VIT Bhopal University

School of Computing Science and Engineering

Computer Networks (CSE3006)

B.Tech. / Int. M.Tech. (Winter Semester 2024-25)

Assignment-02

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Note: Attempt all the questions.

1. Enumerate the benefits of optical fiber in comparison to twisted-pair and coaxial cable?
2. How does sky propagation differ from line-of-sight propagation? What is the difference between omnidirectional waves and unidirectional waves?
3. What are different approaches to switching? Explain each in detail?
4. A path in a digital circuit-switched network has a data rate of 1Mbps. The exchange of 1000 bits is required for the setup and teardown phases. The distance between two parties is 5000 km. Answer the following questions if the propagataion speed is $2X10^8$ m/s:
    a. What is the total delay if 1000 bits of data are exchanged during the data transfer phase?
    b. What is the total delay if 100,000 bits of data are exchanged during the data transfer phase?
    c. What is the total delay if 1,000,000 bits of data are exchanged during the data transfer phase?
    d. Find the delay per 1000 bits of data for each of the above cases and compare them. What can you infer?
5. We need a dataword of at least 11 bits. Find the values of k and n in the Hamming code C(n, k) with $d_{min} = 3$.
6. Prove that the code represented by following table is not a linear code.

Dataword	*Codeword*
00	00000
01	01011
10	10111
11	11111

7. A sender needs to send the four data items 0x3456, 0xABCC, 0x02BC, and 0xEEEE. Answer the following:
    a. Find the checksum at the sender site.

b. Find the checksum at the receiver site if there is no error.
c. Find the checksum at the receiver site if the second data item is changed to 0xABCE.
d. Find the checksum at the receiver site if the second data item is changed to 0xABCE and the third data item is changed to 0x02BA.

8. Which of the following CRC generators guarantee the detection of a single bit error?
   a. $x^3 + x + 1$
   b. $x^4 + xl$
   c. 1
   d. $x^2 + 1$
9. Compare and contrast byte-oriented and bit-oriented protocols. Which category has been popular in the past (explain the reason)? Which category is popular now (explain the reason)?
10. Referring to the CRC-32 polynomial, answer the following questions:
    a. Does it detect a single error? Defend your answer.
    b. Does it detect a burst error of size 16? Defend your answer.
    c. What is the probability of detecting a burst error of size 33?
    d. What is the probability of detecting a burst error of size 55?
11. The timer of a system using the Stop-and-Wait ARQ Protocol has a time-out of 6 ms. Draw the flow diagram for four frames if the round-trip delay is 4ms. Assume no data frame or control frame is lost or damaged.
12. Using 5-bit sequence numbers, what is the maximum size of the send and receive windows for each of the following protocols?
    a. Stop-and-Wait ARQ
    b. Go-Back-N ARQ
    c. Selective-Repeat ARQ
13. A system uses the Stop-and-Wait ARQ Protocol. If each packet carries 1000 bits of data, how long does it take to send 1 million bits of data if the distance between the sender and receiver is 5000 Km and the propagation speed is 2×10^8 m/s? Ignore transmission, waiting, and processing delays. We assume no data or control frame is lost or damaged.