Q1. Explain briefly the different services that Data link layer provides to the Network layer?

Ans: The data link layer can be designed to offer various services. The actual services that are offered vary from protocol to protocol. Three reasonable possibilities that we will consider in turn are:

1. Unacknowledged connectionless Service
2. Acknowledged connectionless Service.
3. Acknowledged connection-oriented service.

Unacknowledged connectionless Service

i. no logical connection is established beforehand are released afterwards.
ii. if a frame is lost due to noise no attempt is made to detect the lose and recover from it.
iii. This is appropriate when error rate is very low and the real time traffic.
iv. Most lan use this service in datalink layer

Acknowledged connectionless Service

1. in this there is no logical connection is used but each frame send is individually acknowledged. here the sender know whether the frame has arrived correctly if it has not arrived within a specified time it can be sent again.

Acknowledged connection-oriented Service

→ the source and destination machine establishes a connection before a data is transfered.
→ each frame send over a connection is numbered and data link layer guarantees each frame sent and received correctly, and is received exactly once with the correct ordering.

Name: Regd. Number:

Q2. The following data fragment occurs in the middle of a data stream for which the byte stuffing algorithm is described in the text used ESC FLAG ESC ESC ESC FLAG. what is the output after stuffing.

Ans

FLAG ESC ESC ESC FLAG ESC ESC ESC ESC ESC ESC ESC FLAG FLAG

Q3 A bit stuffing based framing methods uses an 8-bit delimeter 01111110. if the output string after stuffing is 011111000101, the find the input bit string.

Ans the stuffed bit is 011111(0)0101
5 stuffed

therefore : 0111110101 is the input bit string.

Q4. Consider a binary code that consist only four valid codewords 0000, 01011, 10101, 11110, let the minimum hamming distance of the code p and the maximum number of erroneous bits that can be corrected by the code be q. Determine the values of p and q ?

Ans codewords are 00000
01011
10101
11110

hamming distance:
00000 01011 10101
01011 10101 11110
00011 11110 01011

minimum = 3 $\boxed{p=3}$

maximum error bits that can be correct using hamming distance = Floor $\left(\frac{d-1}{2}\right) = \frac{3-1}{2} = 1$

$\boxed{q=1}$

Name:_____ Regd. Number:_____

Q5 // Assume that a 12 bit Hamming codeword consisting of 8 bit data = 11010101 and 4 check bits = Y010 Determine the value of X and Y if data is encoded using even parity

Ans

8	7	6	5	4	3	2	1
1	1	0	X	0	1	0	1

C_8	C_4	C_2	C_1
Y	0	1	0

then

8	7	6	5	C_8	4	3	2	C_4	1	C_2	C_1
1	1	0	X	Y	0	1	0	0	1	1	0
12	11	10	9	8	7	6	5	4	3	2	1

C_1 = 1, 3, 5, 7, 9, 11

0 1 0 0 X 1 · even parity X = (0)

C_2 = 2, 3, 6, 7, 10, 11

= 1 1 1 0 0 1 even parity = 0

C_4 = 4, 5, 6, 7, 12

= 0 0 1 0 1 = even parity = 0

C_8 = 8, 9, 10, 11, 12

Y X · 0 1 1 =

⇒ Y 0 0 1 1 even parity Y = 0

∴ Therefore X = 0 and Y = 0,

Q6 // Find the remainderc obtained by dividing a binary stream expressed as polynomial x^7+x^5+1 by the generator polynomical.

here : $M(x) = x^7+x^5+1$

10100001

$G(x) = x^3+1$ = 1001

1001 | 10100001000

1001

00110

1001

01010

1001

00110

1001

0011

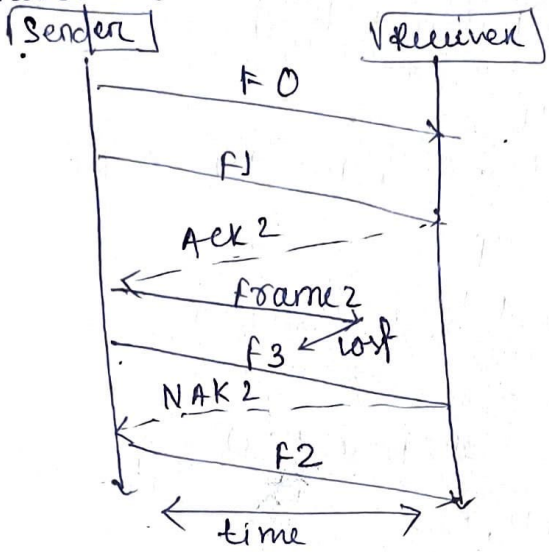
R = 011

01110
1001
01110
1001
0111

Q7. Justify with neat diagram, why the window size is half of the Sequence numbers used in selective repeat protocol?

Ans window size should be less than or equal to half the sequence number in SR protocol.

→ This is to avoid packets being recognized incorrectly. If the size of the window is greater than half the sequence number space then if an Ack is lost, the sender may send new packets that the receiver believes are retransmissions



Q8. Consider a 100 Mbps link bet^n an earth station and a satellite at an altitude of 2100 km. The signal propagates at a speed of 3×10^8 m/s the time taken for the receiver to completely recieve a packe of 1000 bytes transmitted by the sender is _____

Ans. Transmission time T_x = 1000 bytes
= 1000 × 8 bits
= 0.08 μsec

propagation time T_p = 2100 km / 3×10^8
= 2100×10^3 m / 3×10^8
= 7×10^{-3} sec
= 7 msec

time taken to receive the packet = 7 + 0.08
= 7.08 msec

Name:_____ Regd. Number:_____

Q9. Let the Sender window size be N

One way propagation delay = 100 ms = 0.1s

Transmission delay = $\frac{\text{size of data frame}}{\text{bit rate}} = \frac{2000}{10^6} = 0.002s$

Transmission delay $_{Ack}$ = $\frac{\text{size of ack frame}}{\text{bit rate}} = \frac{10}{10^6} = 0.00001s$

Link Utilization(η) = $\frac{\text{useful Data Transfer time}}{\text{total time}}$

$\Rightarrow \eta = \frac{N(T_f)}{T_t + 2(T_p) + T_{Ack}}$

$\Rightarrow N = \frac{\eta(T_f + 2(T_p) + T_{ack})}{T_f} = \left\lceil \frac{0.5(0.002 + 0.2 + 0.00001)}{0.002} \right\rceil$

$= \lceil 50.5 \rceil$

$= 51$

Q10. There are N stations sharing 56 Kbps pure ALOHA

Pure ALOHA usable bandwidth = 0.184 * 56 = 10.3 Kbps

1 station outputs 1000 bits in every 100 sec

1 sec one station will output = 1000/100 = 10 bit/sec

So for N stations in 1 sec = N * 10 = 10300

= N = 1030 is the maximum

Name: _____ Regd Number: