Rajshahi University of Engineering & Technology
Department: CSE   Course: CSE 3103   CT: 1

1. In which fundamental characteristics does the effectiveness of a data communications system depends on? Explain.   4
2. What's happened if protocol is not defined to develop a data communication system? What are the key elements of a protocol?   4
3. Match the following to one or more layers of the OSI model: 4
   a) Flow control   b) Interface to transmission media   c) Route selection   d) Defines frames
4. If you have asked to draw a composite signal then which domain you select to draw this? Why? Draw a sine wave with 0.2 μs period in both time domain and frequency domain.   4
5. What is the limitation of Nyquist bit rate? How Shannon capacity solve this? The attenuation of a signal is -10dB. What is the final signal power if it is originally 5W?   4

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1. You have continuous data stream of 10 zeroes. Which type of problems does it suffer? How can you solve these problems? Explain with necessary figures.   5
2. What are the differences between data element and signal element? Draw signal with i) one data element per two signal element and ii) four data element per three signal element.   5
3. How to solve the problems of NRZ-L, NRZ-I? Draw differential manchester and AMI schemes using each of the following data streams.(assuming that the last signal level has been positive)   5
   a) 10101011   b) 11111010
4. What is the impact of carrier signal in case of data communication? Among all types of digital to analog communication techniques which one you prefer and why? Draw the figure of Quadrature PSK.   5

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1. What is the purpose of a guard band signals? 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?   4
2. You have given 4 input sources with 35KHz, 40KHz, 20KHz, 40KHz data rate. Multiplex these data using Synchronous TDM.   4
3. Multiplexing is used to achieve bandwidth efficiency but spread spectrum technique expands the bandwidth then why spread spectrum is essential in data communication. Explain.   4
4. What's happened if two wires of twisted pair cable are parallel? What are the advantages and disadvantages of STP? Write some application of its.   4
5. Describe the connectors which are used in coaxial cable.   4

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1. How does sky propagation differ from line-of-sight propagation? What is the difference between omnidirectional waves and unidirectional waves?   5
2. What is the purpose of cladding in an optical fiber? Which connectors are used in optical fiber connection and what purpose?   4
3. In case of connecting multiple devices which type of problems do we face? How does switch solve this problem? Why TST switch is important?   6
4. Compare and contrast a circuit-switched network and a packet-switched network. What is the role of the address field in a packet traveling through a virtual-circuit network?   5

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
3rd Year Odd Semester Examination 2019
COURSE NO: CSE 3103   COURSE TITLE: Data Communication
FULL MARKS: 72   TIME: 3 HRS

N.B. (i) Answer any SIX questions taking any THREE from each section.
(ii) Figures in the right margin indicate full marks.
(iii) Use separate answer script for each section.

SECTION : A

Q.1. (a) Explain STAR, BUS and RING topologies in detail with examples.   4
(b) Describe in detail broadband transmission with modulation of digital signal.   4
(c) Describe different types of transmission impairments that can effect wired transmission.   4

Q.2. (a) Consider a signal 10101011. Draw timing diagrams for RZ, Manchester and differential Manchester schemes.   3
(b) If you encode a long series of one's using unipolar signaling, then what type of problems may occur in digital transmission? How this problem can be solved?   6
(c) A file contains 3 million bytes. How long does it take to download this file using a 100Kbps channel and 10 Mbps channel?   3

Q.3. (a) What does the Shanon capacity have to do with communication?   4
(b) A signal has a bandwidth of 10MHz. The signal is sampled, quantized and binary coded to obtain a pulse-code modulation (PCM) signal. The signal is sampled at the Nyquist rate.   8
(i). What is the Nyquist rate?
(ii). If the samples are to be encoded into 120 levels, what is the number of binary pulses (bits) required to encode each sample?
(iii). Based on your answer to part (i) and part (ii), what is the minimum binary pulse rate (bit per second) of the binary coded signal?
(iv). Using the knowledge that 2 bits can be transmitted per second over a 1 Hz bandwidth, determine the minimum transmission bandwidth B_T that can be used to successfully transmit the signal.

Q.4. (a) What is the total delay (latency) for a frame of size 10 million bits that is being sent on a link with 15 routers each having a queuing time of 2μs and processing time of 1μs. The length of the link is 3000 Km. The speed of light inside the link is 2×10^8 ms⁻¹. The link has a bandwidth of 6 Mbps. Which component of the total delay is dominant? Which one is negligible?   4
(b) Compare and contrast PCM and DM.   4
(c) Define DC component, baseline wandering and their effect on digital transmission.   4

SECTION : B

Q.5. (a) Can FDM send digital signal? Justify your answer.   2
(b) Define spread spectrum and its goal. Describe the two spread spectrum techniques.   4
(c) Ten sources, seven with a bit rate of 250 Kbps and three with a bit rate of 400 Kbps are to be combined using multilevel TDM with no synchronizing bits. Answer the following questions about the final stage of the multiplexing: 6
(i). What is the size of a frame in bits?
(ii). What is the frame rate?
(iii). What is the duration of a frame?

Q.6. (a) Name the advantages of optical fiber over twisted-pair and coaxial cable.   4
(b) Is the transmission medium a part of the physical layer? Why or why not?   2
(c) What is the form of the signal in twisted-pair cable and coaxial cable? How does this differ from the signal in fiber optic cable?   3
(d) How does sky propagation differ from line-of-sight propagation?   3

Q.7. (a) Explain with a diagram, Frequency Shift Keying and obtain the relation for baud and minimum bandwidth.   4
(b) Explain HDB3 technique with example.   5
(c) What is the bit rate for each of the following signals?   3
(i). A signal in which 2 bits lasts 0.001s
(ii). A signal in which 5 bits lasts 4 ms

(iii). A signal in which 15 bits last 20µs

Q.8. (a) What is the role of the address field in a packet traveling through a virtual circuit network?   2 2/2

(b) Two channel, one with a bit rate of 190 Kbps and another with a bit rate 180 Kbps are to be multiplexed using a pulse stuffing TDM with no synchronization bits. Answer the following questions: 4 4/4

      (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) Explain why the switch is called a concentrator when n>k. Under what traffic condition is this switch appropriate?   2

(d) Consider the multistage switch in the following figure with N = 16, n=4, k=2. What is the maximum number of connections that can be supported at any given time? Draw the figure.   4 4/4

N inputs

nxk 1	N/n x N/n 1	kxn 1
nxk 2	N/n x N/n 2	kxn 2
nxk 3		kxn 3
nxk N/n	N/n x N/n k	kxn N/n

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