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**R16**

Code No: 135AK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, November/December - 2018

K8 K8 DIGITAL COMMUNICATIONS K8 K8  
(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

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**PART - A**

(25 Marks)

- 1.a) What are the advantages of digital communication over analog communication. [2]
- b) What is aliasing and aperture effect and how to eliminate them? [3]
- c) A source generates 4 messages with the probabilities 1/3, 1/6, 1/4, 1/4. The successive messages limited by the sources are statistically independent. Calculate the entropy of the source. [2]
- d) What are the convolutional codes? Explain. [3]
- e) Write the properties of the matched filter. [2]
- f) What is a correlative level coding? [3]
- g) Compare the bandwidth requirements of (i) BPSK (ii) 8QAM (iii) 8PSK. [2]
- h) For a tri bit input Q=0, I=0 and C=0(000). Determine the output phase for 8 PSK modulation. [3]
- i) List the applications of the spread spectrum techniques. [2]
- j) Write the properties of PN sequence. [3]

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**PART - B**

(50 Marks)

2. Explain the different types of sampling and discuss each technique in detail with neat sketches. [10]

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OR

- 3.a) Discuss the Delta modulation technique. Also discuss the noises in DM.
- b) Discuss the quantization noise in PCM. [5+5]

- 4.a) Explain the Lempel-Ziv coding with an example.
- b) Discuss the Matrix description of the linear block codes. [5+5]

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OR

- 5.a) The generator polynomial of a (7,4) cyclic code is  $G(P) = P^3 + P + 1$ . Obtain all the code vectors for the code in non systematic and systematic form.
- b) State the Shannon Hartley Law and discuss the properties of entropy. [5+5]

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- 6.a) Discuss the Nyquist criteria for distortion less base band binary transmission.
- b) Briefly explain the operation of the optimal linear receiver. [5+5]

OR

- 7.a) What is the principle of the adaptive equalizer? Draw the structure.
- b) Explain the geometric interpretation of the signals. [5+5]

- 8. Draw the QPSK modulator? And construct the truth table, phasor diagram and constellation diagram for it. [10]

OR

- 9. Explain the transmitter and receiver section of the DPSK techniques in detail. [10]

- 10.a) Explain the CDMA techniques.
- b) What is the use of the spread spectrum techniques? [6+4]

OR

- 11. Explain in detail the types of frequency hopping spread spectrum techniques. [10]

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**R09**

**Code No: 56026**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B. Tech III Year II Semester Examinations, November/December - 2015**

**DIGITAL COMMUNICATIONS**

**(Electronics and Communication Engineering)**

**Time: 3 hours**

**Max. Marks: 75**

**Answer any five questions  
All questions carry equal marks**

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- 1.a) Draw the model of digital communication system and discuss the advantages of digital communication systems.
- b) Discuss the bandwidth –S/N tradeoff. [9+6]
- 2.a) Explain about quantization and companding.
- b) What is slope overload distortion and granular noise in delta modulation and how it is removed in ADM. [8+7]
- 3.a) What is the principle of BPSK? And discuss the reception of BPSK.
- b) For the message sequence 1101010010, draw the  
i) QPSK      ii) FSK      iii) ASK waveforms. [8+7]
- 4.a) Draw a base band signal receiver and obtain the signal to noise ratio for it.
- b) Write a short note on eye diagram and cross talk. [10+5]
- 5.a) What is mutual information? State and prove the properties of it.
- b) Explain the Shannon Fano coding with an example. [8+7]
- 6.a) What are the advantages and disadvantages of cyclic codes. Design an encoder for the (7,4) binary cyclic code generated by  $g(x)=1+x+x^3$  and verify its operation using the message vector (0101).
- b) Discuss the matrix description of a linear block codes. [8+7]
- 7.a) Give the Comparison of Error Rates in Coded and Uncoded Transmission.
- b) Explain the viterbi algorithm of convolutional codes with an example. [6+9]
- 8.a) Discuss the application of DS spread spectrum for ranging.
- b) Discuss the synchronization procedure in spread spectrum technique. [7+8]

