

UNITED TECHNICAL COLLEGE
Semester-Fall

Level: Bachelor
Programme: BE -III
Course: Data Communication

Year : 2023
Full Marks: 100
Pass Marks: 45
Time : 1.5hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt any three questions from (1-6) and Q.N. 7 is Compulsory.

- | | | |
|------|--|---|
| 1 a) | Describe the block diagram of data communication system. Write unique features of digital transmission system. | 8 |
| b) | Differentiate parallel and serial transmission. Explain different modes of serial transmission. | 7 |
| 2 a) | Explain RS-232C standards. What is the relationship between baud rate and bit rate, explain. | 8 |
| b) | Explain the different types of signal impairments in communication system. | 7 |
| 3 a) | Define energy and power signals. Check whether $x(t) = A \cos(\omega t)$ is power or energy type signal. | 8 |
| b) | Encode the bit stream 1011000110 using the following scheme. i. Polar NRZ, RZ ii. Bi-polar NRZ, RZ iii. AMI iv. Manchester | 7 |
| 4 a) | Compare the characteristics of twisted-pair cable and co-axial cable. Explain the working principle of satellite communication. | 7 |
| b) | AN audio signal of $20\sin(2\pi \cdot 500t)$ is used for AM with a carrier of $60\sin(2\pi \cdot 106t)$. Calculate | 8 |

- i. Modulation index
- ii. Required bandwidth
- iii. Total power using load resistance of 80Ω
- iv. Efficiency of AM

5 a) Explain TCP/IP layers and compare it with OSI reference model. 7
b) Why is flow control required in data communication? Explain how lost and duplicate packets are handled by selective repeat request ARQ?

6 a) Differentiate between FDM and TDM. Assume that a voice channel occupies a bandwidth of 4 Khz. We need to multiplex 10 voice channels with guard bands of 500 Hz using FDM. Determine the bandwidth of the link. Also show the multiplexing scheme diagrammatically. 8
b) Explain phase modulation and frequency modulation. 7

7 Write short notes on: (Any One) 1×5
a) Continuous vs Discrete Time signal
b) Private Branch Exchange (PBX)
c) QPSK Modulation

Data Communication

Total marks: 100, Pass marks: 45

Attempt all the questions.

1. a) Draw a generic block diagram of digital communication system and briefly explain the function for each block. (4+4)
- b) Differentiate between parallel and serial transmission. Briefly explain RS232C interface standards. (7)
2. a) Explain deterministic and random signal with example. Justify whether unit step signal is energy signal or power signal. (4+3)
- b) Define linear, stable, time invariant and causal system with examples. (8)
3. a) What is PDU? Differentiate between LLC and MAC sub layer of datalink layer of OSI reference model. (7)
- b) What is meant by "Open System Interconnection"? Briefly explain the layers of OSI reference model. (2+6)
4. a) What do you mean by guided media? Mention the advantages of optical fiber over co-axial cables and twisted pair cables. (2+6)
- b) Describe the transmission impairments for communication system with suitable example. (7)
5. a) Define flow control. Briefly explain stop and wait, go-back-N, selective-repeat request ARQ. (2+5)
- b) What do you mean by multiplexing? Compare and contrast between circuit switching, packet switching and message switching. (8)
6. a) Differentiate between AM and FM. Why is FM superior over AM in communication? (4+4)
- b) What are the benefits of modulation? Explain ASK, FSK and PSK with mathematical expression and necessary diagram. (8)
7. Write short notes on (Any Two): (2X5)
 - i) HDLC protocol
 - ii) Lossy Compression
 - iii) Bit Rate / Baud Rate

National Academy of Science and Technology

(Affiliated to Pokhara University)

Dhangadhi, Kailali

Pre University Examination

Level: Bachelor

Semester: Fall III

Year : 2023

Programme: BE Computer

Full Marks: 100

Course: Data Communication

Pass Marks: 45

Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What are standards? Explain its types. Also explain the standard organizations in data communication. 8
- b) What do you mean by data compression technique? Explain the different types of compression techniques 7
2. a) Define Time Invariant System. Explain the following properties of the systems: a) causality b) linearity c) stability d) memory 8
- b) Explain deterministic and random signal with example. Justify whether unit step signal is energy signal or power signal 4+3
3. a) Explain the existence of Fourier Transform. Find the Fourier Transform of Signum function. 7
- b) Compare and Contrast Frame relay, X.25 and ATM 8
4. a) Why optical fiber is considered advantageous over other copper media? Explain. Also, explain about different propagation techniques. 8
- b) A bit stream is 10011101 is transmitted using the standard CRC method. The generator polynomial is x^3+1 . Derive the actual bit string transmitted. Show that the error is detected if any one bit in the received bit stream is inverted. 7
5. a) Define flow control as a layered protocol model. Explain the mechanism of a flow control for an ARQ model. 8
- b) Compare and Contrast between Virtual Circuit Network and Datagram network. 7
6. a) Differentiate between encoding and modulation? Explain frequency modulation with an example. 7

b) Encode digital data 110000101110001 using

- (i) NRZ-L
- (ii) NRZ-I
- (iii) AMI
- (iv) Manchester

7. Write short notes on: (Any two) 2×5

- a) Synchronous and asynchronous Communication
- b) Types of Switching
- c) TCP/IP VS OSI Model

