Hajee Mohammad Danesh Science & Technology University, Dinajpur
Department of Computer Science and Engineering
B.Sc. in Computer Science and Engineering
Semester Final Examination 2016 (Jan-Jun)
Level 3 Semester I, Course Code: CSE 303, Credit: 3.0
Course Title: Data Communication

Time: 3 Hours

Full Marks: 90

[N.B. The figure in the right margin indicates the marks for respective question and Split answer of any question is unacceptable]

## Section-A

### Answer any 3 (three) questions

1. (a) Define hybrid topology. Draw a hybrid topology with a ring backbone and three bus networks. — 1+2
   (b) What is an internet? Briefly explain the necessary criteria for an efficient network. — 1+3
   (c) What are the similarities and differences between the telephone network and the Internet? — 2
   (d) Why are protocols needed? Describe the key elements of a protocol. — 1+3
   (e) Distinguish between half and full duplex transmission mode. — 2

2. (a) Define service-point addressing. Why is it necessary to have layering in a network? — 1+2
   (b) Briefly describe the functions of physical, data link and network layers of OSI model. — 6
   (c) Differentiate between a physical address and a logical address. — 3
   (d) What are the factors in communication on which data rate depends? What is the length of a bit in a channel with a propagation speed of $2\times10^8$ m/s if the channel bandwidth is 20Mbps? — 1.5+1.5

3. (a) Define throughput. Distinguish between baseband and broadband transmission. — 1+2
   (b) What does the Shanon capacity have to do with communication? We have a channel with 1 MHz bandwidth and SNR for this channel is 63. What is the appropriate bit rate of the channel? — 1+2
   (c) What is SNR? Describe the types of transmission impairment. — 2+3
   (d) Encode the data stream 01110010 with the following techniques: — 4
      i) NRZ-L      ii) NRZ-I      iii) Bipolar-AMI      iv) Manchester

4. (a) Define baud rate. What is the number of bits per baud for the FSK technique with 16 different frequencies? — 1+1
   (b) What is carrier signal? Why modulation is necessary for data communication? — 1+3
   (c) Describe the drawbacks of amplitude modulation. — 4
   (d) How analog signal can be converted into PCM digital code? Show it in figure. — 5

## Section-B

### Answer any 3 (three) questions

1. (a) Describe the strategies to manage input data rate in TDM.    6
   (b) What is spread spectrum? Explain how Direct Sequence Spread Spectrum (DSSS) achieves bandwidth spreading.    6
   (c) Three 3-kbps connections are multiplexed together using synchronous TDM. If I bit at a time is multiplexed, what is the duration of (i) each input slot, (ii) each output slot, and (iii) each frame?    3

2. (a) Define refraction. Write some advantages of optical fiber over metallic cable.    1+3
   (b) Write some characteristics and applications of microwave propagation.    5
   (c) Describe several propagation ways of unguided signals with examples.    6

3. (a) What is redundancy in error detection and correction? Describe various types of errors because of interference.    1+2
   (b) Given the dataword 1010011010 and the divisor 10111, show the generation and checking (assume no error) of the codeword at the sender and receiver site respectively.    4
   (c) Describe Hamming code for detecting and correcting error with proper diagram.    5
   (d) What kind of errors is undetectable by the checksum?    3

4. (a) Explain the functions of the components of a packet switch.    4
   (b) Discuss the transmission of the packets using the datagram approach of packet switching with example.    6
   (c) Draw the configuration diagram of a three stage space-division switch with $N=120$, where 10 crossbars at the first and third stages and 4 crossbars at the middle stage. Also calculate the total number of crosspoints.    5