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**Bangabandhu Sheikh Mujibur Rahman Science & Technology University**

**Department of Computer Science and Engineering**

**4<sup>th</sup> Year 1<sup>st</sup> Semester B.Sc. Engineering Final Examination-2017**

**Course Title: Communication Engineering**

**Course Code: CSE412**

**Full Marks: 60**

**Time: 03(Three) hours**

**N.B.**

- i) Answer **SIX** questions taking, any **THREE** from each section.
- ii) All questions are of equal values.
- iii) Use separate answer script for each section.

**Section-A**

1.
  - a) Explain the five components of a data communications system. 4
  - b) Give one real time example of simplex, half duplex and full duplex data flow between two communicating devices. 2
  - c) Draw the four basic network topologies separately for four devices and cite an advantage of each type. 4
2.
  - a) Which signal has a wider bandwidth, a sine wave with a frequency of 100 Hz or a sine wave with a frequency of 200 Hz? *both same* 1
  - b) Can we say if a signal is periodic or nonperiodic by just looking at its frequency domain plot? How? 3
  - c) A non-periodic composite signal contains frequencies from 10 to 30 KHz. The peak amplitude is 10 V for the lowest and the highest signals and is 30 V for the 20-KHz signal. Assuming that the amplitudes change gradually from the minimum to the maximum, draw the frequency spectrum and bandwidth. 4
  - d) For transmitting broadcasting TV images which transmission technique is preferable and why? 2
3.
  - a) What is a peer-to-peer process? 1
  - b) What is the difference between a port address, a logical address, and a physical address? 3
  - c) How parity check matrix can be used to detect error? 2
  - d) Distinguish the following terms: 4
    - i. Baseband transmission and broadband transmission, and
    - ii. Low-pass channel and a band-pass channel.
4.
  - a) Describe the evolution of 3G cellular system from 2G cellular system. 3
  - b) Why cellular system use different frequency band for uplink and downlink? 3
  - c) For the data streams 10010011, draw the graph for the following line coding schemes: 4
    - i. 2B 1Q      ii. MLT-3

**Section-B**

5.
  - a) Describe the switching protocol of ATM. 3
  - b) Define carrier signal and its role in analog transmission. 2
  - c) Draw the constellation diagram for the following: 3
    - i. QPSK, with a peak amplitude value of 4
    - ii. 8-QAM with two different peak amplitude values, 2 and 5, and four different phases.
  - d) Find the bandwidth for the PM (set  $\beta = 3$ ) situation if we need to modulate an 8-KHz voice. 2
6.
  - a) How we can multiplex and de-multiplex the analog signal, using the FDM technique? 6

- b) Fig-6(b) shows synchronous TDM with the data rate for each input connection is 2Mbps and one data stream for output. The unit of data is 1 bit. Find (a) the input bit duration, (b) the output bit duration, (c) the output bit rate, and (d) the output frame rate.

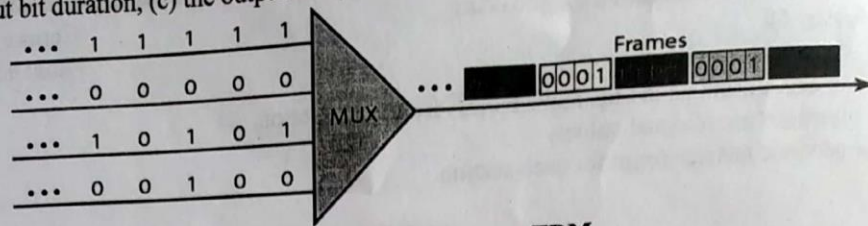


Fig-6(b): Synchronous TDM.

7. a) In the optical fiber communication, how step index differs from graded index? 3
- b) An analog signal has a bit rate of 8000 bps and it has 128 signal elements. Find out the baud rate for this signal 3
- c) Describe the basic operation of packet switching. How packet size affects the overall data transmission in packet switching. 4
8. a) What is Hamming distance? What is minimum Hamming distance? 2
- b) In CRC, show the relationship between the following entities (size means the number of bits): 4
  - i. The size of the dataword and the size of the codeword
  - ii. The size of the divisor and the remainder
  - iii. The degree of the polynomial generator and the size of the divisor
  - iv. The degree of the polynomial generator and the size of the remainder
- c) Can the value of a checksum be all 0s (in binary) or all 1s (in binary)? Defend your answer. 2
- d) In table-8(d), the sender sends dataword 10. If a 3-bit burst error occurs the first three bits of the codeword, can the receiver detect the error using the block coding technique? Defend your answer. 2

Table-8(d): Dataword with corresponding codeword.