LUMBINI ENGINEERING MANAGEMENT AND SCIENCE COLLEGE
FINAL INTERNAL ASSESSMENT

Level: Bachelor

Programme: BE

Course: Data Communication

Year: 2024

Full Marks: 100

Pass Marks: 45

Time: 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figure in the margin indicates full marks.
Attempt all the questions.

1.
 - a. Define signal and system. Explain elementary signals with their representation.[7]
 - b. Differentiate between periodic and non-periodic signal. A signal is expressed by its function as; $x[n] = A[u[n+a] - u[n-a]]$. Determine whether the signal is an energy or power or neither.[4+4]
[OR]

Check the system properties for the system; $y(t) = \text{Acos } 100\pi t x(t-1)$

2.
 - a. How can the effectiveness of data communication system be measured? Explain the data communication system with neat and clean block diagram.[2+6]
 - b. Why transmission impairments are necessary in data communication? Explain the different types of transmission impairments.[2+5]
3.
 - a. Differentiate between bit rate and baud rate. What does a channel capacity signifies? A digital signaling system is required to operate at 9600 bps. If a signal element encodes a 4-bit word, what is the minimum required bandwidth of the channel?[3+2+3]
 - b. Differentiate between guided and unguided media. Explain the modes of signal transmission in optical fiber cable. List out the advantages of optical fiber cable.[7]
4.
 - a. Differentiate between parallel and serial communication. 1000 characters are to be sent using a communication link in which each character is encoded in 8 bits. Determine the number of bits transmitted in; [4+3]
 - i. Parallel transmission
 - ii. Synchronous transmission
 - iii. Asynchronous transmission
 - b. What is the significance of multiplexing in data communication? Differentiate between FDM and TDM with suitable diagram.[2+6]
- 5.

- Define modulation. Explain the PCM transmission system. An analog signal, $i(t) = 1 \sin(100\pi t)$, is sampled at 100Hz, and quantized into 256 different voltage levels, determine the PCM generated digital code for any three values. [8]

- b. What are the properties of line coding? Represent the digital sequence 110000000011010100001 by following line encoding techniques. [1+1+1+1]

- i. AMI
- ii. BHZS
- iii. HDB3
- iv. NRZ-L

6.

- a. Why switching is necessary in data communication? Differentiate between packet switching and circuit switching with suitable diagram. [2+3]

- b. Explain the sliding window protocol. [4]

7. Write short notes on Any Two. [2*5=10]

- a. AM vs FM
- b. CRC
- c. Antenna

POKHARA ENGINEERING COLLEGE

Level: Bachelor **Semester –** Spring **Year :** 2024
Programme: BE **Full Marks:** 100 **Pass Marks:** 45
Course: Data Communication **Time :** 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

Assessment Examination.

1. a) Write a brief about evolution of Data Communication. Why is analog transmission backed off as digital transmission coming into the influence. Explain. 8
b) Compare serial and parallel transmission. Explain with appropriate example the condition $\text{Bit rate} \geq \text{Baud rate}$. 7

2. a) How do you define unit step function? Find whether $A \sin(\omega t)$ is an energy or power signal. 7
b) A discrete time system is described as $y - y^2(n-1) + x(n)$. Now a bounded input of $x(n) = 2\delta(n)$ is applied to this system. Assume that the system is initially relaxed. Check whether the system is stable or not. 8

3. a) Explain the basic system properties. Find whether $x(t) = 5t$ is a linear time invariant or not? 7
b) Why is TCP/IP called an implementation model? Explain the functions of each protocol of all the layers of OSI reference model. 8

4. a) Explain the construction of coaxial cable. Fiber optics and copper wires are two means of cables used in today's wired communications. Which one among two is the best connection and why? 7
b) Define error with its types. Generate CRC code for given data sequence $x^4 + x^3 + 1$ and divisor 1011. 8

5. a) What is ARQ? Explain about sliding window flow control 7

mechanism.

- b) Draw the following data formats for the bit stream 110101101 using Polar NRZ, Unipolar RZ, AMI and Manchester.

