

Roll No.....

A

Total No. of Questions : 9]

[Total No. of Printed Pages : 3

EC-304

**DIGITAL COMMUNICATION
(NEW)**

(B.Tech., 6th Semester, 2055)

Time : 3 Hours

Maximum Marks : 60

Note :- Section A is compulsory. Attempt any Four questions from Section B and any two questions from Section C.

Section-A Marks : 2 Each

1. (a) Define Sampling Rate.
(b) What is Quantisation Error ?
(c) What is intersymbol interference ?
(d) What is 'Slope Overload' ?

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Turn Over

K-39



(2)

- (e) Define Jitter.
- (f) Explain FSK Bandwidth.
- (g) What is spectral efficiency ?
- (h) Explain noncoherent demodulation.
- (i) Distinguish between bit and word interleaving.
- (j) What is squaring loop ?

Section-B

Marks : 5 Each

- 2. Describe the delta-modulation quantization process.
- 3. Explain the instantaneous, non-uniform and uniform compounding.
- 4. Determine the signal-to-quantization error ratio of a PCM system using 8-bit words for quantization while not exceeding its predetermined voltage boundaries.

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(3)

- 5. Determine the error distance of the 8-QAM modulation scheme, assuming that the peak power levels of adjacent points are equal.
- 6. Describe the coders and combo chips.
- 7. Describe QAM transmitters and receivers.
- 8. Describe BPSK demodulator circuit.
- 9. Write notes on the following :

Section-C

Marks : 10 Each

- (a) Simulation using Com Sim and MATCAB
- (b) Statistical TDM.

**Data Communication
(EC-304, Dec-2005)**

Note: Section A is compulsory. Attempt any four questions from Section-B and any two from Section-C.

Section-A

1. a) List the merits of digital transmission.
- b) Define Aliasing.
- c) What is Intersymbol Interference?
- d) State the sampling theorem.
- e) What is non-linear Quantization?
- f) What is phase reverse keying?
- g) What is the need of QAM digital modulation?
- h) Explain coherent detection.
- i) What is Costar loop?
- j) Define word interleaving.

Section-B

2. Describe the process of PCM with example.
3. What are companding laws? Explain their similarities and differences.
4. Determine the signal to quantization noise ratio of a delta modulator with a bit rate of 64 kb/s and an input signal bandwidth of 4 KHz.
5. Determine the error distance in a Db for a BPSK modulation scheme.
6. Compare various encoding techniques.

Section-C

7. Describe the DBPSK transmitter and receiver.
8. Calculate the error probability $P(e)$ of a 16 QAM modulation scheme for various levels of E_b/N^0
9. Write short notes on:
 - (a) Simulation of digital systems
 - (b) PSK

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J-160[5260]

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B.Tech. (Semester - 6th & 7th)
DIGITAL COMMUNICATION (EC -304)

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:



- 1) Section - A is **compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section - A

Q1)

(10 x 2 = 20)

- a) Explain the aliasing phenomenon when the sampling frequency is less than the twice of the maximum modulating frequency.
- b) What is slope overload in delta modulation? How it can be avoided?
- c) Explain the use of eye patterns in the signal analysis.
- d) Calculate the bit rate in T1 digital system when the number of channels are 32.
- e) Explain the difference between bit rate and baud rate.
- f) What is the advantage of MSK over QPSK?
- g) Compare Non-coherent and coherent FSK Detectors.
- h) Explain the structure of a basic digital PLL.
- i) What is the physical significance of Shannon limit for information capacity.
- j) Explain μ -law of companding.

Section - B

(4 x 5 = 20)

- Q2) Explain the block diagram of PCM system in brief. How it gives benefit over its analog counterparts.

P.T.O.

- Q3) Describe the use of PLL in Costas loop.
- Q4) 24 telephone channels, each band-limited to 3.4 kHz are to be time division multiplexed by using PCM. Calculate the bandwidth of PCM system for 128 quantization levels at 8 kHz sampling frequency.
- Q5) Calculate the probability of error of Amplitude Shift Keying.
- Q6) Explain the use of interleaving. Compare bit and word interleaving.

Section - C

(2 x 10 = 20)

- Q7) Explain the Quadrature Phase Shift Keying way of digital modulation in detail. Derive all the mathematical equations to support your answer.
- Q8) (a) A Gaussian channel is having a bandwidth of 1 MHz. Calculate the channel capacity if the signal power to noise spectral density is 10^5 Hz. Also find the maximum information rate.
- (b) Explain the process of Adaptive Delta modulation. What is its advantage over delta modulation.
- Q9) Write short notes on the following :
- (a) Probability of error on FSK.
- (b) Codecs and Combo chips.

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Digital Communication (EC-304, Dec-2007)

Note: Section A is compulsory. Attempt any four questions from Section-B and any two from Section-C.

Section-A

1. a) What are the advantages of digital communication system over analog communication system?
- b) What are the sampling rates of the following signals: voice at 5 k Hz, high fidelity music at 20 k Hz.
- c) In a PCM system, the signal to noise (quantization noise) ratio is to be held to a minimum of 40 d B. Determine the number of quantization levels needed.
- d) Describe the difference between uniform and non-uniform companding.
- e) Explain Nyquist criterion for distribution less base band binary transmission.
- f) Why is clock recovery required in a BPSK demodulator circuit?
- g) What is MSK modulation scheme?
- h) Suggest some pulse shaping filter function to ensure zero Intersymbol interference.
- i) State the difference between coherent and non-coherent detection.
- j) Differentiate between unipolar and bipolar signaling

Section-B

2. What are companding laws? Explain their differences and similarities.
3. Describe delta-modulation (DM) and explain how DM improves the system's tolerance to slope overload?
4. Determine the range of variation for a T1 PCM-TDM system with jitter amplitude of 3 UI and jitter frequency equal to 200 Hz.
5. With the assistance of a block diagram, describe the function of a 16-QAM modulation scheme.
6. Describe M-ary modulation techniques. In what conditions M-ary signaling schemes are preferred over binary signaling schemes.

Section-C

7. Describe FSK modulation scheme using appropriate block diagram. Derive the output voltage relationship and the bandwidth relationship for FSK modulation.
8. (a) How eye patterns are useful for studying intersymbol interference in digital communication systems?
(b) Explain how differential PCM improves system performance?
9. Write short notes on:
 - (a) State and explain Shannon's channel capacity theorem.
 - (b) Sketch the phase state diagram of a QPSK modulator.

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Total No. of Questions : 09]

[Total No. of Pages : 02

Paper ID [EC304]

(Please fill this Paper ID in OMR Sheet)

B.Tech. (Sem. - 6th/7th)

DIGITAL COMMUNICATION (EC - 304)

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section - A

Q1)

(10 × 2 = 20)

- a) What are the advantages and disadvantages of digital communication.
- b) What do you mean by companding.
- c) Explain the principle of non-coherent FSK demodulator.
- d) Slope overload problem can be overcome by increasing the step size. Justify it.
- e) State and Explain the sampling theorem.
- f) Draw the ASK spectrum.
- g) Explain the purpose of signaling bit.
- h) What are Guard Bands and when it is used.
- i) Contrast bit and word interleaving.
- j) What is a re-generative repeaters. Why it is used in digital signal transmission.

Section - B

(4 × 5 = 20)

Q2) Explain the principle of continuously variable slope delta modulator.

Q3) Contrast delta modulation PCM and standard PCM.

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- Q4)** What is SQR? Explain the relation between SQR, resolution, dynamic range and number of bits in a PCM code.
- Q5)** Explain the relationship between the minimum bandwidth required for a 16-QAM system and the bit rate.
- Q6)** Explain ASK and FSK encoding techniques.

Section - C

(2 × 10 = 20)

- Q7)** A binary PSK signal is applied to a correlator supplied with the phase reference which differs from the exact carrier phase by ϕ radians. Determine the effect of phase error ϕ on the average probability of error of the system.
- Q8)** (a) What is a purpose of a clock recovery circuit? When it is used.
(b) Explain the relationship between bits per second and baud for FSK system.
- Q9)** (a) Explain QPSK modulator, demodulator and bandwidth requirement for that.
(b) Determine the bandwidth efficiency for the QPSK modulator and 8-PSK modulator with $F_b = 10\text{Mbps}$.



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Total No. of Questions : 09]

[Total No. of Pages :02

Paper ID [A0318]

(Please fill this Paper ID in OMR Sheet)

B.Tech. (Sem. - 6th)

DIGITAL COMMUNICATION (EC - 304)

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section - A

Q1)

(10 × 2 = 20)

- a) Explain Fundamentals of Time Division Multiplexing.
- b) What is the cause of slope overload error in delta modulation?
- c) Explain the term coding efficiency.
- d) What is the phase difference between two possible transmitter signals in BPSK?
- e) What is quantization error?
- f) State the advantages of DPSK and PSK.
- g) Sketch the QPSK waveform for the sequences 1101010111 assuming the carrier frequency to be equal to the bit rate.
- h) Explain Statistical TDM.
- i) What is granular noise?
- j) Explain Gaussian Minimum Shift Keying.

Section - B

(4 × 5 = 20)

- Q2)** Describe the various types of line codecs and plot them for the following data output: 1110010101.
- Q3)** State and Explain Shannon's Channel Capacity Theorem.
- Q4)** The bandwidth of TV video plus audio signal is 4.5 MHz. if this signal is converted into PCM bit stream with 1024 quantization levels, Determine number of bits/sec of the resulting signal. Assume that the signal is sampled at the rate 20% above Nyquist rate.
- Q5)** Draw the block diagram of an 8-QAM modulation scheme and describe its function.
- Q6)** Discuss Codecs & Combo Chips.

Section - C

(2 × 10 = 20)

- Q7)** Explain the following with proper diagram wherever applicable:
- (a) FSK Bit Rate and Baud Rate.
 - (b) Bandwidth and Frequency Spectrum of FSK.
 - (c) FSK Transmitter.
 - (d) FSK Detection.
- Q8)** (a) Derive the expression for the maximum signal to quantization noise ratio in dB when the signal is sinusoidal having a peak to peak voltage "2V" volts.
- (b) Discuss the advantages and disadvantages of the following signaling formats:
- (i) Unipolar NRZ
 - (ii) Bipolar RZ
 - (iii) Alternate mark inversion RZ.
- Q9)** (a) Explain how eye pattern are useful for studying inter symbol interference in Digital Communication System.
- (b) Explain DBPSK transmitter and receiver.



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Total No. of Questions : 09]

[Total No. of Pages : 02

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B.Tech. (Sem. - 6th)

DIGITAL COMMUNICATION

SUBJECT CODE : EC - 304

Paper ID : [A0318]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section - A

Q1)

(10 x 2 = 20)

- a) Differentiate with the help of neat diagram between sampling and quantization.
- b) What is a band limited signal?
- c) Explain the term 'Statistical TDM'.
- d) Explain uniform and non uniform quantization.
- e) Draw the waveforms of an unmodulated carrier, data, ASK, PSK and FSK.
- f) State the disadvantages of DPSK and PSK.
- g) Sketch the QPSK waveform for the sequences 1101010111 assuming the carrier frequency to be equal to the bit rate.
- h) What is a Non-coherent FSK Detector? Discuss briefly.
- i) Explain Fundamentals of time division multiplexing?
- j) Explain Gaussian Minimum Shift Keying.

M-149 [1859]

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Section - B

(4 x 5 = 20)

- Q2) Describe with block diagram the working of adaptive delta modulation.
- Q3) Sketch phase state diagram of QPSK modulator.
- Q4) Define FSK Modulation scheme using appropriate block diagram.
- Q5) In a binary PCM system, the output signal-to-quantizing-noise ratio is to be held to a minimum of 40 dB. Determine the number of required levels and find the corresponding output signal-to-quantizing-noise ratio.
- Q6) Compare A-Law and μ -Law.

Section - C

(2 x 10 = 20)

- Q7) (a) Explain how DPCM improves system performance.
(b) Describe Codec and Combo chip.
- Q8) (a) Consider an audio signal comprised of the sinusoidal term:
$$s(t) = 4 \cos 800 \pi t$$

(i) Find the signal to quantization noise ratio when this is quantized using 10-bit PCM.
(ii) How many bits of quantization are needed to achieve a signal to quantization noise ratio at least 40 dB.
(b) Discuss the advantages and disadvantages of the following:
(i) TDM.
(ii) DBPSK.
(iii) Alternate mark inversion RZ.
- Q9) (a) Explain how eye pattern are useful for studying inter symbol interference in Digital Communication System.
(b) What is ISI and remedy for ISI?



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Total No. of Questions : 09]

[Total No. of Pages : 02

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B.Tech. (Sem. - 6th)

DIGITAL COMMUNICATION

SUBJECT CODE : EC - 304

Paper ID : [A0318]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section - A

Q1)

(10 × 2 = 20)

- a) Justify the statement "Digital Transmission is more reliable"?
- b) Define Shannon limit for information capacity?
- c) What is bandpass waveform?
- d) Write a method to avoid intersymbol interference?
- e) Define bandwidth of PCM?
- f) Compare 8QAM with 16 QAM?
- g) Write main drawback of coherent ASK detector?
- h) What is the basic difference between T1 PCM and T2 PCM system?
- i) What is major advantage of MSK?
- j) What type of information is provided by eye pattern?

Section - B

(4 × 5 = 20)

Q2) Discuss uniform quantization of a signal?

Q3) Discuss with block diagram a PCM system?

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P.T.O.

Q4) Discuss with block diagram Adaptive delta modulation?

Q5) Discuss Manchester coding and its power spectra?

Q6) Describe T2 PCM system with block diagram?

Section - C

(2 × 10 = 20)

Q7) (a) Describe with block diagram ASK modulator?

(b) Describe with block diagram Coherent ASK detector?

Q8) (a) Discuss bandwidth and frequency of FSK?

(b) Explain FSK detection using PLL?

Q9) (a) Describe 8 QAM transmitter with block diagram?

(b) Describe DBPSK receiver with block diagram?