Dataword	Codeword
00	00000
01	01011
10	10101
11	11110



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Bangabandhu Sheikh Mujibur Rahman Science & Technology University  
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4<sup>th</sup> Year 1<sup>st</sup> Semester B.Sc. (Engg.) Examination-2016

Course No.: CSE412

Course Title: Communication Engineering

Full Marks: 60

Time: 03 hours

N.B.

- i) Answer SIX questions taking any THREE from each Section
- ii) All questions are of equal values.
- iii) Use separate answer script for each section

**Section-A**

1. ~~a)~~ What is data communications? What are the protocols of data communication? 3  
~~b)~~ How does the term jitter effect on effective data communication systems? 2  
~~c)~~ Draw a hybrid topology with a ring backbone and three bus networks. 3  
~~d)~~ "Security is one of the most important criteria in Networking" – justify this. 2
2. ~~a)~~ What is protocol? Describe the key elements of a protocol. 4  
~~b)~~ Distinguish between baseband transmission and broadband transmission. 3  
~~c)~~ Assume we need to download text documents at the rate of 100 pages per sec. A page is an average of 25 lines with 80 characters in each line. What is the required bit rate of the channel? 3
3. ~~a)~~ What is impairment? What are the cause of impairment? Discuss briefly. 4  
~~b)~~ What are the propagation time and the transmission time for a 3-MB message if the bandwidth of the network is 1 Mbps? Assume that the distance between the sender and the receiver is 10,000 km and that light travels at  $2.5 \times 10^8$  m/s. 3  
~~c)~~ For transmitting broadcasting TV images which transmission technique is preferable and why? 3
4. ~~a)~~ Differentiate between Nyquist theorem and Shannon's theorem for a communication channel in two points? 1  
~~b)~~ Consider a noiseless channel with a bandwidth 4000 Hz, transmitting a signal with three bits per signal level. Calculate the maximum bit rate for this channel. 3  
~~c)~~ Convert the data, 10010 into a digital signal, using the following line coding schemes: 4  
i. NRZ-I ii. Manchester.  
~~d)~~ We want to digitize the human voice. What is the bit rate, assuming 8 bits per sample? 2

**Section-B**

5. ~~a)~~ What do you mean by Amplitude Shift Keying and Frequency Shift Keying? 4  
~~b)~~ Find the bandwidth for a signal transmitting at 12 Mbps for QPSK. The value of  $d = 0$ . 3  
~~c)~~ What do you understand by propagation and transmission delay and latency? 3
6. ~~a)~~ Why analog-to-analog conversion is needed? 1  
~~b)~~ How FM works? 3  
~~c)~~ An analog signal has a bit rate of 8000 bps and it has 128 signal elements. Find out the baud rate for this signal. 2  
~~d)~~ Draw the constellation diagram for the following cases. Find the peak amplitude value for each case and define the type of modulation (ASK, FSK, PSK, or QAM). 4  
The numbers in parentheses define the amplitude of in-phase and quadrature carrier, respectively.  
i. Two points at (3, 0) and (4, 0). ii. Four points at (1, -1), (1, 1), (2, -1), and (2, 1).
7. ~~a)~~ In the optical fiber communication, how step index differs from graded index? 2  
~~b)~~ Why microwaves are used in Cellular Telephones? 3  
~~c)~~ Four channels, two with a bit rate of 600 kbps and two with a bit rate of 500 kbps, are to be multiplexed using multiple slot TDM with no synchronization bits, Answer the following questions: 5  
i. What is the size of a frame in bits? ii. What is the frame rate?  
iii. What is the duration of a frame? iv. What is the data rate?
8. ~~a)~~ What is Hamming distance? What is the minimum Hamming distance? 2  
~~b)~~ Suppose sender sends data to the receiver through unreliable transmission. During transmission receiver gets corrupted codeword i.e. 10011. Find out the correct data-word using the Block Coding technique. 4  
Table-1 shows the data-words with corresponding code-words.

