(Please write your Exam Roll No.)

Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH/M.TECH] DECEMBER 2017

Paper Code: IT-303 **Subject: Analog and Digital Communications**

Time: 3 Hours **Maximum Marks: 60**

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each Unit. Assume missing data if any.

Q1 (a) Compare PCM and Delta Modulation in terms of their figure of merits.
(b) A source emits one of four messages randomly every 1 microsecond. The probabilities of these messages are 0.5, 0.3, 0.1 and 0.1. Messages are independently generated (i) what is the source entropy? (ii) obtain a compact binary code and determine the average length of the codeword, the efficiency and the redundancy of this code rate.
(c) Determine the Nyquist sampling rate and sampling interval for the signal (i) $\sin(100\pi t) + \sin(200\,\pi t)$ (ii) $\cos^2(2000\,\pi t)$.
(d) Draw and explain circuit of envelope detector for AM.
(e) Discuss Quadrature Amplitude Modulation (QAM) with the help of block diagram. **(5x4=20)**

Unit-I

Q2 (a) The output power of 60% modulated AM generator is 2 A. To what value will this current rise if the generator is modulated additionally by another audio wave, whose modulation index is 0.6? What will be the percentage power saving if the carrier and one of the sideband are now suppressed. **(5)**
(b) Explain trapezoidal method of monitoring A.M waveform directly on an oscilloscope. Sketch trapezoidal pattern for $0 \leq m \leq 1$. **(5)**

Q3 (a) Explain balanced modulator. Why a ring modulator is known as a double balanced modulator. **(5)**
(b) Explain Phasing method for generation SSBSC signal in detail. **(5)**

Unit-II

Q4 (a) Explain Foster-Seelay discriminator in detail. **(5)**
(b) Explain the importance of pre-emphasis and de-emphasis circuits. Why it is not useful in phase modulation but useful in frequency modulation? **(5)**

Q5 (a) Explain the Armstrong method of FM generation with neat diagram. **(5)**
(b) An FM wave is given by $e(t) = 20\sin(6 * 10^8 t + 7\sin 1250t)$. Determine (i) carrier frequency (ii) modulating frequency (iii) modulation index (iv) maximum deviation and (v) Transmitted power. **(5)**

Unit-III

Q6 (a) Write the difference between coherent and non-coherent detection techniques? Describe non-coherent detection of FSK signal. **(5)**
(b) What is advantage of Differential Phase-Shift Keying (DPSK) over BPSK? Explain DPSK modulation technique in detail. **(5)**

P.T.O.

IT-303
P1/2

Q7 (a) What is Delta Modulation? Draw the block diagram of Delta modulator transmitter and explain its working with waveforms. (5)

(b) A television signal with bandwidth of 4.2 MHz is transmitted using binary PCM. The number of quantization levels are 512. Calculate: (5)

(i) Code word length
(ii) Transmission bandwidth
(iii) Final bit rate
(iv) Output signal to quantization noise ratio

Unit-IV

Q8 (a) A source emits three equiprobable message randomly and independently. Find the source entropy. Find a compact binary code the average length of the code word, the code efficiency and the redundancy. (5)

(b) Construct a single-error correct (7, 4) linear block code and the corresponding decoding table. (5)

Q9 (a) Define information and entropy of a source. What is mutual information? What is its significance? A memoryless source emits messages m_1 and m_2 with probabilities 0.8 and 0.2 respectively. Find the Huffman binary code for this source and determine its efficiency. (5)

(b) Explain code tree, code trellis and state diagram for convolution encoders having generator polynomial $g_1 = [101]$ and $g_2 = [111]$. (5)

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IT-303

(Please write your Exam Roll No.) *Exam Roll No. .....*

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH/M.TECH] DECEMBER 2017

Paper Code: IT-303	*Subject: Analog and Digital Communications*
Time: 3 Hours	*Maximum Marks: 75*

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each Unit. Assume missing data if any.

Q1 (a) Compare PCM and Delta Modulation in terms of their figure of merits.
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(c) Determine the Nyquist sampling rate and sampling interval for the signal (i) $\sin(100\pi t) + \sin(200\,\pi t)$ (ii) $\cos^2(2000\,\pi t)$.
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Unit-I

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(b) Explain trapezoidal method of monitoring A.M waveform directly on an oscilloscope. Sketch trapezoidal pattern for $0 \leq m \leq 1$. **(6)**

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Unit-II

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(b) What is advantage of Differential Phase-Shift Keying (DPSK) over BPSK? Explain DPSK modulation technique in detail. **(6)**

P.T.O.

IT-303

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(ii) Transmission bandwidth
(iii) Final bit rate
(iv) Output signal to quantization noise ratio

Unit-IV

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(b) Construct a single-error correct (7, 4) linear block code and the corresponding decoding table. (6.5)

Q9 (a) Define information and entropy of a source. What is mutual information? What is its significance? A memoryless source emits messages m_1 and m_2 with probabilities 0.8 and 0.2 respectively. Find the Huffman binary code for this source and determine its efficiency. (6)

(b) Explain code tree, code trellis and state diagram for convolution encoders having generator polynomial $g_1 = [101]$ and $g_2 = [111]$. (6)

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(Please write your Exam Roll No.)

Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.] DEC. 2014-JAN. 2015

Paper Code: IT303 **Subject: Analog & Digital Communications**

Time : 3 Hours **Maximum Marks :60**

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each unit.

Q1 (a) Differentiate between Analog and Digital signals. Discuss pros and cons of these signals. Give atleast two application of each.
(b) Draw the Spectrum of Frequency Modulated signal and express the relation for bandwidth requirement.
(c) How do you avoid aliasing effect in sampled signals and show this effect pictorically?
(d) List the major demerits of Delta modulation and how these can overcome?
(e) What is entropy of a source, give the formula and explain the significance of this term in information theory? **(4x5=20)**

UNIT-I

Q2 Explain one of the methods to generate Standard AM signal (DSB, Full carrier), deduce the relation for bandwidth and represent the signal in time domain and frequency domain. **(10)**

Q3 Discuss about the following two entities used for statistical analysis of Random signals:-
(a) Power Spectral Density (PDF)
(b) Autocorrelation Function
How these two parameters are interrelated? **(10)**

UNIT-II

Q4 Describe Armstrong method to generate frequency modulated signal. Draw its spectrum. Discuss about bandwidth requirement of Narrowband and wideband FM signals. **(10)**

Q5 Describe the generation and detection of Pulse width Modulation (PWM) signal. Draw all the relevant waveforms. **(10)**

UNIT-III

Q6 What is quantization and quantization error? Obtain the relation for signal to Quantization noise ratio of uniform quantizer that is used to make the signal discrete in amplitude domain. Why non-uniform quantization is preferred over uniform quantization? **(10)**

Q7 Draw and explain the block diagram to Generate QPSK signals over Binary PSK (BPSK) signals. Draw the constellation diagram for BPSK and QPSK. **(10)**

UNIT-IV

Q8 A discrete Memory less source has an alphabet of eight letters with probabilities 0.25, 0.20, 0.15, 0.12, 0.10, 0.08, 0.05, 0.05. Use the Huffman encoding procedure to determine the binary code for the source output. **(10)**

Q9 Write short notes on **any two** of the following:- (2X5=10)
(a) Block codes
(b) Convolutional codes
(c) Significance of S/N ratio and Noise figure.

