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Question :1) Complete the next table for the different protocols discussed in this chapter. Answer yes or no.

Characteristic	Token Passing	Chanalization
Multiple access	no	yes
Carrier Sense	no	no
Collision checking	no	no
Acknowledgment	no	no

Question : 2) A network with one primary and four secondary stations uses polling. The size of a data frame is 1000 bytes. The size of the poll, ACK, NACK frames are 32 bytes. Each station has 5 frames to send how many total bytes are exchanged if each station can send only one frame in response to a poll.

Polling and data transfer:

Frame 1 for all four stations: 4 * [poll + frame + ACK]

Frame 2 for all four stations: 4 * [poll + frame + ACK]

Frame 3 for all four stations: 4 * [poll + frame + ACK]

Frame 4 for all four stations: 4 * [poll + frame + ACK]

Frame 5 for all four stations: 4 * [poll + frame + ACK]

Polling and sending NAKs

Station 1: [poll+ NAK]

Station 2: [poll+ NAK]

Station 3: [poll+ NAK]

Station 4: [poll+ NAK]

Total activity:

24 polls + 20 frames + 20 ACK s+ 4 NAKs = 21536 bytes.

3) Prove that the inner product of the two same sequences will give N , where N is the number of sequences (stations) for any two entries of your choice in W8.

[+1 -1 +1 -1 +1 -1 +1 -1]. [+1 -1 +1 -1 +1 -1 +1 -1]

=1+1+1+1+1+1+1+1=8 =N

5) What is the number of sequences if we have 50 stations in our network?

The number of sequences needs to be 2^m

We need to choose m = 6 and Number of sequences = 2^6 or 64.

We can then use 50 of the sequences as the chips.

6) Get the sequences (chips) for 6 stations. (6 is not power of 2 but 2^3=8 so we calculate W8 but consider only the first 6 rows as our stations)

1) W_1=[1]

W_2 = 1 1

1 -1

W_{4} = +1 +1 +1 +1

+1 -1 +1 -1

+1 +1 -1 -1

+1 -1 -1 +1

W_{8} = +1 +1 +1 +1 +1 +1 +1 +1 S1

+1 -1 +1 -1 +1 -1 +1 -1 S2

+1 +1 -1 -1 +1 +1 -1 -1 S3

+1 -1 -1 +1 +1 -1 -1 +1 S4

+1 +1 +1 +1 -1 -1 -1 -1 S5

7) Four stations A,B,C and D share a link during 1-bit interval using CDMA channelization method. Assume that station B send a ***0*** bit ,stations A is ***silen***t and both of station C and D send a ***1*** bit and W_1=[-1].

a) Determine the common data on the common channel.

- Sequence generation:

We have 4 stations N=4

W_{4} = -1 -1 -1 -1

-1 +1 -1 +1

-1 -1 +1 +1

-1 +1 +1 -1

- Each station is assigned a sequence:

A = [-1 -1 -1 -1]

B = [-1 +1 -1 +1]

C = [-1 -1 +1 +1]

D = [-1 +1 +1 -1]

- Encoding:
  A is silent → 0

  B send 0 bit →-1

  C send 1 bit → 1

  D send 1 bit → 1

- In the multiplexer:
  0* [-1 -1 -1 -1] +-1 * [-1 +1 -1 +1] + 1 * [-1 -1 +1 +1] +1*[-1 +1 +1 -1]

  The encoded number is multiplied by each chip in the sequence=

  [0 0 0 0] + [+1 -1 +1 -1] + [-1 -1 +1 +1] + [-1 +1 +1 -1]

  All first chips are added, as are all second, third and forth= [-1 -1 +3 -1] the result is a new sequence, which is transmitted through the link.

b) Show how does station can detect the data sent by stations A and D

- Station A: [-1 -1 +3 -1] * [-1 -1 -1 -1] = [+1 +1 -3 +1]

  Then the chips in the sequence are added and divided by 4: 1+1-3+1=0/4 =0→ silence

- Station B: [-1 -1 +3 -1] * [-1 +1 -1 +1] =[+1 -1 -3 -1] =-4/4= -1 → bit 0
- Station C: [-1 -1 +3 -1] * [-1 -1 +1 +1] = [+1 +1+3 -1] =4/4=1→bit 1
- Station D: [-1 -1 +3 -1] * [-1 +1 +1 -1] = [+1 -1 +3 +1] = 4/4 =1→bit 1

Question 3 Hamming code is a technique that is used to achieve forward error control. This allows a receiver to correct any single error, if any, in the received message. If the transmitted character is **01001010**, generate the Hamming codeword.

1) Calculate the number of redundant bits:

2^r>= m + r + 1   we have 8 bit of data so,

2^r>= 8 + r + 1

r=4

16 > 13

We have 4 redundant bits which gives us a total of 4+8=12 bit

2) Implementing the Hamming codeword:

12	11	10	9	8	7	6	5	4	3	2	1
0	1	0	0	r_8	1	0	1	r_4	0	r_2	r_1

r_1: 1, 3, 5, 7, 9, 11

r_2: 2, 3, 6, 7, 10, 11

r_4: 4, 5, 6, 7,12

r_8: 8, 9, 10, 11,12

0	1	0	0	r_8	1	0	1	r_4	0	r_2	r_1
0	1	0	0	r_8	1	0	1	r_4	0	r_2	**1**
0	1	0	0	r_8	1	0	1	r_4	0	**0**	**1**
0	1	0	0	r_8	1	0	1	**0**	0	**0**	**1**
0	1	0	0	**1**	1	0	1	**0**	0	**0**	**1**

Question 4)how does CSMA/CD protocol improve performance compared to CSMA protocol?

CSMA/CD has less Collision that's why CSMA/CD performs better than CSMA