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**R09**

**Code No: 56026**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD**

**B. Tech III Year II Semester Examinations, December-2014/January-2015**

**DIGITAL COMMUNICATIONS**

**(Electronics and Communication Engineering)**

**Time: 3 hours**

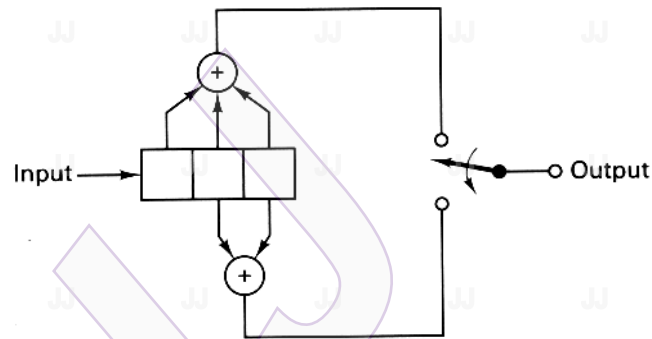
**Max. Marks: 75**

**Answer any five questions  
All questions carry equal marks**

- - -

- 1.a) What are the advantages and disadvantages of digital transmission?
- b) A signal  $f(t) = \text{sinc}^2(5\pi t)$  is sampled (using uniformly spaced impulses) at a rate of 7 Hz; 12 Hz; and 20 Hz. For each of the three cases:
  - i) Find out the signal bandwidth and its nyquist rate. Sketch the sampled signal.
  - ii) Sketch the spectrum of the sampled signal.
  - iii) Explain whether you can recover the signal  $f(t)$  from the sampled signal.
  - iv) If the sampled signal is passed through an ideal low pass filter of bandwidth 5 Hz, sketch the spectrum of the output signal.
- 2.a) Discuss the comparison of PCM vs. delta modulation with respect to SNR and bandwidth. Draw the necessary plots.
- b) Information in an analog waveform with a maximum frequency  $f_m = 3$  kHz, is to be transmitted using PCM. The quantization distortion is specified not to exceed  $\pm 1\%$  of the peak-to-peak analog signal.
  - i) What is the minimum required sampling rate?
  - ii) What is the minimum number of bits per sample or bits/PCM word that should be used in digitizing the analog waveform?
  - iii) What is the resulting bit transmission rate?
  - iv) What is the transmission Bandwidth?
- 3.a) Briefly explain BPSK and DPSK with the help of appropriate diagram wherever necessary and compare it? In which case bit error probability is higher and why?
- b) Consider a binary digital modulation system, where the carrier amplitude at the receiver is 1 V, and the white Gaussian noise has standard deviation 0.2. Assume that symbol 0 and symbol 1 occur with equal probabilities.
  - i) Compute the bit error rates for ASK, FSK, and PSK with coherent detection. Use the following approximation to the Q-function
$$Q(x) \leq \frac{1}{\sqrt{2\pi}} e^{-x^2/2}, x \geq 0$$
  - ii) Compute the bit error rates for ASK, FSK, and DPSK with noncoherent detection.
4. Differentiate coherent and noncoherent methods. What is M-ary coding? What are the advantages of M-ary signaling scheme? Under what circumstances M-ary signaling schemes are preferred over binary schemes? Compare bandwidth efficiency of M-ary PSK signals and FSK signals. What happens to the probability of error in M-ary FSK as the value of M-increase?

- 5.a) What is entropy? Derive its expression. Define information rate. Write down the derivation for average information  $H$  for case of two messages  $P$  and  $1-P$  and also find out the maximum value of  $H$ .
- b) A continuous signal is band limited to 5 KHz. The signal is quantized in 8 levels of a PCM system with probabilities 0.25, 0.2, 0.2, 0.1, 0.1, 0.05, 0.05 and 0.05. Calculate the entropy and rate of information?
- 6.a) What do you mean by algebraic code? Give one example for generating such code.
- b) Explain the method of coding and decoding for cyclic code. Write down the advantage of cyclic code.
- c) The generator polynomial of a (7, 4) cyclic code is  $g(x) = 1+x+x^3$ . Find the 16 code words of this code.
7. What is convolution coding? The encoder for a convolution code is as shown in the figure:



**Figure**

- a) What are the connection vectors?
  - b) What are the polynomials?
  - c) What is the impulse response?
  - d) Draw the state Diagram.
  - e) Write the output for an input of  $\{1\ 1\ 0\ 1\ 0\ 0\ 1\ 0\ 0\}$ .
  - f) Draw the trellis diagram up to depth 4.
  - g) What is the minimum difference?
8. Write short notes on:
    - a) Eye Diagram.
    - b) Delta Pulse Code Modulation.
    - c) Frequency hopping spread spectrum.

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**R09**

**Code No: 09A60404**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD**

**B. Tech III Year II Semester Examinations, June – 2014**

**DIGITAL COMMUNICATIONS**

**(Electronics and Communication Engineering)**

**Time: 3 hours**

**Max. Marks: 75**

**Answer any five questions  
All questions carry equal marks**

- - -

1. a) Explain the bandwidth- S/N tradeoff.  
b) Explain about the line coding and scrambling.  
c) List the advantages of digital communications.
  
2. a) Explain the compression laws  $\mu$ -Law and A-Law.  
b) Consider a low pass signal with a bandwidth of 3 KHz. A linear delta modulation system with a step size  $\Delta=0.1V$  is used to process this signal at a sampling rate ten times the Nyquist rate.  
i) Evaluate the maximum amplitude of a test sinusoidal signal of frequency 1 KHz which can be processed by the system without slope overload distortion.  
ii) For the specifications given in part (i) evaluate the output signal to noise ratio under pre filtered and post filtered conditions.
  
3. a) Explain the DPSK transmitter and receiver.  
b) Explain the non coherent ASK detector in detail.
  
4. a) What is inter symbol interference (ISI) and ISI free signals? Explain.  
b) Obtain the optimum filter transfer function.
  
5. a) State and prove the properties of mutual information.  
b) Consider a discrete memory less source with a alphabets  $\{s_0, s_1, s_2\}$  and statistics  $\{0.7, 0.15, 0.15\}$  for its output.  
i) Apply Huffman algorithm to this code. Hence show that the average code word length of the Huffman code equal to 1.3 bits/symbol.  
ii) Let the source be extended to order two. Apply the Huffman algorithm for the resulting extended source, and show that the average code word length of the Huffman code equal to 1.1975 bits/symbol.  
iii) Compare the average code word length calculated in part (ii) with the entropy of the original source.
  
6. a) Draw the general form of a decoder for the cyclic code and explain the error correction procedure for it.  
b) Describe the matrix description of linear block codes.
  
7. a) Compare Error Rates in Coded and Uncoded Transmission.  
b) Discuss the code tree and trellis diagram for a convolution codes.
  
8. a) Explain the ranging using Direct Sequence spread spectrum.  
b) Explain the slow and fast frequency hopping techniques in detail.

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**R13**

Code No: 126AN

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B.Tech III Year II Semester Examinations, May - 2016****DIGITAL COMMUNICATIONS****(Electronics and Communication Engineering)****Time: 3 hours****Max. Marks: 75****Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART - A (25 Marks)**

- 1.a) What are the drawbacks of delta modulation? [2]
- b) Explain the need for non-uniform quantization in digital communication. [3]
- c) Draw the Signal space Diagram of ASK. [2]
- d) List out the Advantages of Pass band Transmission over Baseband transmission. [3]
- e) Define Entropy. [2]
- f) Derive the Expression for the Information Rate. [3]
- g) Explain in one sentence about (i) Block Size (ii) Linear block codes. [2]
- h) List out Properties of Cyclic Codes. [3]
- i) Briefly explain about "Spread spectrum." [2]
- j) What is Frequency hopping spread spectrum? [3]