6. a) The equation of amplitude wave is given by $s(t) = 20[1+0.8 \cos(2\pi \cdot 10^3 t)] \cos(4\pi \cdot 10^3 t)$. Find the carrier power, total sideband power and the bandwidth of AM wave.

- b) Explain QPSK block diagram with its relevant transmitting and receiving sides. 7

- 7. Write short notes on (Any Two):**

- a) QPSK
 - b) Standard Organizations
 - c) Data Encoding and Modulation

***** Best of Luck *****

**NEPAL COLLEGE OF INFORMATION
TECHNOLOGY_FALL_2023**

Level: Bachelor

Semester: Fall

Year: 2023

Programme: Computer

Full Marks: 100

Course: Data Communication

Pass Marks: 45

Time: 3 hrs.

*Candidates are required to answer in their own words as far as practicable.
The figures in the margin indicate full marks.*

Attempt all the questions.

1. a) Explain a simplified data communication model. Why is digital transmission preferred over analog transmission? 7
b) Explain Shannon's theorem for a noisy channel. The bandwidth of a channel is 2 MHz and its SNR is 63. Determine the appropriate bit rate and signal level. 8
2. a) Determine whether the given signal $x(t) = 3 \cos 5\omega t$ is power or energy signal. 7
b) Test the following systems for linearity and time invariance.
 - a. $y(t) = 2t x(t)$
 - b. $y(t) = 3x(-t)$8
3. a) Compare the OSI model with the TCP/IP model. 7
b) What is the purpose of cladding in an optical fibre? Explain the modes of propagation used in the optical fibre. 8
4. a) Evaluate the attenuation, if a signal travels through a transmission medium and its power is reduced to one-half. 3
b) Why CRC is used to detect burst error correction? If the frame is $x^7 + x^5 + 1$ by the generator polynomial $x^3 + 1$, what would be the transmitted frame? 4+8
5. a) When is the Retransmission necessary? Explain about stop and wait ARQ protocol for the damaged frame. 2+5
b) What do you mean by multiplexing? How does the statistical TDM overcome the problem of synchronous 8

TDM?

6. a) Explain ASK, PSK, and FSK in digital modulation. 7
OR

A carrier wave of frequency $f = 1\text{MHz}$ with a peak voltage of 20V is used for amplitude modulation with a signal of frequency 1kHz with a peak voltage of 10v. Find out the modulation index, bandwidth, and transmit Power. 8

- b) Consider that the bit sequence 10111001101 is to be transmitted. Draw the resulting waveform if the sequence is transmitted using Polar RZ, AMI and Manchester Code

7. Write short notes on: (Any two) 2×5

- a) Packet Switching
- b) QAM
- c) Transform coding

: Bachelor
Programme: B.E.

Code: Data Communication

Candidates are required to give their answers in their own words as far as possible.

Figures in the margin indicate full marks.

Answer all questions.

-) What is data communication? Can you explain its importance in today's digital world? Describe the basic components of a data communication system? 7
-) What are synchronous, asynchronous, and isochronous communication? How do they differ from each other? describe the different modes of data transmission? 8
- i) Consider a system that is characterized by the equation $2y(t) = x(t)$. If the input signal $x(t) = \cos(2\pi t)$. Find the signal is 8
- Causality
 - Linearity
 - Stability
 - Time Invariance
- b) Can you define energy and power signals? How are they used in signal processing? Consider a signal $x(t) = A \cos(\omega t)$, where A and ω are constants. Is $x(t)$ an energy signal or a power signal? Justify your answer. 7
- a) Describe the seven layers of the OSI model and their functions? 7
- b) How does the frequency of a signal in the electromagnetic spectrum affect its use in telecommunication? What is the role of antennas in signal transmission and reception? Describe what VSAT is and how it is used in telecommunication? 8
- a) What data compression is and why it is important in data communication? What is interference and crosstalk? How do they impact signal transmission? 8
- b) A bit string 1100110 is received. The Hamming code for this was generated using even parity. What is the original data sent if there was 1-bit error? Show your calculations. 7
- a) How does the Sliding Window method improve upon the Stop-and-Wait method? What is Automatic Repeat Request (ARQ) and how does it help in error control? 7

- b) Explain the difference between circuit switching, packet switching, and message switching? Can you explain the difference between circuit switching, packet switching, and message switching?
5. a) Explain Encoding and Modulation. Describe the principles of amplitude modulation (AM), frequency modulation (FM), and phase modulation (PM)?
- b) Given a binary data sequence **11100010000100**, how would this be represented in following line coding schemes?
- a. Unipolar NRZ
 - b. Polar (RZ, Manchester, Differential Manchester)
 - c. bipolar (AMI, HDB3)
 - d. ASK
 - e. PSK
7. Write short notes on (Any Two):
- a) RS-232C
 - b) HDLC
 - c) ATM