Data-word	Code-word
00	00000
01	00010
10	00011
11	00100

**Table 1: A code for error correction**

- ~~c)~~ Describe the process of checksum. What kind of error is undetectable by the checksum? 4

**N.B.:**

- i. Answer **SIX** questions, taking any **THREE** from each section.
- ii. All questions are of equal values
- iii. Use **separate answer script** for each section.

**Section- A**

1.
  - a) What do you understand by data communications? What are the characteristics of data communications? 3
  - b) What is the difference between half-duplex and full duplex transmission modes? 2
  - c) Describe the components of data communications system. 4
  - d) When a party makes a local telephone call to another party, is this a point-to-point or multipoint connection? Explain your answer. 2.67
2.
  - a) What is frequency modulation? Classify it. 3
  - b) How does FDM combine multiple signals into one? 3.67
  - c) Distinguish between baseband transmission and broadband transmission. 3
  - d) When the signal is 20V, the noise is 6mV. What is the maximum data rate supported by this telephone line? 2
3.
  - a) What does the amplitude, frequency and phase of a signal measure? 3
  - b) What is the theoretical capacity of a channel is each of the following cases. 3
    - i. Bandwidth: 20 kHz  $SNR_{dB} = 40$
    - ii. Bandwidth: 200 kHz  $SNR_{dB} = 6$
  - c) What is Nyquist theorem? Explain briefly. 3
  - d) Distinguish bit stuffing and byte stuffing 2.67
4.
  - a) What is bit padding in TDM process? Compare it with framing bits. 5
  - b) What is the relationship between the number of slots in a frame and the number of inputs lines for TDM? Explain. 4
  - c) Why FM is superior to AM? 2.67

**Section - B**

5.
  - a) What are the difference between data element and signal element? 2
  - b) Discuss different kind of line coding schemes. 5
  - c) We have sampled a low pass signal with a bandwidth of 300 kHz using 1024 levels of quantization. 3
    - i. Calculate the bit rate of the digitized signal.
    - ii. Calculate  $SNR_{dB}$  for this signal.
    - iii. Calculate the PCM bandwidth of this signal.
  - d) List three techniques of digital-to-digital conversion. 1.67
6.
  - a) Which characteristics of an analog signal are changes to represent the digital signal in each of the following digital to analog conversion? 6
    - i. ASK ii. FSK iii. PSK iv. QAM
  - b) An analog signal has a bit rate of 8000 bps and a baud rate of 1000 baud. How many data elements are carried by each signal element? How many signal elements do we need? 3

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**Department of Computer Science and Engineering**

4<sup>th</sup> Year 1<sup>st</sup> Semester BSc Engineering Examination-2015

Course No. : CSE 412

Course Name: Communication Engineering

Full Marks: 70

Times: 4 Hours

**N.B.:**

i. Answer **SIX** questions, taking any **THREE** from each section.

ii. All questions are of equal values

iii. Use **separate answer script** for each section.

- c) How are QAM related to ASK and PSK? Draw the constellation diagram for the following: 2.67
- i. 16 QAM , 3 amplitudes, 12 phase
  - ii. 16 QAM , 4 amplitudes, 8 phase
7. a) Discuss different kind of analog to analog conversion. 4
- b) Four channels, two with a bit rate of 300 kbps and two with a bit rate of 250 kbps, are to be multiplexed using multiple slot TDM with no synchronization bits. Answer the following questions. 4
- i. What is the size of a frame in bits?
  - ii. What is the frame rate?
  - iii. What is the duration of a frame?
  - iv. What is the data rate?
- c) Describe multilevel TDM, multiple slot TDM and pulse stuff TDM. 3.67
8. a) What is the purpose of the Hamming code? How can we use the Hamming code to correct a burst error? 3.67
- b) Draw a QAM Modulator and Demodulator. 3
- c) What is checksum? Describe the process of checksum. What kind of error is undetectable by the checksum? 5



Bangabandhu Sheikh Mujibur Rahman Science and Technology University  
Department of Computer Science & Engineering  
4<sup>th</sup> Year 1<sup>st</sup> Semester B.Sc. Engineering Examination-2019

Course No: CSE 412

Full Marks: 60

N.B.: Answer any six questions out of eight.

