Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 31241

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Sixth Semester

Electronics and Communication Engineering

080290039 — DIGITAL COMMUNICATION

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Find the Nyquist rate for the given signal $x(t) = 10\cos(20\pi t)\cos(200\pi t)$ which is sampled at a rate of 250 samples/s.

2. What are the advantages and disadvantages of delta modulation?

3. Differentiate : Base band and Pass band signals.

4. What is coherent communication?

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 code.

8. What are Turbo codes?

9. What is frequency-hop spread spectrum?

10. Define processing gain and jamming margin.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Compare PCM, DPCM and DM. (5)

(ii) Explain the process of Delta Modulation and the methods to avoid different types of noises. (5)

(iii) Show that if the sampling rate is equal to or greater than twice the highest message frequency, the message m(t) can be recovered from the natural sampled signal $X_{ns}(t)$ by low-pass filtering. (6)

Or

(b) (i) Explain the modulation and demodulation processes of pulse code modulation with necessary diagrams and expressions. (10)

(ii) Given the signal

$m(t) = 10 \cos 2000 \pi t \cos 8000 \pi t$

(1) What is the minimum sampling rate based on the low-pass uniform sampling theorem? (3)

(2) What is the minimum sampling rate based on the band pass sampling theorem? (3)

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) (i) Draw the block diagram of Costas loop and explain how it achieves carrier synchronization with necessary expression. (8)

(ii) For the following input binary sequence $b(k) = \{1, -1, 1, -1, -1, -1, 1, 1\}$, find the transmitted phase sequence and sketch the transmitted waveform for QPSK. (8)

Or

(b) Explain the principle of operation, waveforms, constellation diagram, transmitter and receiver of a MSK system in detail. (16)

14. (a) Consider a (7, 4) cyclic code with generator polynomial $g(X)=1+X+X^3$. Draw the encoder and syndrome calculator. Obtain the code words for the message 1100. Calculate the syncrome calculator output when the codeword of the message 1100 is applied for the conditions :

(i) Without error and

(ii) The least significant bit (LSB) is in error. (16)

Or

(b) A Convolutional code is described by $g1=[1\ 0\ 1]$, $g^{-2}[010]$ $g^3=[110]$. Find the transfer function and the free distance of the code. (16)

15. (a) Explain direct sequence spread spectrum system with block diagram and derive expression for processing gain. (16)

Or

(b) (i) Explain frequency hopping spread spectrum system with block diagram. (12)

(ii) How many runs of three zeros would be expected in a $2^{14}-1$ chip PN sequences? (4)