**PART - B (50 Marks)**

- 2.a) With neat block diagram, Explain the process of Sampling and Quantization in digital communication.
  - b) Derive the expression for the Quantization error. [5+5]
- OR**
- 3.a) Explain about the noise in PCM systems.
  - b) Write the comparison between PCM and Analog modulation techniques. [5+5]
- 4.a) With neat diagrams and equations, explain about PSK system.
  - b) Draw the space representation of BPSK. And also draw its waveforms? [5+5]
- OR**
- 5.a) The bit stream 1011100011 is to be transmitted using DPSK. Determine the encoded sequence and transmitted phase sequence.
  - b) Explain about DPSK system. And also give the comparison between DPSK and PSK. [5+5]
- 6.a) What is the need of pulse shaping for optimum transmission in baseband transmission? Explain.
  - b) What is meant by Cross talk? Explain in detail about the causes for cross talk. [5+5]
- OR**
- 7.a) Briefly explain about Variable length coding.
  - b) Explain in detail about Huffman coding and Lossy source code. [5+5]

8.a) Write short notes on Hamming codes.

b) Explain about Error detection and Correction capabilities of Hamming codes. [5+5]

OR

9.a) Explain how Parity checking can be used for error detection or error correction.

b) For a linear block code, prove with example that:

i) The Syndrome depends only on error pattern and not on transmitted code word?

ii) All error patterns that differ by a codeword have the same syndrome? [5+5]

10.a) Explain the role of code division multiple access technique in present generation?

b) Give a brief history about direct sequence spread spectrum. [5+5]

OR

11.a) Explain about PN-Sequences generation and their characteristics.

b) What is meant by Synchronization? Why we require synchronization in spread spectrum? Explain in detail. [5+5]

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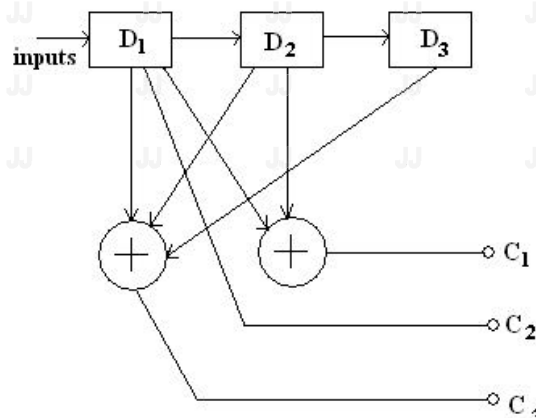


**R09****Code No: 56026****JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD****B. Tech III Year II Semester Examinations, May - 2015****DIGITAL COMMUNICATIONS****(Electronics and Communication Engineering)****Time: 3 hours****Max. Marks: 75**

**Answer any five questions**  
**All questions carry equal marks**

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- 1.a) State and prove the Hartley Shannon law and explain its importance.
- b) Write a note on the advantages and disadvantages of a digital communication system. [8+7]
  
- 2.a) A TV signal of bandwidth 4.2MHz is transmitted using binary PCM with the number of representation level of 512. Calculate the following:  
 i) Code word length    ii) final bit rate    iii) transmission bandwidth
- b) Describe the Delta modulation with a neat sketch. [8+7]
  
- 3.a) Describe the working principle of QPSK with the help of a neat diagram.
- b) Discuss non-coherent FSK detector in detail. [8+7]
  
- 4.a) Describe about the base-band signal receiver with the help of a neat sketch.
- b) Write a short note on eye diagram. [8+7]
  
- 5.a) State and prove the condition for maximum entropy.
- b) Show that  $H(Y/X) \leq H(Y)$  with equality if and only if X and Y are independent. [8+7]
  
- 6.a) Find the (7,4) linear block code for the message bits 1101 with the generator polynomial  $G(D) = 1+D^2+D^3$ .
- b) Describe the encoding, syndrome and decoding of cyclic codes in detail with neat sketches. [8+7]
  
- 7.a) Sketch the code tree for the convolutional encoder shown in figure.