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D 401

(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.]- DECEMBER 2010

Paper Code: IT303 **Subject: Analog & Digital Communication**
Paper ID: 15303

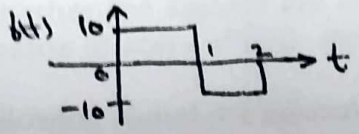
Time : 3 Hours **Maximum Marks : 60**

Note: Attempt any five questions including Q.1 which is compulsory. Attempt one question from each unit.

Q1 (a) Give the general block diagram of a typical electrical communication system. (2)
(b) Explain the physical significance of (i) Convolution between two signals (ii) Auto-correlation function. (3)
(c) Give the representation of following signals in time domain:- (3)
(i) AM-DSB/SC (ii) FM signal (3)
(d) Explain the features of asynchronous multiplexing. (3)
(e) What is the difference between coherent and incoherent detection of digital carrier modulation systems? (3)
(f) Explain the terms (i) rate of information (ii) entropy. (3)
(g) What is meant by (i) noise figure (ii) equivalent noise temperature of a communication system? (3)

UNIT-I

Q2 (a) A rectangular pulse is given by $f(t) = A; \quad -T/2 < t < +T/2$ $= 0; \quad otherwise$ find (i) auto-correlation (ii) spectral density. (5)
(b) Find the Fourier transform of the signal given in fig.1 (5)



Q3 (a) Explain the basic principle of AM modulation and demodulation using diode. Give neat circuit diagrams and necessary waveforms. (7)
(b) List the power and bandwidth requirements for various types of AM signals. (3)

UNIT-II

Q4 (a) State and explain Sampling Theorem for band-limited signals. A signal is given by $f(t) = 2\cos^2 100\pi t + 10\sin 200\pi t.\cos 400\pi t$. Find Nyquist rate of sampling. (3)
(b) Explain the difference between (i) narrowband FM (ii) wideband FM. (3)
(c) Compare the features of AM, FM and PM. (4)

Q5 Explain the method of generation of various pulse modulated signals. How will you regenerate the baseband signal from these pulse modulated signals? Give the principle of time-division multiplexing with reference to pulse modulated signals. (10)

UNIT-III

Q6 (a) What are the advantages of digital communication over analog communications? (3)
(b) Compare the features of DM, ADM and ADPCM systems. (7)

Q7 Using block diagrams and necessary waveforms, explain the generation and demodulation of following signals (a) DPSK (b) QPSK. (10)

UNIT-IV

Q8 (a) Find (i) Shannon Fano's Codes (ii) Huffman's Codes, for following symbols with probabilities mentioned: (7)
$P(A) = 0.4; \quad P(B) = 0.2; \quad P(C) = 0.25;$
$P(D) = 0.1; \quad P(E) = 0.045; \quad P(F) = 0.005$
(b) Why coding of signals is required in digital communication systems? Explain by taking suitable examples. (3)

Q9 List various error detection and correction codes. What are the features and typical applications of (a) Block codes (b) Convolution codes? Give typical suitable examples. (10)

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END TERM EXAMINATION

FIFTH SEMESTER [B.TECH] NOVEMBER-DECEMBER 2018

Paper Code: IT-303 **Subject: Analog and Digital Communication**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q no.1 which is compulsory. Select one question from each unit.

Q1 (a) Find the Fourier transform of a periodic gate function with period T=1/2 and width τ=1/20. **(6.25)**

(b) Consider a FM broadcast signal which has been modulated by a single tone modulating signal of frequency f_m=15 KHz. The frequency deviation is the same as allowed by the international regulation. Find the significant sidebands and the bandwidth of the FM signal as a result of these sidebands. **(6.25)**

(c) Explain the process of QAM demodulation. **(6.25)**

(d) A continuous signal is band limited to 5 kHz. The signal is quantized in 8 levels of a PCM system with the probabilities 0.25, 0.2, 0.2, 0.1, 0.05, 0.05, and 0.05. Calculate the entropy and the rate of information. **(6.25)**

UNIT-I

Q2 (a) Write a note on suppressed carrier system (DSB-SC). Explain how baseband signal is recovered using synchronous detection? **(6)**

(b) In an AM-SC system, the modulating signal is a single-tone sinusoid $E_m Cosw_m t$ which modulates a carrier signal $E_c Cosw_c t$. Plot the spectrum of the modulates wave. **(6.5)**

Q3 (a) Explain with the help of block diagram generation and demodulation process of AM. **(6)**

(b) Find the convolution with itself of a rectangular pulse shown in Fig. 1 using Time-Convolution theorem. **(6.5)**

UNIT-II

Q4 (a) Explain with the help of block diagram and mathematical expressions to the method for generating narrowband FM signal. **(6)**

(b) A single-tone modulating signal cos ($15\pi 10^3 t$) frequency modulates a carrier of 10 MHz and produces a frequency deviation of 75 KHz. Find (i) the modulation index and (ii) Phase deviation produced in the FM waves. **(6.5)**

Q5 (a) Explain with the help of suitable block diagram and expression baseband binary PAM transmission system. **(6)**

(b) Find the minimum value of the average probability of error in optimum filter. **(6.5)**

UNIT-III

Q6 (a) Write a note on Delta modulation system. **(6)**

(b) Explain various elements of a PCM system. **(6.5)**

P.T.O.

IT-303

P1/2

B/323

Q7 (a) Explain with the help of block diagram coherent QPSK transmitter and receiver. (6)

(b) Write a note on ADPCM. (6.5)

UNIT-IV

Q8 For a (6,3) code the generator matrix is given below. The received word is 100011. Find the transmitted information word. (12.5)

$$G = \left[\begin{array}{ccc:cc} 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 \end{array}\right]$$

Q9 Consider a source with 7 messages having probabilities 0.25, 0.25, 0.125, 0.125, 0.125, 0.0625, 0.0625 respectively. Find entropy and efficiency using Huffman coding procedure. (12.5)

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END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.] DECEMBER-2013

Paper Code: IT-303 **Subject: Analog & Digital Communication**

Time : 3 Hours **Maximum Marks :60**

Note: Attempt five questions including Q.No.1 which is compulsory. Select one question from each unit.

Q.1 (a) Explain the need for modulation in communication system. (2)

(b) Compare energy spectral density function and power spectral density function. (2)

(c) Show that the maximum power efficiency of an AM modular is 50%. (2)

(d) What do you mean by Hilbert transfer and inverse Hilbert transform. (2)

(e) Draw the block diagram to show the process of generation of FM using phase modulator. (2)

(f) What is aliasing and how it is reduced? (2)

(g) What is slope overload distortion? (2)

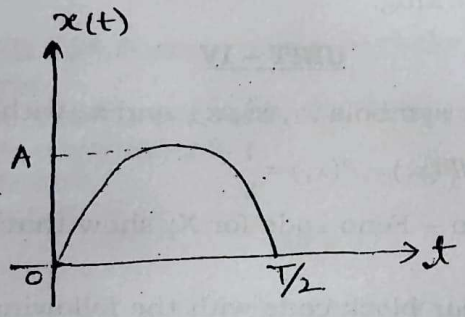
(h) Explain the concept of Non-coherent BPSK. (2)

(i) State source coding theorem. (2)

(j) State the properties of Linear block codes. (2)

UNIT – I

Q.2 (a) Determine the Fourier transform of the sinusoidal pulse shown in Fig.1. (5)



(b) Prove that the convolution of a function x(f) with an unit impulse function results the function itself. (5)

