DATA COMMUNICATION ASSIGNMENT - 2

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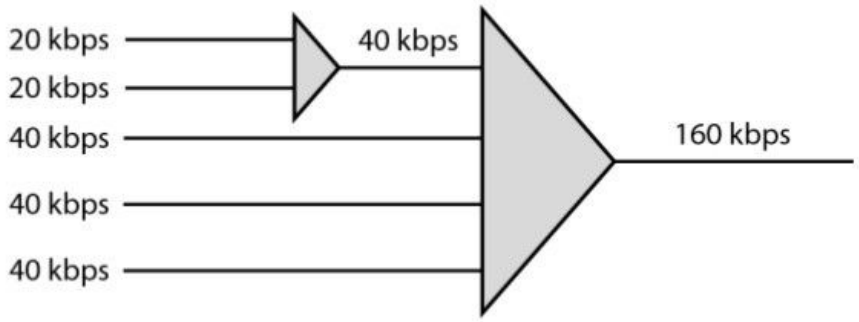
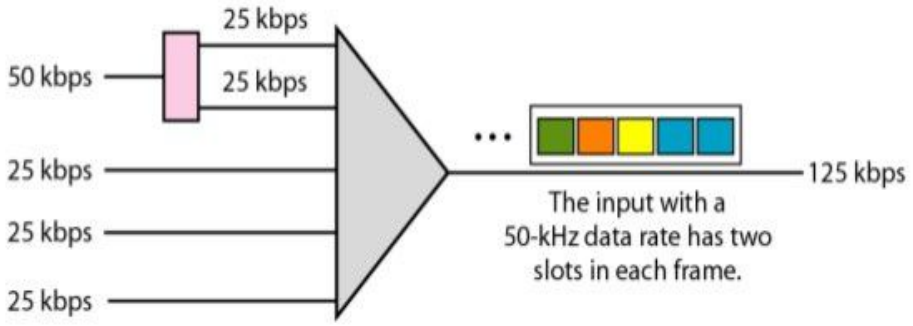
1. Distinguish between multilevel TDM,multiple-slot TDM, and pulse-stuffed TDM.

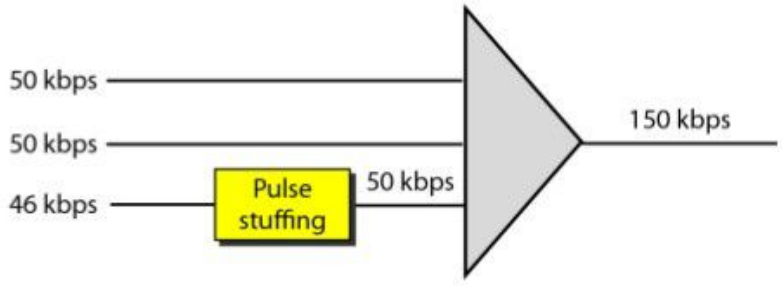
Multilevel: used when the data rate of the input links are multiples of each other.



Multislot: used when there is a GCD between the data rates. The higher bit rate channels are allocated more slots per frame, and the output frame rate is a multiple of each input link.



Pulse Stuffing: used when there is no GCD between the links. The slowest speed link will be brought up to the speed of the other links by bit insertion, this is called pulse stuffing.



2.In CRC we have chosen the generator 1100101.what is the probability of

detecting a burst error of length
a.5 b.7 c.10

Answer: The term burst error means that 2 or more bits in the data unit have changed from 1 to 0 or from 0 to 1.

In this case r = 7 − 1 = 6.

a) The length of the error is L = 5, which means L ≤ r. All burst errors of this size will be detected.

b) The length of the error is L = 7, which means L = r + 1. This CRC will detect all burst errors of this size with the probability 1 − (0.5)5 ≈ 0.9688. Almost 312 out of 10,000 errors of this length may be passed undetected.

c) The length of the error is L = 10, which means L > r. This CRC will detect all burst errors of this size with the probability 1 − (0.5)6 ≈ 0.9844. Almost 156 out of 10,000 errors of this length may be passed undetected. Although the length of the burst error is increased, the probability of errors being passed undetected is decreased.

3.In CRC,which of the following generators(divisors) guarantees the detection of an odd number of errors?
a.10111 b.101101 c.111

Answer:

a) 10111: this generator is divisible by 11 therefore the quotient will be 1101. It can always detect odd number of errors.

b) 101101:this generator is divisible by 11 therefore the quotient will be 11011. It can always detect odd number of errors.

c) 111:this generator is qualified but is not divisible by 11; it can detect odd number of errors but not at all times

4.Assume we are sending data items of 16-bit length.if two data items are swapped during transmission,can the traditional checksum detect this error ? Explain.

Answer: No. In this case there two error, but the two errors cannot be detected because the sum and checksum remain the same.

5. Assume we want to send a dataword of two bits using FEC based on the hamming distance. Show how the following list of datawords /codewords can automatically correct up to a one bit error in transmission.
00->00000 01->01011 10->10101
11->11110

6.In a codeword we add two add two add redundant bits to each 8 bit data word.Find the number of
a.valid codewords b.invalid codewords
Answers: a.valid: 2^8 valid codes
b.invalid: 2^10 – 2^8 invalid codes

7.In CRC,which of the following generators(divisors) guarantees the detection of a single bit error?
a.101 b.100 c.1
Answer: a. No xi can be divisible by x + 1. Any single-bit error can be caught.
b. 100=x^2 .If i is equal to or greater than 2, xi is divisible by g(x). All single-bit errors in positions 1 and 2 are caught.
c. 1=x^0 All values of i make xi divisible by g(x). No single-bit error can be caught. This g(x) is useless.

8.What is the hamming distance for each of the following codewords?
a.d(10000,00000)
Answer: Hamming distance=1

b.d(10101,10000)
Answer: hamming distance =2
c.d(00000,11111)
Answer: Hamming distance=5
d.d(00000,00000)
Answer: Hamming distance=0