- b) Describe the viterbi algorithm for maximum-likelihood decoding of convolution codes. [7+8]
  
- 8.a) What are various spread spectrum techniques. Write the advantages of spread spectrum technique?
- b) Write a short note on code division multiple access technique in detail. [8+7]

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**R09**

**Code No: 56026**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B. Tech III Year II Semester Examinations, May - 2016**

**DIGITAL COMMUNICATIONS**

**(Electronics and Communication Engineering)**

**Time: 3 hours**

**Max. Marks: 75**

**Answer any five questions  
All questions carry equal marks**

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- 1.a) State and Prove the sampling theorem for band limited signals.
- b) What are the advantages of Digital communication system? Draw the digital communication system and explain. [8+7]
- 2.a) What is the difference between uniform and non-uniform quantization.
- b) Draw the Delta modulation system? And explain noise in DM. [6+9]
- 3.a) Explain the QPSK techniques in detail.
- b) Explain the Bandwidth and Frequency Spectrum of FSK, ASK, BPSK. [8+7]
- 4.a) Obtain the probability of error for a optimum filter.
- b) Discuss the pulse shaping for optimum transmission and what is a baseband signal receiver. [7+8]
- 5.a) Explain the Shannon Fano coding with an example.
- b) Define and discuss the properties of Mutual information and entropy. [7+8]
- 6.a) Explain the algebraic structure and encoding of the cyclic codes.
- b) Discuss the error detection and correction capabilities of linear block codes. [7+8]
- 7.a) Explain the decoding of convolution codes using Viterbi algorithm.
- b) Discuss the following: tree and state diagram. [7+8]
- 8.a) Explain the direct sequence spread spectrum technique in detail.
- b) What do you mean by PN sequence? Discuss the characteristics and generation of it. [8+7]

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**R09**

**Code No: 56026**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B. Tech III Year II Semester Examinations, May - 2017**

**DIGITAL COMMUNICATIONS**  
**(Electronics and Communication Engineering)**

**Time: 3 hours**

**Max. Marks: 75**

**Answer any five questions**  
**All questions carry equal marks**

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- 1.a) Explain sampling theorem in detail. [10+5]  
b) Discuss the advantages of digital communication systems.
- 2.a) Explain the importance of a predictor in a DPCM.  
b) Explain the working of delta modulation system with a neat block diagram. [7+8]
- 3.a) Explain the signal space representation of a QPSK.  
b) Explain the procedure of coherent detection of signals in noise. [8+7]
- 4.a) Explain inter symbol interference and eye pattern.  
b) Explain Nyquist criterion for distortion less base band binary transmission. [7+8]
- 5.a) Write short notes on the following i) Mutual information ii) Self information.  
b) Explain Shannon-fano coding with an example. [7+8]
- 6.a) Explain matrix description of linear block codes.  
b) Draw the cycle encoder for a (7, 4) cyclic code. [8+7]
- 7.a) Explain various methods for describing convolution codes.  
b) Mention the difference between tree and trellis diagram. [7+8]
- 8.a) With the help of neat block diagram explain DS spectrum system with coherent binary PSK.  
b) Explain PN sequence. Also discuss its properties. [8+7]

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**R13**

**Code No: 126AN**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B. Tech III Year II Semester Examinations, May - 2017**

**DIGITAL COMMUNICATIONS**

**(Electronics and Communication Engineering)**

**Time: 3 hours**

**Max. Marks: 75**

**Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART - A**

**(25 Marks)**

- 1.a) Compare the performance of PCM and DM system. [2]
- b) What is slope overload distortion? Explain. [3]
- c) Write the expression for baud rate of BPSK system. [2]
- d) Explain advantages of coherent digital modulation schemes. [3]
- e) Sketch the wave form of the FSK signal for the input binary sequence 1100100010. [2]
- f) Define entropy and conditional entropy. [3]
- g) Define code rate of block code. [2]
- h) Mention various types of errors caused by noise in communication channel. [3]
- i) Define processing gain and jamming margin [2]
- j) Explain the generation of PN sequence. [3]

**PART - B**

**(50 Marks)**

- 2.a) A voice frequency signal band limited to 3kHz is transmitted with the use of the DM system. The pulse repetition frequency is 30,000 pulses per second, and the step size is 40mV. Determine the permissible speech signal amplitude to avoid slope overload.
- b) Derive the expression for overall SNR in a ADM system. [5+5]