OR

Q.3 (a) Explain the square-law diode modulation method for AM generation. (5)

(b) Compare the three main system of SSB generation by drawing up a table of the outstanding characteristics of each system. (5)

UNIT – II

Q.4 A baseband or modulating signal $x(t) = 5\cos 2\pi 15x10^3 t$ angle modulates a carrier signal $A\cos\omega_c t$ (10)

(i) Determine the modulation index and band width for (a) FM System (b) PM System

(ii) find the change in the bandwidth and modulation index for both FM and PM if modulating frequency fm is reduced to 5KHZ. Assume $K_f = K_p = 15$ KHz/Volt

P.T.O

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OR

Q.5 (a) Find the Nyquist rate and the Nyquist internal for the signal. (5)

$$x(t) = \frac{1}{2\pi}\cos(4000\pi t)\cos(1000\pi t)$$

(b) Write short notes on **any two** (2.5X2=5)

(i) Asynchronous Multiplexing
(ii) FDM
(iii) PWM detector

UNIT – III

Q.6 (a) Explain the quantization error and derive an expression for maximum signal to noise ratio in PCM system that uses Linear quantization. (5)

(b) With the help of neat diagram explain the transmitter and receiver of PCM. (5)

OR

Q.7 (a) Draw the block diagram of DPSK modulator and explain how synchronization problem is avoided for its detection. (5)

(b) What is QPSK. Draw the block diagram of generation of QPSK system and explain its working. (5)

UNIT – IV

Q.8 (a) A DMS X has four symbols x_1, x_2, x_3, and x_4 with (5)

$$P(x_1) = \frac{1}{2}, P(x_2) = \frac{1}{4} and P(x_3) = P(x_4) = \frac{1}{8}.$$

Construct a Shannon – Feno code for X; show that the code efficiency is 100 percent.

(b) Given a (6,3) Linear block code with the following parity-check matrix H; (5)

$$H = \begin{bmatrix} 101100 \\ 011010 \\ 111001 \end{bmatrix}$$

(i) Find the generator matrix
(ii) Find the code word for the data bit 101.

OR

Q.9 Write short notes on **any two** (5X2=10)

(a) Convolution Codes
(b) Entropy and information rate
(c) Noise temperature and Noise figure.

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(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.] DECEMBER 2016

Paper Code: IT-303 **Subject: Analog and Digital Communication**

Time: 3 Hours **Maximum Marks: 60**

Note: Attempts any five questions including Q no.1 which is compulsory. Select one question from each unit.

Q1 (a) What is difference between time – division multiplexing. (TDM) and Frequency division multiplexing (FDM). **(4)**

(b) Give the advantages of digital communication. List some practical applications of such communication. **(4)**

(c) Explain the terms: **(4)**
(i) Noise temperature (T_e)
(ii) Noise figure (F)
(iii) S/N ratio (SNR)

(d) What is the need of representation of any signal in terms of Fourier transform in communication? Give typical examples. **(4)**

(e) What is the effect of Quantization in digital communication? What is meant by base-band digital signal? **(4)**

UNIT-I

Q2 Using block/functional diagram, explain a typical method of generation and demodulation of AM-DSB/SC signal. **(10)**

Q3 A signal is given by **(10)**
$X(t) = A \cos\omega_o t$
Find (i) auto – correlation function (ACF)
(ii) power spectral density (PSD)
(iii) power contained in the signal

UNIT-II

Q4 What are the advantages of FM over AM? Explain the difference between narrowband and wideband FM signals. Give the relation between FM and PM signals. **(10)**

Q5 Explain the sampling theorem for band-limited signals. What is the Nyquist rate of sampling? List important features of PAM, PWM and PPM signals. **(10)**

UNIT-III

Q6 Compare the features of following digital communication systems: **(10)**
(i) PCM (ii) DM (iii) ADPCM

Q7 Explain the difference between coherent and non-coherent demodulation of digital signals. Give the basic principle of ASK, FSK and PSK systems. **(10)**

UNIT-IV

Q8 What are various error detection and correction codes? Using typical examples, explain the application of block codes and convolution codes. **(10)**

Q9 Explain the significance of:- **(10)**
(a) Rate of information
(b) Entropy
(c) Coding efficiency.
Using typical examples, explain the difference between Shannon-Fano and Huffman coding.

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(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.] DECEMBER 2015

Paper Code: IT303 **Subject: Analog & Digital Communication**

Time: 3 Hours **Maximum Marks: 60**

Note: Attempt any five questions including Q no.1 which is compulsory. Internal choice is indicated.

Q1 Answer the following:-

(a) What are the basic signals? Explain. Also find the Fourier transform of unit step signal. **(4)**

(b) What do you mean by modulation index? Explain how bandwidth is dependent on the modulation index in FM. **(3)**

(c) What is quantization noise? Explain the different type of quantization noise in communication system. **(4)**

(d) Explain the Shannon's channel capacity theorem. **(3)**

(e) What is the need of modulation in communication system? Explain using examples. **(3)**

(f) A signal is transmitted over a medium with bandwidth of 4 KHz. If signal power is 64 Watts and a white Gaussian noise is added to the signal in medium is of power 2Watt. Find the required capacity of the medium. **(3)**

Q2 (a) Compare the different scheme AM, DSBSC and SSBSC. Explain which one is power efficient. **(5)**

(b) What do you mean Auto Correlation and Cross Correlation of the signals? What is the significance of Correlation functions in communication system? **(5)**

OR

Q3 (a) Explain the various communication systems using block diagram. **(5)**

(b) Draw Fourier spectrum of DSBSC and also find the power spectral density. **(5)**

Q4 (a) What is the difference between narrow band and wideband FM? **(5)**

(b) Explain the PWM scheme. How PWM and PPM signals are generated? Explain. **(5)**

OR

Q5 (a) Explain the sampling theorem. What is significance of Nyquist theorem at receiver in communication systems? **(5)**

(b) Compare the FM and PM scheme. **(5)**

Q6 (a) Explain the ADM scheme. What are the advantages of ADM over DM? **(5)**

(b) What are the steps for generation of digital signal from an analog signal? Explain the advantages of encoding of the signals. **(5)**

OR

Q7 (a) What do you mean by multiplexing? What are the advantages of multiplxing in communication system? **(5)**

(b) Find the probability of error for ASK, PSK, and FSK. Also draw the constellation diagram for each. **(5)**

Q8 (a) Compare the Shannon's and Huffman's coding scheme using an example. Which one is better? **(5)**

(b) A DMS X has five symbols x1, x2, x3, x4, and x5 with p(x1) = 0.4, p(x2) = 0.19, p(x3) = 0.16, p(x4) = 0.15 and p(x5) = 0.1. **(5)**

(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.

OR

Q9 (a) What is the difference between source coding and channel coding? Define entropy and rate of information. **(5)**

(b) What are convolution codes? How are they different from block codes? **(5)**

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(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH.] DEC.-2019

Paper Code: IT303 **Subject: Analog & Digital Communications**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt any five questions in all including Q. No. 1 which is compulsory. Assume suitable missing data if any

Q1. i) What is code rate & constraint length in error correcting codes. List their significance.
ii) Define source entropy. When is it maximum.
iii) Compare coherent, incoherent & partially coherent reception along with their merits/ demerits.
iv) Sketch the auto correlation & PSD for while noise.
v) What is adoptive PCM. Why is it needed. **(5x3=15)**

Q2. a) Compare & constant the various signal types: Analog, Pulse & Digital & then associated communication schemes. What is the great benefit of Digital over Analog & what is the disadvantage of Digital Signaling. **(9)**

b) What is meant by PSD. Draw the PSD for a Gate function & AWGN & label the axes. **(6)**

Q3. a) Explain the need for modulation. State & prove the frequency shifting property of fourier transform. **(9)**

b) Sketch & work out the Autocorrelation & Crosscorrelation between $\sin \omega_0 t$ & $\cos \omega_0 t$. Are they orthogonal? **(6)**

Q4. a) Explain with neatly labeled B.D.s any one means of generating & demodulating AM. **(10)**

b) Show that the carrier occupies at least $2/3^{rd}$ of power in DSB-FC **(5)**

Q5. a) What is Narrow Band & Wide Band FM. State the Carrons Rule for FM bandwidth. **(5)**

b) State & Prove the sampling theorem for band limited signals. What is an Antialiasing fitter. **(10)**

Q6. a) If 20 baseband signals each 1 MHz wide (videosignals) are multiplexed using TDM, find the bandwidth consumed by the TDM signals. **(5)**

b) Show that SNR of a uniform Quantizer varies as $1/\Delta^2$ where Δ is the step size. **(10)**

Q7. a) What is DPCM. Explain its key principles & show how it can be refined further using a predictor. Give relevant B.D. & necessary mathematical expressions. **(5)**

b) With a neat B.D. explain the working of a BPSK Modem. Why are modems used in computer data transmission. Draw the signal constellation of BPSK . **(10)**

Q8. a) Show how Shannon – Fano coding can help compact a digital source representation. Take a suitable example. **(9)**

b) How many errors can a 7 bit Hamming Code detect and correct. Explain using codeword space. **(6)**

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Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.] DECEMBER 2016

Paper Code: IT-303 **Subject: Analog and Digital Communication**

Time: 3 Hours **Maximum Marks: 60**

Note: Attempts any five questions including Q no.1 which is compulsory. Select one question from each unit.

Q1 (a) What is difference between time – division multiplexing. (TDM) and Frequency division multiplexing (FDM). **(4)**

(b) Give the advantages of digital communication. List some practical applications of such communication. **(4)**

(c) Explain the terms: **(4)**
(i) Noise temperature (T_e)
(ii) Noise figure (F)
(iii) S/N ratio (SNR)

(d) What is the need of representation of any signal in terms of Fourier transform in communication? Give typical examples. **(4)**

(e) What is the effect of Quantization in digital communication? What is meant by base-band digital signal? **(4)**

UNIT-I

Q2 Using block/functional diagram, explain a typical method of generation and demodulation of AM-DSB/SC signal. **(10)**

Q3 A signal is given by **(10)**
$X(t) = A \cos\omega_o t$
Find (i) auto – correlation function (ACF)
(ii) power spectral density (PSD)
(iii) power contained in the signal

UNIT-II

Q4 What are the advantages of FM over AM? Explain the difference between narrowband and wideband FM signals. Give the relation between FM and PM signals. **(10)**

Q5 Explain the sampling theorem for band-limited signals. What is the Nyquist rate of sampling? List important features of PAM, PWM and PPM signals. **(10)**

UNIT-III

Q6 Compare the features of following digital communication systems: **(10)**
(i) PCM (ii) DM (iii) ADPCM

Q7 Explain the difference between coherent and non-coherent demodulation of digital signals. Give the basic principle of ASK, FSK and PSK systems. **(10)**

UNIT-IV

Q8 What are various error detection and correction codes? Using typical examples, explain the application of block codes and convolution codes. **(10)**

Q9 Explain the significance of:- **(10)**
(a) Rate of information
(b) Entropy
(c) Coding efficiency.
Using typical examples, explain the difference between Shannon-Fano and Huffman coding.

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(Please write your Exam Roll No.)

Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.] DECEMBER 2016

Paper Code: IT-303 **Subject: Analog and Digital Communication**

Time: 3 Hours **Maximum Marks: 60**

Note: Attempts any five questions including Q no.1 which is compulsory. Select one question from each unit.

Q1 (a) What is difference between time – division multiplexing. (TDM) and Frequency division multiplexing (FDM). **(4)**

(b) Give the advantages of digital communication. List some practical applications of such communication. **(4)**

(c) Explain the terms: **(4)**
(i) Noise temperature (T_e)
(ii) Noise figure (F)
(iii) S/N ratio (SNR)

(d) What is the need of representation of any signal in terms of Fourier transform in communication? Give typical examples. **(4)**

(e) What is the effect of Quantization in digital communication? What is meant by base-band digital signal? **(4)**

UNIT-I

Q2 Using block/functional diagram, explain a typical method of generation and demodulation of AM-DSB/SC signal. **(10)**

Q3 A signal is given by **(10)**
$X(t) = A \cos\omega_o t$
Find (i) auto – correlation function (ACF)
(ii) power spectral density (PSD)
(iii) power contained in the signal

UNIT-II

Q4 What are the advantages of FM over AM? Explain the difference between narrowband and wideband FM signals. Give the relation between FM and PM signals. **(10)**

Q5 Explain the sampling theorem for band-limited signals. What is the Nyquist rate of sampling? List important features of PAM, PWM and PPM signals. **(10)**

UNIT-III

Q6 Compare the features of following digital communication systems: **(10)**
(i) PCM (ii) DM (iii) ADPCM

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UNIT-IV

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Q9 **(10)**
Explain the significance of:-
(a) Rate of information
(b) Entropy
(c) Coding efficiency.
Using typical examples, explain the difference between Shannon-Fano and Huffman coding.

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(Please write your Exam Roll No.)

Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.] DECEMBER 2015

Paper Code: IT303 **Subject: Analog & Digital Communication**

Time: 3 Hours **Maximum Marks: 60**

Note: Attempt any five questions including Q no.1 which is compulsory. Internal choice is indicated.

Q1 Answer the following:-

(a) What are the basic signals? Explain. Also find the Fourier transform of unit step signal. **(4)**

(b) What do you mean by modulation index? Explain how bandwidth is dependent on the modulation index in FM. **(3)**

(c) What is quantization noise? Explain the different type of quantization noise in communication system. **(4)**

(d) Explain the Shannon's channel capacity theorem. **(3)**

(e) What is the need of modulation in communication system? Explain using examples. **(3)**

(f) A signal is transmitted over a medium with bandwidth of 4 KHz. If signal power is 64 Watts and a white Gaussian noise is added to the signal in medium is of power 2Watt. Find the required capacity of the medium. **(3)**

Q2 (a) Compare the different scheme AM, DSBSC and SSBSC. Explain which one is power efficient. **(5)**

(b) What do you mean Auto Correlation and Cross Correlation of the signals? What is the significance of Correlation functions in communication system? **(5)**

OR

Q3 (a) Explain the various communication systems using block diagram. **(5)**

(b) Draw Fourier spectrum of DSBSC and also find the power spectral density. **(5)**

Q4 (a) What is the difference between narrow band and wideband FM? **(5)**

(b) Explain the PWM scheme. How PWM and PPM signals are generated? Explain. **(5)**

OR

Q5 (a) Explain the sampling theorem. What is significance of Nyquist theorem at receiver in communication systems? **(5)**

(b) Compare the FM and PM scheme. **(5)**

Q6 (a) Explain the ADM scheme. What are the advantages of ADM over DM? **(5)**

(b) What are the steps for generation of digital signal from an analog signal? Explain the advantages of encoding of the signals. **(5)**

OR

Q7 (a) What do you mean by multiplexing? What are the advantages of multiplxing in communication system? **(5)**

(b) Find the probability of error for ASK, PSK, and FSK. Also draw the constellation diagram for each. **(5)**

Q8 (a) Compare the Shannon's and Huffman's coding scheme using an example. Which one is better? **(5)**

(b) A DMS X has five symbols x1, x2, x3, x4, and x5 with p(x1) = 0.4, p(x2) = 0.19, p(x3) = 0.16, p(x4) = 0.15 and p(x5) = 0.1. **(5)**

(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.

