Unique Paper Code : 32341303
Name of Course : B.Sc. (H) Computer Science *(CBCS-LOCF)*
Name of the Paper : Computer Networks
Semester : III
Duration : 3 Hours Maximum Marks: 75
Year of Admission : 2019, 2020

Instructions for Candidates
Attempt any four questions
All Questions carry equal Marks

Q1. a) A message M(x) 1101101101 is transmitted using the CRC method. The generator polynomial is $x^3 + 1$. Compute the bit stream transmitted which includes the message and CRC. Suppose that the fifth bit from the left is inverted during transmission. Show that this error is detected at the receiver's end. Elaborate the steps involved.

b) How can the receiver correct a single bit error occurred during the transmission? Name the method used for this purpose. Compute the bit stream transmitted using this method for the message M = 1101101. Show the steps to detect and correct the error at receiver's end if the fifth bit from the left is inverted during transmission.

Q 2. Briefly state the functionality of the following devices/protocols. Also mention the layer(s) on which each of these operate.

(i) TCP	(ii) IP	(iii) UDP	(iv) ICMP
(v) DNS	(vi) SMTP	(vii) Switch	(viii) Router
(ix) HTTP	(x) ARP	(xi) Hub	(xii) RARP

Q3. a) What is the bandwidth of an analog signal that can be decomposed into five sine waves with frequencies at 10, 210, 100, 130 and 150 Hz? How long will it take to send a frame of 100,000 bits if the bandwidth of the digital channel is 10 kbps? What is the maximum data rate supported by this line, if the signal-to-noise ratio is 1023 with bandwidth of 10 kbps?

b) What is the bit pattern of the preamble used in Ethernet frame? What is the purpose of using preamble? Ethernet requires valid frames to have at least 46 bytes data. Give reasons for choosing the minimum data size of 46 bytes. How the data of size less than 46 bytes is handled by Ethernet?

c) Why do we require guard bands in frequency division multiplexing (FDM)? 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. Calculate the required bandwidth. Can we use coaxial cable for transmitting this multiplexed data? Give reasons in support of your answer.

Q4. a) An organization is granted a block of addresses beginning with 100.100.100.0/24. How many addresses are possible in this block? How many hosts can we connect to each subnet if the organization needs to have 8 subnets? Give first and last address in each of the 8 subnets.

b) Explain the difference between circuit switching and packet switching techniques. A message of size 10000 bytes has to be sent in a network having bandwidth 10 kbps. Assume that each packet size is 1000 bytes with header of 100 bytes. How many packets will be formed to transmit this message? How much time will it take to transmit this message?

Q5. Explain UDP header with the help of diagram. What is the minimum and maximum size of a UDP segment? List and explain the steps involved in message transfer from source to destination using UDP? How do they differ from the steps used by TCP for message transfer?

Q6. a) What is the importance of flow control in context of network communication? Which layer(s) provide this service? List and compare the different flow control protocols.

b) What are the different types of transmission impairment? How are these type of transmission impairment handled? Consider an extremely noisy channel in which the value of the signal-to-noise ratio is 40 dB. Compute approximate bit rate if bandwidth of the channel is 1 kHz.