**OR**

- 3.a) In a binary PCM system, the output signal to quantizing noise ratio is to be held to a minimum of 40dB. Determine the number of required levels and find the corresponding output signal to quantization noise ratio.
- b) Explain the modulation and demodulation procedure in DPCM system. [5+5]
- 4.a) Explain frequency shift keying. Describe coherent detection of FSK signals. What should be the relationship between bit-rate and frequency-shift for a better performance?
- b) Explain non coherent detection method of binary frequency shift keying scheme. [5+5]

**OR**

- 5.a) Explain coherent detection of PSK signals and derive probability of error.
- b) Differentiate coherent and non-coherent detection techniques. [5+5]

- 6.a) Derive the bit error probability of a coherent ASK signaling scheme.
- b) Apply Shannon-Fano coding procedure of  $M=2$  and  $M=3$   $[X]=[x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8]$  with probability  $[P]=[1/4, 1/8, 1/16, 1/16, 1/4, 1/16, 1/8, 1/16]$ . [5+5]

**OR**

- 7.a) Compare code efficiency of Shannon Fano coding and Huffman coding when five source messages have probabilities  $m_1=0.4, m_2=0.15, m_3=0.15, m_4=0.15, m_5=0.15$ .
- b) Obtain the probability of bit error for coherently detected BPSK. [5+5]

- 8.a) We transmit either a 1 or a 0, and add redundancy by repeating the bit. (i) Show that if we transmit 11111 or 00000, then 2 errors can be corrected. (ii) Show that in general if we transmit the same bit  $2t+1$  times we can correct upto  $t$  errors.

- b) What are code tree, code trellis and state diagrams for convolution encoders? [5+5]

**OR**

- 9.a) Design the encoder for the  $(7, 4)$  cyclic code generated by  $G(p)=p^3+p^2+1$  and also verify the operation for any message vector.

- b) Derive the steps involved in generation of linear block codes. Define and explain the properties of syndrome. [6+4]

- 10.a) Derive the necessity of DSSS techniques. Draw the transmitter and receiver block diagram and explain.

- b) Write a note on CDMA. [6+4]

**OR**

- 11.a) Explain the advantages and applications of spread spectrum modulation.

- b) Discuss the frequency hopping spread spectrum technique in detail. [4+6]

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Code No: 126AN

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech III Year II Semester Examinations, October/November-2016

DIGITAL COMMUNICATIONS

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 75

**Note:** This question paper contains two parts A and B.  
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

## PART - A

(25 Marks)

- 1.a) Compare PCM and DM. [2]
- b) Write the advantages of digital communication. [3]
- c) Define QPSK. [2]
- d) Draw the block diagram of the PLL. [3]
- e) Define Baseband transmission. [2]
- f) Define conditional entropy. [3]
- g) Mention the properties of cyclic code. [2]
- h) Write the advantages of convolution codes. [3]
- i) List out the applications of CDMA. [2]
- j) Define spread spectrum. List its uses. [3]

## PART - B

(50 Marks)

- 2.a) What is Hartley Shannon law? And explain sampling theorem.
  - b) With a neat sketch describe ADPCM concept. [5+5]
- OR**
- 3.a) Explain the tradeoff between bandwidth and signal to noise ratio.
  - b) Distinguish between analog communication and digital communication. [5+5]
- 4.a) Draw and explain the operating principle of ASK Modulator.
  - b) Describe the BPSK modulation technique with the help of a neat diagram. [5+5]
- OR**
- 5.a) Explain the DPSK modulation technique with the help of a neat sketch.
  - b) Explain the working of non-coherent FSK detector. [5+5]
- 6.a) Draw and explain the working of optimum receiver with a neat diagram.
  - b) Define eye diagram. Draw the eye diagram for FSK. [5+5]
- OR**
- 7.a) Explain Huffman coding with an example.
  - b) Explain crosstalk concept. [5+5]



- 8.a) Describe the algebraic structure of cyclic codes. [5+5]  
b) Explain how to encode cyclic codes.

OR

- 9.a) Give the matrix description for linear block codes. [5+5]  
b) Decode convolution process using viterbi algorithm.

