

**Fifth Semester B.E. Degree Examination, Dec.2016/Jan.2017**  
**Computer Networks – I**

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting at least TWO questions from each part.**

**PART – A**

- 1 a. Explain the fundamental characteristics and components of a data communication system. (08 Marks)  
b. With a neat diagram explain the TCP/IP protocol suite mentioning the different layers and their functions in TCP/IP. Why is TCP/IP called a defacto standard? (08 Marks)  
c. Explain the different addresses used in TCP/IP and diagrammatically indicate how they are related to different layers in TCP/IP. (04 Marks)
- 2 a. Mention and explain with reasons the causes of impairment of transmission of signals through transmission media. (08 Marks)  
b. What is pulse code modulation (PCM)? Draw the block schematic of a PCM encoder indicating different components and relevant waveforms for the input voltage  $v(t) = 2t$  for  $t = 0$  to  $t = T/2$  and  $v(t) = 0$  for  $t = T/2$  to  $T$ . (08 Marks)  
c. The human voice normally contains frequencies from 0 to 4000 Hz. What is the minimum sampling rate as per Nyquist theorem? Assuming 8-bits/sample, what is the bit rate? (04 Marks)
- 3 a. When is the use of multiplexing justified? Mention and explain different types of multiplexing. (08 Marks)  
b. Describe the different switched networks used in computer networks, mentioning specifically which of these need setup, transfer and teardown phase. (08 Marks)  
c. A path in a digital circuit switched network has a data rate of 1 Mbps. Exchange of 1000 bits is required for setup and 1000 bits for teardown. The distance between two parties is 8000 km. calculate the total time required to transfer 2000 bits of data if acknowledgement requires exchange of 500 bits and tearing down of connection is initiated from source assuming no error in data transmission, no processing delay and propagation speed in connecting medium  $2 \times 10^8$  m/s (Protocol ends with sending of tearing down message from source side). (04 Marks)
- 4 a. For the following code find the minimum Hamming distance.

Data word	Code word
0 0	0 0 0 0 0
0 1	0 1 0 1 1
1 0	1 0 1 0 1
1 1	1 1 1 1 0

- Based on the minimum Hamming distance found, discuss the capabilities of this code. Represent the code in symbolic form. (08 Marks)
- b. Draw the block schematic diagram for encoder and decoder which uses a standard polynomial  $CRC-8 = x^8 + x^2 + x + 1$  for coding and decoding. Explain how code words are generated and errors in received code words are detected, if the message length is 8-bits, say 10101010. (08 Marks)

- c. In a system using CRC (Cyclic Redundancy Check) for error detection the generation used is 1011 and codeword received is 1011110. Explain with reason what is the action taken at receiver. (04 Marks)

**PART – B**

- 5 a. In stop-and-wait automatic repeat request (Stop-and-wait ARQ), explain how is error control mechanism added to stop-and-wait protocol of noise free channel for a noisy channel. With frame flow diagram, explain how a frame is delivered when (i) it is delivered first time and acknowledged (ii) When it is lost (iii) when it is delivered but it's acknowledgement is lost. (08 Marks)
- b. What is a High-Level Data Link Control (HDLC) protocol? Indicate in diagrammatic form, the frame format of different HDLC frames. Which field in these frames indicates the type of frame? (08 Marks)
- c. Assume that in a stop-and-wait ARQ system the bandwidth of the line is 1 Mbps and 1 bit takes 10 ms for one way trip. What is the bandwidth-delay product? If the system data frames are 1000 bits in length, what is the utilization percentage of the link? (04 Marks)
- 6 a. Describe CSMA/CD access method with space/time model and indicate the requirements needed for this type of access. (08 Marks)
- b. With a neat diagram describe the different fields and their lengths in bytes of standard Ethernet (802.3 MAC) frame. (08 Marks)
- c. A network using CSMA/CD has a bandwidth of 10 Mbps. What should be the minimum size of frame if the maximum propagation time including delays in devices is  $25.6 \times 10^{-6}$  s. (04 Marks)
- 7 a. Describe how the communication takes place in wireless LANs with the help of CSMA/CA flowchart. Also explain how is collision avoided. (08 Marks)
- b. Draw the schematic diagram of a cellular system in cellular telephony and describe how a call is made and a call is received by the mobile station. (08 Marks)
- c. Advanced Mobile Phone System (AMPS) uses 824 MHz to 849 MHz (25 MHz) band for reverse communication and 869 MHz to 894 MHz (25 MHz) band for forward communication. Calculate the number of analog channels if the bandwidth of analog channel is 30.04 kHz. If AMPS has frequency reuse factor of 7, how many channels are available in a cell? (04 Marks)
- 8 a. Why is Network Address Translation (NAT) used in IPv4 protocol? Explain with example how the address of datagram gets changed? (Use private source address 198.168.0.1, NAT router address 200.24.5.8 and Destination address 25.8.2.10). (08 Marks)
- b. Draw the diagram showing the IPv4 datagram format showing different fields with their length in bits. Explain the function of each field. (08 Marks)
- c. In IPv4 datagram has arrived with the following information in the header (in hexadecimal)  
OX 4500 0054 0003 5850 2006 0000 7C4E 0302 B40E 0F20  
Answer the following questions:  
(i) Is the packet fragmented? (Give reason to your answer)  
(ii) What is the size of data?  
(iii) How many routers the packet can travel to?  
(iv) What is the identification of the packet in decimal? (04 Marks)

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