OR

Q9 (a) What is the difference between source coding and channel coding? Define entropy and rate of information. **(5)**

(b) What are convolution codes? How are they different from block codes? **(5)**

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(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH] NOVEMBER-DECEMBER 2018

Paper Code: IT-303 **Subject: Analog and Digital Communication**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q no.1 which is compulsory. Select one question from each unit.

Q1 (a) Find the Fourier transform of a periodic gate function with period T=1/2 and width τ=1/20. **(6.25)**

(b) Consider a FM broadcast signal which has been modulated by a single tone modulating signal of frequency f_m=15 KHz. The frequency deviation is the same as allowed by the international regulation. Find the significant sidebands and the bandwidth of the FM signal as a result of these sidebands. **(6.25)**

(c) Explain the process of QAM demodulation. **(6.25)**

(d) A continuous signal is band limited to 5 kHz. The signal is quantized in 8 levels of a PCM system with the probabilities 0.25, 0.2, 0.2, 0.1, 0.05, 0.05, and 0.05. Calculate the entropy and the rate of information. **(6.25)**

UNIT-I

Q2 (a) Write a note on suppressed carrier system (DSB-SC). Explain how baseband signal is recovered using synchronous detection? **(6)**

(b) In an AM-SC system, the modulating signal is a single-tone sinusoid $E_m Cos w_m t$ which modulates a carrier signal $E_c Cos w_c t$. Plot the spectrum of the modulates wave. **(6.5)**

Q3 (a) Explain with the help of block diagram generation and demodulation process of AM. **(6)**

(b) Find the convolution with itself of a rectangular pulse shown in Fig. 1 using Time-Convolution theorem. **(6.5)**

UNIT-II

Q4 (a) Explain with the help of block diagram and mathematical expressions to the method for generating narrowband FM signal. **(6)**

(b) A single-tone modulating signal cos $(15\pi 10^3 t)$ frequency modulates a carrier of 10 MHz and produces a frequency deviation of 75 KHz. Find (i) the modulation index and (ii) Phase deviation produced in the FM waves. **(6.5)**

Q5 (a) Explain with the help of suitable block diagram and expression baseband binary PAM transmission system. **(6)**

(b) Find the minimum value of the average probability of error in optimum filter. **(6.5)**

UNIT-III

Q6 (a) Write a note on Delta modulation system. **(6)**

(b) Explain various elements of a PCM system. **(6.5)**

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Q7 (a) Explain with the help of block diagram coherent QPSK transmitter and receiver. **(6)**

(b) Write a note on ADPCM. **(6.5)**

UNIT-IV

Q8 For a (6,3) code the generator matrix is given below. The received word is 100011. Find the transmitted information word. **(12.5)**

$$G = \left[\begin{array}{ccc:cc} 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 \end{array}\right]$$

Q9 Consider a source with 7 messages having probabilities 0.25, 0.25, 0.125, 0.125, 0.125, 0.125, 0.0625, 0.0625 respectively. Find entropy and efficiency using Huffman coding procedure. **(12.5)**

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(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH.] DEC.-2019

Paper Code: IT303 **Subject: Analog & Digital Communications**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt any five questions in all including Q. No. 1 which is compulsory. Assume suitable missing data if any

Q1. i) What is code rate & constraint length in error correcting codes. List their significance.
ii) Define source entropy. When is it maximum.
iii) Compare coherent, incoherent & partially coherent reception along with their merits/ demerits.
iv) Sketch the auto correlation & PSD for while noise.
v) What is adoptive PCM. Why is it needed. **(5x3=15)**

Q2. a) Compare & constant the various signal types: Analog, Pulse & Digital & then associated communication schemes. What is the great benefit of Digital over Analog & what is the disadvantage of Digital Signaling. **(9)**

b) What is meant by PSD. Draw the PSD for a Gate function & AWGN & label the axes. **(6)**

Q3. a) Explain the need for modulation. State & prove the frequency shifting property of fourier transform. **(9)**

b) Sketch & work out the Autocorrelation & Crosscorrelation between $\sin \omega_0 t$ & $\cos \omega_0 t$. Are they orthogonal? **(6)**

Q4. a) Explain with neatly labeled B.D.s any one means of generating & demodulating AM. **(10)**

b) Show that the carrier occupies at least $2/3^{rd}$ of power in DSB-FC **(5)**

Q5. a) What is Narrow Band & Wide Band FM. State the Carrons Rule for FM bandwidth. **(5)**

b) State & Prove the sampling theorem for band limited signals. What is an Antialiasing fitter. **(10)**

Q6. a) If 20 baseband signals each 1 MHz wide (videosignals) are multiplexed using TDM, find the bandwidth consumed by the TDM signals. **(5)**

b) Show that SNR of a uniform Quantizer varies as $1/\Delta^2$ where Δ is the step size. **(10)**

Q7. a) What is DPCM. Explain its key principles & show how it can be refined further using a predictor. Give relevant B.D. & necessary mathematical expressions. **(5)**

b) With a neat B.D. explain the working of a BPSK Modem. Why are modems used in computer data transmission. Draw the signal constellation of BPSK . **(10)**

Q8. a) Show how Shannon – Fano coding can help compact a digital source representation. Take a suitable example. **(9)**

b) How many errors can a 7 bit Hamming Code detect and correct. Explain using codeword space. **(6)**

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END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.] DECEMBER 2015

Paper Code: IT303 **Subject: Analog & Digital Communication**

Time: 3 Hours **Maximum Marks: 60**

Note: Attempt any five questions including Q no.1 which is compulsory. Internal choice is indicated.

Q1 Answer the following:-

(a) What are the basic signals? Explain. Also find the Fourier transform of unit step signal. **(4)**

(b) What do you mean by modulation index? Explain how bandwidth is dependent on the modulation index in FM. **(3)**

(c) What is quantization noise? Explain the different type of quantization noise in communication system. **(4)**

(d) Explain the Shannon's channel capacity theorem. **(3)**

(e) What is the need of modulation in communication system? Explain using examples. **(3)**

(f) A signal is transmitted over a medium with bandwidth of 4 KHz. If signal power is 64 Watts and a white Gaussian noise is added to the signal in medium is of power 2Watt. Find the required capacity of the medium. **(3)**

Q2 (a) Compare the different scheme AM, DSBSC and SSBSC. Explain which one is power efficient. **(5)**

(b) What do you mean Auto Correlation and Cross Correlation of the signals? What is the significance of Correlation functions in communication system? **(5)**

OR

Q3 (a) Explain the various communication systems using block diagram. **(5)**

(b) Draw Fourier spectrum of DSBSC and also find the power spectral density. **(5)**

Q4 (a) What is the difference between narrow band and wideband FM? **(5)**

(b) Explain the PWM scheme. How PWM and PPM signals are generated? Explain. **(5)**

OR

Q5 (a) Explain the sampling theorem. What is significance of Nyquist theorem at receiver in communication systems? **(5)**

(b) Compare the FM and PM scheme. **(5)**

Q6 (a) Explain the ADM scheme. What are the advantages of ADM over DM? **(5)**

(b) What are the steps for generation of digital signal from an analog signal? Explain the advantages of encoding of the signals. **(5)**

OR

Q7 (a) What do you mean by multiplexing? What are the advantages of multiplxing in communication system? **(5)**

(b) Find the probability of error for ASK, PSK, and FSK. Also draw the constellation diagram for each. **(5)**

Q8 (a) Compare the Shannon's and Huffman's coding scheme using an example. Which one is better? **(5)**

(b) A DMS X has five symbols x1, x2, x3, x4, and x5 with p(x1) = 0.4, p(x2) = 0.19, p(x3) = 0.16, p(x4) = 0.15 and p(x5) = 0.1. **(5)**

(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.