- 10.a) What are the characteristics of PN sequences? Explain [5+5]  
b) Describe the process of code division multiple access in detail.

OR

- 11.a) Describe with a neat sketch the direct sequence Spread spectrum technique. [5+5]  
b) Describe the concept of Ranging using DSSS.

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**R13**

**Code No: 126AN**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B.Tech III Year II Semester Examinations, October/November-2016**

**DIGITAL COMMUNICATIONS**

**(Electronics and Communication Engineering)**

**Time: 3 hours**

**Max. Marks: 75**

**Note:** This question paper contains two parts A and B.  
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART - A**

**(25 Marks)**

- 1.a) Compare PCM and DM. [2]
- b) Write the advantages of digital communication. [3]
- c) Define QPSK. [2]
- d) Draw the block diagram of the PLL. [3]
- e) Define Baseband transmission. [2]
- f) Define conditional entropy. [3]
- g) Mention the properties of cyclic code. [2]
- h) Write the advantages of convolution codes. [3]
- i) List out the applications of CDMA. [2]
- j) Define spread spectrum. List its uses. [3]

**PART - B**

**(50 Marks)**

- 2.a) What is Hartley Shannon law? And explain sampling theorem. [5+5]
  - b) With a neat sketch describe ADPCM concept. [5+5]
- OR**
- 3.a) Explain the tradeoff between bandwidth and signal to noise ratio. [5+5]
  - b) Distinguish between analog communication and digital communication. [5+5]
- 4.a) Draw and explain the operating principle of ASK Modulator. [5+5]
  - b) Describe the BPSK modulation technique with the help of a neat diagram. [5+5]
- OR**
- 5.a) Explain the DPSK modulation technique with the help of a neat sketch. [5+5]
  - b) Explain the working of non-coherent FSK detector. [5+5]
- 6.a) Draw and explain the working of optimum receiver with a neat diagram. [5+5]
  - b) Define eye diagram. Draw the eye diagram for FSK. [5+5]
- OR**
- 7.a) Explain Huffman coding with an example. [5+5]
  - b) Explain crosstalk concept. [5+5]

- 8.a) Describe the algebraic structure of cyclic codes.
- b) Explain how to encode cyclic codes. [5+5]

**OR**

- 9.a) Give the matrix description for linear block codes.
- b) Decode convolution process using viterbi algorithm. [5+5]

- 10.a) What are the characteristics of PN sequences? Explain
- b) Describe the process of code division multiple access in detail. [5+5]

**OR**

- 11.a) Describe with a neat sketch the direct sequence Spread spectrum technique.
- b) Describe the concept of Ranging using DSSS. [5+5]

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POP

**R09**

**Code No: 56026**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B. Tech III Year II Semester Examinations, October/November - 2016**

**DIGITAL COMMUNICATIONS**

**(Electronics and Communication Engineering)**

**Time: 3 hours**

**Max. Marks: 75**

**Answer any five questions  
All questions carry equal marks**

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- 1.a) State Shannon-Hartley law and explain its significance. Also derive Shannon's limit.  
b) What is aliasing effect? Suggest a remedy to prevent it. [7+8]
- 2.a) Derive the expression for signal to quantization noise ration in PCM system.  
b) Discuss the drawbacks of DM system. [8+7]
3. Explain coherent detection of FSK and also derive the expression for probability of error. [15]
- 4.a) A source emits different symbols a, b, c, d, e with respective probabilities 0.1,0.2,0.1,0.1,0.5. Obtain the code words using Huffman coding and also calculate entropy.  
b) Define conditional entropy. Explain how it is related to mutual information. [7+8]
- 5.a) Derive the expression for probability of error of optimum receiver.  
b) Write short notes on cross talk. [8+7]
- 6.a) Explain the error correction procedure using syndrome in cyclic codes.  
b) Write the matrix description of linear block codes. [8+7]
- 7.a) Explain generation of convolutional code using an example. Also explain the term constraint length and its significance in convolutional code.  
b) Write the steps to be followed in Viterbi decoding of convolutional codes. [8+7]
8. Write short notes on:  
a) Ranging using DSSS.  
b) CDMA. [7+8]

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