Course Title: Communication Engineering

Time: 63 hours

- Q.1 (a) Define data and data communication. Identify the five components of a data communication system. 3  
(b) Mention two advantages and disadvantages of wireless communication over wire communication. 2  
(c) What is protocol? Describe the elements of protocol. 3  
(d) Which layers are concern about physical address and logical address? 2
- Q.2 (a) Define Channel capacity. What key factors affect channel capacity? 2  
(b) In a noiseless channel with a bandwidth of 3000 Hz transmitting a signal with 8 signal levels, calculate maximum bit rate. 3  
(c) We have a bandpass channel and a digital signal how can we transmit that signal through that channel? 2  
(d) A sine wave is offset 1/4 cycle with respect to time 0. What is its phase in degrees and radians? 3
- Q.3 (a) Distinguish between signal level and data level with appropriate figure. 3  
(b) Describe amplitude modulation and frequency modulation. 4  
(c) What is the advantages of QAM over ASK or PSK? 3
- Q.4 (a) For the bit stream 01011001, sketch the waveforms for NRZ-I and NRZ-L encoding format. 4  
(b) Define Channel capacity. What key factors affect channel capacity? 2  
(c) In a noiseless channel with a bandwidth of 3000 Hz transmitting a signal with 8 signal levels, calculate maximum bit rate. 3  
(d) We have a bandpass channel and a digital signal how can we transmit that signal through that channel? 2  
(e) A sine wave is offset 1/4 cycle with respect to time 0. What is its phase in degrees and radians? 3
- Q.3 (a) Distinguish between signal level and data level with appropriate figure. 3  
(b) Describe amplitude modulation and frequency modulation. 4  
(c) What is the advantages of QAM over ASK or PSK? 3
- Q.4 (a) For the bit stream 01011001, sketch the waveforms for NRZ-I and NRZ-L encoding format. 4  
(b) What is pulse rate and bit rate? Show the relation between them. 2  
(c) Briefly describe the pulse code modulation (PCM) technique. 4
- Q.5 (a) What do you mean by modulation? Briefly describe the Frequency shift Keying (FSK) technique. 3  
(b) An analog signal has a bit rate of 8000 bps and a baud rate of 1000 baud. How many data elements are carried by each signal element? How many signal elements do we need? 3  
(c) Sketch binary phase shift keying for the bit stream 1100110. 2  
(d) Describe frequency modulation (FM) technique. 2
- Q.6 (a) Explain the stop and wait flow control methods and calculate the value of maximum potential efficiency of the link. 4  
(b) Explain time division multiplexing (TDM) technique. 3  
(c) Five channels, each with a 100-kHz bandwidth are to be multiplexed together. What is the minimum bandwidth of the link if there is a need for a guard band of 10 kHz between the channels to prevent interference? 2  
(d) Explain wave length division multiplexing (WDM). 2

- technique.
- (b) An analog signal has a bit rate of 8000 bps and a baud rate of 1000 baud. How many data elements are carried by each signal element? How many signal elements do we need? 3
- (c) Sketch binary phase shift keying for the bit stream 1100110. 3
- (d) Describe frequency modulation (FM) technique. 2
- 6 (a) Explain the stop and wait flow control methods and calculate the value of maximum potential efficiency of the link. 2
- (b) Explain time division multiplexing (TDM) technique. 4
- (c) Five channels, each with a 100-kHz bandwidth are to be multiplexed together. What is the minimum bandwidth of the link if there is a need for a guard band of 10 kHz between the channels to prevent interference? 3
- (d) Explain wave length division multiplexing (WDM). 2
- (a) What is the relationship between propagation speed and propagation time. 4
- b) What is piggybacking? 2
- c) How does FDM combine multiple signals into one and one combined signal separate into its original components? 4
- d) What is parity bit? Generate codewords for dataword 10101 using even parity and odd parity. 2
- e) Find the Hamming distance between two pairs of words 10101 and 11110. 2
- For  $P = 110011$  and  $M = 1110011$ , find CRC using modulo 2 arithmetic. 3
- Discuss the concept of redundancy in error detection. 3