OR

Q9 (a) What is the difference between source coding and channel coding? Define entropy and rate of information. **(5)**

(b) What are convolution codes? How are they different from block codes? **(5)**

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(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.] DECEMBER 2016

Paper Code: IT-303 **Subject: Analog and Digital Communication**

Time: 3 Hours **Maximum Marks: 60**

Note: Attempts any five questions including Q no.1 which is compulsory. Select one question from each unit.

Q1 (a) What is difference between time – division multiplexing. (TDM) and Frequency division multiplexing (FDM). **(4)**

(b) Give the advantages of digital communication. List some practical applications of such communication. **(4)**

(c) Explain the terms: **(4)**
(i) Noise temperature (T_e)
(ii) Noise figure (F)
(iii) S/N ratio (SNR)

(d) What is the need of representation of any signal in terms of Fourier transform in communication? Give typical examples. **(4)**

(e) What is the effect of Quantization in digital communication? What is meant by base-band digital signal? **(4)**

UNIT-I

Q2 Using block/functional diagram, explain a typical method of generation and demodulation of AM-DSB/SC signal. **(10)**

Q3 A signal is given by **(10)**
$X(t) = A \cos\omega_o t$
Find (i) auto – correlation function (ACF)
(ii) power spectral density (PSD)
(iii) power contained in the signal

UNIT-II

Q4 What are the advantages of FM over AM? Explain the difference between narrowband and wideband FM signals. Give the relation between FM and PM signals. **(10)**

Q5 Explain the sampling theorem for band-limited signals. What is the Nyquist rate of sampling? List important features of PAM, PWM and PPM signals. **(10)**

UNIT-III

Q6 Compare the features of following digital communication systems: **(10)**
(i) PCM (ii) DM (iii) ADPCM

Q7 Explain the difference between coherent and non-coherent demodulation of digital signals. Give the basic principle of ASK, FSK and PSK systems. **(10)**

UNIT-IV

Q8 What are various error detection and correction codes? Using typical examples, explain the application of block codes and convolution codes. **(10)**

Q9 Explain the significance of:- **(10)**
(a) Rate of information
(b) Entropy
(c) Coding efficiency.
Using typical examples, explain the difference between Shannon-Fano and Huffman coding.

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(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.] DECEMBER-2013

Paper Code: IT-303 **Subject: Analog & Digital Communication**

Time : 3 Hours **Maximum Marks :60**

Note: Attempt five questions including Q.No.1 which is compulsory. Select one question from each unit.

Q.1 (a) Explain the need for modulation in communication system. (2)

(b) Compare energy spectral density function and power spectral density function. (2)

(c) Show that the maximum power efficiency of an AM modular is 50%. (2)

(d) What do you mean by Hilbert transfer and inverse Hilbert transform. (2)

(e) Draw the block diagram to show the process of generation of FM using phase modulator. (2)

(f) What is aliasing and how it is reduced? (2)

(g) What is slope overload distortion? (2)

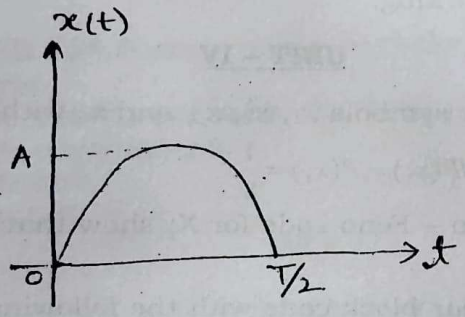
(h) Explain the concept of Non-coherent BPSK. (2)

(i) State source coding theorem. (2)

(j) State the properties of Linear block codes. (2)

UNIT – I

Q.2 (a) Determine the Fourier transform of the sinusoidal pulse shown in Fig.1. (5)



(b) Prove that the convolution of a function x(f) with an unit impulse function results the function itself. (5)

OR

Q.3 (a) Explain the square-law diode modulation method for AM generation. (5)

(b) Compare the three main system of SSB generation by drawing up a table of the outstanding characteristics of each system. (5)

UNIT – II

Q.4 A baseband or modulating signal $x(t) = 5\cos 2\pi 15x10^3 t$ angle modulates a carrier signal $A\cos\omega_c t$ (10)

(i) Determine the modulation index and band width for (a) FM System (b) PM System

(ii) find the change in the bandwidth and modulation index for both FM and PM if modulating frequency fm is reduced to 5KHZ. Assume $K_f = K_p = 15$ KHz/Volt

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OR

Q.5 (a) Find the Nyquist rate and the Nyquist internal for the signal. (5)

$$x(t) = \frac{1}{2\pi}\cos(4000\pi t)\cos(1000\pi t)$$

(b) Write short notes on **any two** (2.5X2=5)

(i) Asynchronous Multiplexing
(ii) FDM
(iii) PWM detector

UNIT – III

Q.6 (a) Explain the quantization error and derive an expression for maximum signal to noise ratio in PCM system that uses Linear quantization. (5)

(b) With the help of neat diagram explain the transmitter and receiver of PCM. (5)

OR

Q.7 (a) Draw the block diagram of DPSK modulator and explain how synchronization problem is avoided for its detection. (5)

(b) What is QPSK. Draw the block diagram of generation of QPSK system and explain its working. (5)

UNIT – IV

Q.8 (a) A DMS X has four symbols x_1, x_2, x_3, and x_4 with (5)

$$P(x_1) = \frac{1}{2}, P(x_2) = \frac{1}{4} and P(x_3) = P(x_4) = \frac{1}{8}.$$

Construct a Shannon – Feno code for X; show that the code efficiency is 100 percent.

(b) Given a (6,3) Linear block code with the following parity-check matrix H; (5)

$$H = \begin{bmatrix} 101100 \\ 011010 \\ 111001 \end{bmatrix}$$

(i) Find the generator matrix
(ii) Find the code word for the data bit 101.

OR

Q.9 Write short notes on **any two** (5X2=10)

(a) Convolution Codes
(b) Entropy and information rate
(c) Noise temperature and Noise figure.

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(Please write your Exam Roll No.)

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END TERM EXAMINATION

FIFTH SEMESTER [B.TECH] NOVEMBER-DECEMBER 2018

Paper Code: IT-303 **Subject: Analog and Digital Communication**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q no.1 which is compulsory. Select one question from each unit.

