An analog signal of band width 20 KHz is sampled at a rate of 40 KHz and quantized into 16 levels. The resultant digital signal is transmitted using M–ary PSK with raised cosine pulse (roll–off factor 0.3). A channel with a 110 KHz band width is available to transmit the data.

(1) Determine the bit rate. (2.5)

(2) Determine the smallest acceptable value of M. (2.5)

(3) Determine the baud rate. (2.5)

(4) Determine the spectral efficiency. (2.5)

12. (a) The binary data 001101001 are applied to the input of a duobinary system.

(i) Construct the duobinary coder output and corresponding receiver output without a precoder. (8)

(ii) Suppose that due to error during transmission, the level of the receiver input produced by the second digit is reduced to zero. Construct the new receiver output. (8)

Or

(b) (i) What do you mean by Equalization? Why does a digital communication system require equalization? (3)

(ii) Differentiate : Normal and Adaptive Equalizations. (3)

(iii) Describe the adaptive equalization process for digital data transmission by illustrating the different modes of operation of an adaptive equaliter. (10)

13. (a) Consider a signal of the form $s(t,a) = \begin{cases} as(t) & 0 \le t \le T \\ 0 & elsewhere \end{cases}$ where $s(t)$ is completely known and the amplitude 'a' is unknown. Find the maximum likelihood estimate of 'a' in the presence of white Gaussian noise of zero mean and power spectral density $\frac{No}{2}$. What are the mean and variance of this estimate?

Or

(b) (i) What do you mean by QPSK system? Define the symbols and construct the signal space diagram. (4)

(ii) With detailed block diagrams, explain the functions of each block in the transmitter and receiver of QPSK system. (6)

(iii) Derive probability of error of QPSK system. (3)

(iv) Compare QPSK with QAM. (3)

14. (a) Consider a rate $\frac{1}{2}$ constraint length – 7 convolutional code with free distance d_{free} = 10. Calculate the asymptotic coding gain of the channel for the following two channel :

(i) Binary symmetric channel. (8)

(ii) Binary input AWGN channel. (8)

Or

(b) Explain the concept, implementation, properties and characteristics of :

(i) Trellis coded Modulation. (6)

(ii) Cyclic codes. (5)

(iii) Linear block codes. (5)

15. (a) (i) A psuedo noise (PN) sequence is generated using a feedback shift register of length m = 4. The chip rate is 10^7 chips per second. Find the following parameters :

(1) PN sequence length. (6)

(2) Chip duration of the PN sequence.

(3) PN sequence period.

(ii) Explain FH - spread spectrom and the area of its applications. (10)

Or

(b) Write detailed notes on the following with necessary diagrams and expressions :

(i) m – sequence. (5)

(ii) PN sequence. (5)

(iii) DSSS. (6)