Q1 (a) Find the Fourier transform of a periodic gate function with period T=1/2 and width τ=1/20. **(6.25)**

(b) Consider a FM broadcast signal which has been modulated by a single tone modulating signal of frequency f_m=15 KHz. The frequency deviation is the same as allowed by the international regulation. Find the significant sidebands and the bandwidth of the FM signal as a result of these sidebands. **(6.25)**

(c) Explain the process of QAM demodulation. **(6.25)**

(d) A continuous signal is band limited to 5 kHz. The signal is quantized in 8 levels of a PCM system with the probabilities 0.25, 0.2, 0.2, 0.1, 0.05, 0.05, and 0.05. Calculate the entropy and the rate of information. **(6.25)**

UNIT-I

Q2 (a) Write a note on suppressed carrier system (DSB-SC). Explain how baseband signal is recovered using synchronous detection? **(6)**

(b) In an AM-SC system, the modulating signal is a single-tone sinusoid $E_m Cosw_m t$ which modulates a carrier signal $E_c Cosw_c t$. Plot the spectrum of the modulates wave. **(6.5)**

Q3 (a) Explain with the help of block diagram generation and demodulation process of AM. **(6)**

(b) Find the convolution with itself of a rectangular pulse shown in Fig. 1 using Time-Convolution theorem. **(6.5)**

UNIT-II

Q4 (a) Explain with the help of block diagram and mathematical expressions to the method for generating narrowband FM signal. **(6)**

(b) A single-tone modulating signal cos ($15\pi 10^3 t$) frequency modulates a carrier of 10 MHz and produces a frequency deviation of 75 KHz. Find (i) the modulation index and (ii) Phase deviation produced in the FM waves. **(6.5)**

Q5 (a) Explain with the help of suitable block diagram and expression baseband binary PAM transmission system. **(6)**

(b) Find the minimum value of the average probability of error in optimum filter. **(6.5)**

UNIT-III

Q6 (a) Write a note on Delta modulation system. **(6)**

(b) Explain various elements of a PCM system. **(6.5)**

P.T.O.

IT-303

P1/2

B/323

Q7 (a) Explain with the help of block diagram coherent QPSK transmitter and receiver. (6)

(b) Write a note on ADPCM. (6.5)

UNIT-IV

Q8 For a (6,3) code the generator matrix is given below. The received word is 100011. Find the transmitted information word. (12.5)

$$G = \left[\begin{array}{ccc:cc} 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 \end{array}\right]$$

Q9 Consider a source with 7 messages having probabilities 0.25, 0.25, 0.125, 0.125, 0.125, 0.0625, 0.0625 respectively. Find entropy and efficiency using Huffman coding procedure. (12.5)

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(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.]- DECEMBER 2010

Paper Code: IT303 **Subject: Analog & Digital Communication**
Paper ID: 15303

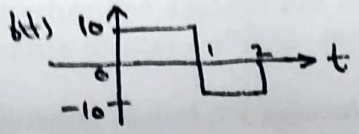
Time : 3 Hours **Maximum Marks : 60**

Note: Attempt any five questions including Q.1 which is compulsory. Attempt one question from each unit.

Q1 (a) Give the general block diagram of a typical electrical communication system. (2)
(b) Explain the physical significance of (i) Convolution between two signals (ii) Auto-correlation function. (3)
(c) Give the representation of following signals in time domain:- (3)
(i) AM-DSB/SC (ii) FM signal (3)
(d) Explain the features of asynchronous multiplexing. (3)
(e) What is the difference between coherent and incoherent detection of digital carrier modulation systems? (3)
(f) Explain the terms (i) rate of information (ii) entropy. (3)
(g) What is meant by (i) noise figure (ii) equivalent noise temperature of a communication system? (3)

UNIT-I

Q2 (a) A rectangular pulse is given by $f(t) = A; \quad -T/2 < t < +T/2$ $= 0; \quad otherwise$ find (i) auto-correlation (ii) spectral density. (5)
(b) Find the Fourier transform of the signal given in fig.1 (5)



Q3 (a) Explain the basic principle of AM modulation and demodulation using diode. Give neat circuit diagrams and necessary waveforms. (7)
(b) List the power and bandwidth requirements for various types of AM signals. (3)

UNIT-II

Q4 (a) State and explain Sampling Theorem for band-limited signals. A signal is given by $f(t) = 2\cos^2 100\pi t + 10\sin 200\pi t.\cos 400\pi t$. Find Nyquist rate of sampling. (3)
(b) Explain the difference between (i) narrowband FM (ii) wideband FM. (3)
(c) Compare the features of AM, FM and PM. (4)

Q5 Explain the method of generation of various pulse modulated signals. How will you regenerate the baseband signal from these pulse modulated signals? Give the principle of time-division multiplexing with reference to pulse modulated signals. (10)

UNIT-III

Q6 (a) What are the advantages of digital communication over analog communications? (3)
(b) Compare the features of DM, ADM and ADPCM systems. (7)

Q7 Using block diagrams and necessary waveforms, explain the generation and demodulation of following signals (a) DPSK (b) QPSK. (10)

UNIT-IV

Q8 (a) Find (i) Shannon Fano's Codes (ii) Huffman's Codes, for following symbols with probabilities mentioned: (7)
$P(A) = 0.4; \quad P(B) = 0.2; \quad P(C) = 0.25;$
$P(D) = 0.1; \quad P(E) = 0.045; \quad P(F) = 0.005$
(b) Why coding of signals is required in digital communication systems? Explain by taking suitable examples. (3)

Q9 List various error detection and correction codes. What are the features and typical applications of (a) Block codes (b) Convolution codes? Give typical suitable examples. (10)

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END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.] DEC. 2014-JAN. 2015

Paper Code: IT303 **Subject: Analog & Digital Communications**

Time : 3 Hours **Maximum Marks :60**

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each unit.

Q1 (a) Differentiate between Analog and Digital signals. Discuss pros and cons of these signals. Give atleast two application of each.
(b) Draw the Spectrum of Frequency Modulated signal and express the relation for bandwidth requirement.
(c) How do you avoid aliasing effect in sampled signals and show this effect pictorically?
(d) List the major demerits of Delta modulation and how these can overcome?
(e) What is entropy of a source, give the formula and explain the significance of this term in information theory? **(4x5=20)**

UNIT-I

Q2 Explain one of the methods to generate Standard AM signal (DSB, Full carrier), deduce the relation for bandwidth and represent the signal in time domain and frequency domain. **(10)**

Q3 Discuss about the following two entities used for statistical analysis of Random signals:-
(a) Power Spectral Density (PDF)
(b) Autocorrelation Function
How these two parameters are interrelated? **(10)**

UNIT-II

Q4 Describe Armstrong method to generate frequency modulated signal. Draw its spectrum. Discuss about bandwidth requirement of Narrowband and wideband FM signals. **(10)**

Q5 Describe the generation and detection of Pulse width Modulation (PWM) signal. Draw all the relevant waveforms. **(10)**

UNIT-III

Q6 What is quantization and quantization error? Obtain the relation for signal to Quantization noise ratio of uniform quantizer that is used to make the signal discrete in amplitude domain. Why non-uniform quantization is preferred over uniform quantization? **(10)**

Q7 Draw and explain the block diagram to Generate QPSK signals over Binary PSK (BPSK) signals. Draw the constellation diagram for BPSK and QPSK. **(10)**

UNIT-IV

Q8 A discrete Memory less source has an alphabet of eight letters with probabilities 0.25, 0.20, 0.15, 0.12, 0.10, 0.08, 0.05, 0.05. Use the Huffman encoding procedure to determine the binary code for the source output. **(10)**

Q9 Write short notes on **any two** of the following:- (2X5=10)
(a) Block codes
(b) Convolutional codes
(c) Significance of S/N ratio and Noise figure.

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END TERM EXAMINATION

FIFTH SEMESTER [B.TECH/M.TECH] DECEMBER 2017

Paper Code: IT-303	*Subject: Analog and Digital Communications*
Time: 3 Hours	*Maximum Marks: 75*

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each Unit. Assume missing data if any.

Q1 (a) Compare PCM and Delta Modulation in terms of their figure of merits.
(b) A source emits one of four messages randomly every 1 microsecond. The probabilities of these messages are 0.5, 0.3, 0.1 and 0.1. Messages are independently generated (i) what is the source entropy? (ii) obtain a compact binary code and determine the average length of the codeword, the efficiency and the redundancy of this code rate.
(c) Determine the Nyquist sampling rate and sampling interval for the signal (i) $\sin(100\pi t) + \sin(200\,\pi t)$ (ii) $\cos^2(2000\,\pi t)$.
(d) Draw and explain circuit of envelope detector for AM.
(e) Discuss Quadrature Amplitude Modulation (QAM) with the help of block diagram. **(5x5=25)**

Unit-I

Q2 (a) The output power of 60% modulated AM generator is 2 A. To what value will this current rise if the generator is modulated additionally by another audio wave, whose modulation index is 0.6? What will be the percentage power saving if the carrier and one of the sideband are now suppressed. **(6.5)**
(b) Explain trapezoidal method of monitoring A.M waveform directly on an oscilloscope. Sketch trapezoidal pattern for $0 \leq m \leq 1$. **(6)**

Q3 (a) Explain balanced modulator. Why a ring modulator is known as a double balanced modulator. **(6.5)**
(b) Explain Phasing method for generation SSBSC signal in detail. **(6)**

Unit-II

Q4 (a) Explain Foster-Seelay discriminator in detail. **(6.5)**
(b) Explain the importance of pre-emphasis and de-emphasis circuits. Why it is not useful in phase modulation but useful in frequency modulation? **(6)**

Q5 (a) Explain the Armstrong method of FM generation with neat diagram. **(6.5)**
(b) An FM wave is given by $e(t) = 20\sin(6 * 10^8 t + 7\sin 1250t)$. Determine (i) carrier frequency (ii) modulating frequency (iii) modulation index (iv) maximum deviation and (v) Transmitted power. **(6)**

Unit-III

Q6 (a) Write the difference between coherent and non-coherent detection techniques? Describe non-coherent detection of FSK signal. **(6.5)**
(b) What is advantage of Differential Phase-Shift Keying (DPSK) over BPSK? Explain DPSK modulation technique in detail. **(6)**

P.T.O.

IT-303

Q7 (a) What is Delta Modulation? Draw the block diagram of Delta modulator transmitter and explain its working with waveforms. (6.5)

(b) A television signal with bandwidth of 4.2 MHz is transmitted using binary PCM. The number of quantization levels are 512. Calculate: (6)

(i) Code word length
(ii) Transmission bandwidth
(iii) Final bit rate
(iv) Output signal to quantization noise ratio

Unit-IV

Q8 (a) A source emits three equiprobable message randomly and independently. Find the source entropy. Find a compact binary code the average length of the code word, the code efficiency and the redundancy.

(b) Construct a single-error correct (7, 4) linear block code and the corresponding decoding table. (6.5)

Q9 (a) Define information and entropy of a source. What is mutual information? What is its significance? A memoryless source emits messages m_1 and m_2 with probabilities 0.8 and 0.2 respectively. Find the Huffman binary code for this source and determine its efficiency. (6)

(b) Explain code tree, code trellis and state diagram for convolution encoders having generator polynomial $g_1 = [101]$ and $g_2 = [111]$. (6)

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Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH/M.TECH] DECEMBER 2017

Paper Code: IT-303 **Subject: Analog and Digital Communications**

Time: 3 Hours **Maximum Marks: 60**

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each Unit. Assume missing data if any.

Q1 (a) Compare PCM and Delta Modulation in terms of their figure of merits.
(b) A source emits one of four messages randomly every 1 microsecond. The probabilities of these messages are 0.5, 0.3, 0.1 and 0.1. Messages are independently generated (i) what is the source entropy? (ii) obtain a compact binary code and determine the average length of the codeword, the efficiency and the redundancy of this code rate.
(c) Determine the Nyquist sampling rate and sampling interval for the signal (i) $\sin(100\pi t) + \sin(200\,\pi t)$ (ii) $\cos^2(2000\,\pi t)$.
(d) Draw and explain circuit of envelope detector for AM.
(e) Discuss Quadrature Amplitude Modulation (QAM) with the help of block diagram. **(5x4=20)**

Unit-I

Q2 (a) The output power of 60% modulated AM generator is 2 A. To what value will this current rise if the generator is modulated additionally by another audio wave, whose modulation index is 0.6? What will be the percentage power saving if the carrier and one of the sideband are now suppressed. **(5)**
(b) Explain trapezoidal method of monitoring A.M waveform directly on an oscilloscope. Sketch trapezoidal pattern for $0 \leq m \leq 1$. **(5)**

Q3 (a) Explain balanced modulator. Why a ring modulator is known as a double balanced modulator. **(5)**
(b) Explain Phasing method for generation SSBSC signal in detail. **(5)**

Unit-II

Q4 (a) Explain Foster-Seelay discriminator in detail. **(5)**
(b) Explain the importance of pre-emphasis and de-emphasis circuits. Why it is not useful in phase modulation but useful in frequency modulation? **(5)**

Q5 (a) Explain the Armstrong method of FM generation with neat diagram. **(5)**
(b) An FM wave is given by $e(t) = 20\sin(6 * 10^8 t + 7\sin 1250t)$. Determine (i) carrier frequency (ii) modulating frequency (iii) modulation index (iv) maximum deviation and (v) Transmitted power. **(5)**

Unit-III

Q6 (a) Write the difference between coherent and non-coherent detection techniques? Describe non-coherent detection of FSK signal. **(5)**
(b) What is advantage of Differential Phase-Shift Keying (DPSK) over BPSK? Explain DPSK modulation technique in detail. **(5)**

P.T.O.

IT-303
P1/2

Q7 (a) What is Delta Modulation? Draw the block diagram of Delta modulator transmitter and explain its working with waveforms. (5)

(b) A television signal with bandwidth of 4.2 MHz is transmitted using binary PCM. The number of quantization levels are 512. Calculate: (5)

(i) Code word length
(ii) Transmission bandwidth
(iii) Final bit rate
(iv) Output signal to quantization noise ratio

Unit-IV

Q8 (a) A source emits three equiprobable message randomly and independently. Find the source entropy. Find a compact binary code the average length of the code word, the code efficiency and the redundancy. (5)

(b) Construct a single-error correct (7, 4) linear block code and the corresponding decoding table. (5)

Q9 (a) Define information and entropy of a source. What is mutual information? What is its significance? A memoryless source emits messages m_1 and m_2 with probabilities 0.8 and 0.2 respectively. Find the Huffman binary code for this source and determine its efficiency. (5)

(b) Explain code tree, code trellis and state diagram for convolution encoders having generator polynomial $g_1 = [101]$ and $g_2 = [111]$. (5)

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IT-303