1a. Which OSI layer is responsible for the following?

i) Determining the best path to route the packets-Network layer
ii) Providing end-to-end process communication with reliable service-Transport layer
iii) Flow control-Data link & transport layer
iv) Provides access for end user-Application layer
v) Interface to transmission media-physical layer

1b. If a binary signal is sent over a 3-kHz channel whose signal-to-noise ratio is 20 dB, what is the maximum achievable data rate?

A signal-to-noise ratio of 20 dB
$S/N = 100$.
$\log_2 101 = 6.658$,
The Shannon limit is about 19.975 kbps. The Nyquist limit is 6 kbps.
Therefore maximum channel capacity of 6 kbps.

2. Compare Circuit switching and Packet switching with reference to call setup, path, Bandwidth, congestion, transmission, charging, transparency

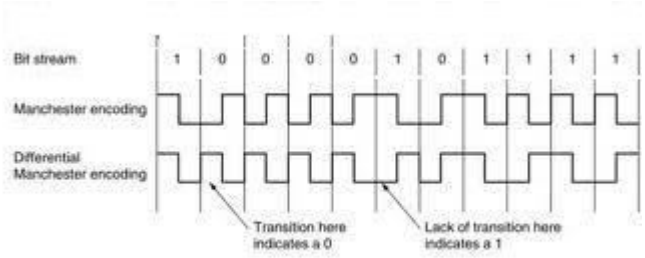
Item	Circuit switched	Packet switched
Call setup	Required	Not needed
Dedicated physical path	Yes	No
Each packet follows the same route	Yes	No
Packets arrive in order	Yes	No
Is a switch crash fatal	Yes	No
Bandwidth available	Fixed	Dynamic
Time of possible congestion	At setup time	On every packet
Potentially wasted bandwidth	Yes	No
Store-and-forward transmission	No	Yes
Transparency	Yes	No
Charging	Per minute	Per packet

3. Compare the An HDLC frame in a network is composed as (Bit stuffing with 2 byte of FCS is used) Start_ 7E072B3E5E50BFCS7E
Identify the type of frame.- I-frame
Identify the secondary address. 0000011 (3)
Identify the frame sequence and acknowledgement numbers if any. Sequence no -2
& acknowledgement no-3

Identify the actual user data carried in the frame, if any. 3E5E50B
What is the maximum number of nodes possible in this network? 128

4a. Given a remainder of 111, a data unit of 10110011, and a divisor of 1001, is there an error in the data unit? Explicitly show the relevant CRC binary division calculation. No error

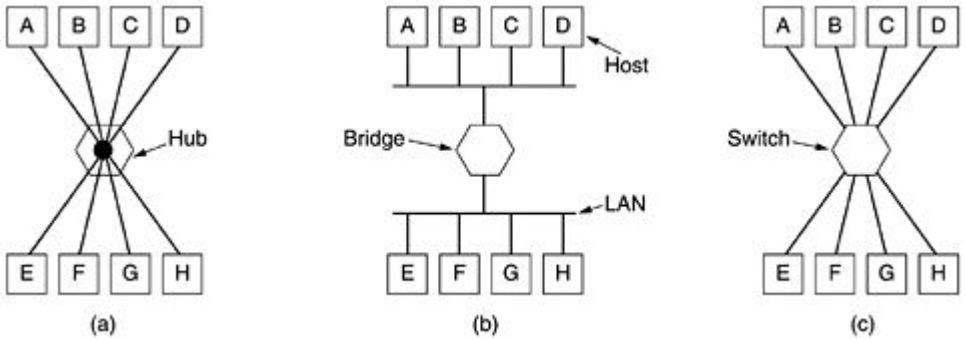
4b. For the bit sequence 10000101111 draw the waveform for
i) Manchester Encoding
ii) Differential Manchester Encoding



5. The following character encoding is used in a data link protocol: A: 01000111; B: 11100011; FLAG:
01111110; ESC: 11100000 Show the bit sequence transmitted (in binary) for the four-character frame: A
B ESC FLAG when each of the following framing methods are used:
a. (a) Character count.
b. (b) Flag bytes with byte stuffing.
c. (c) Starting and ending flag bytes, with bit stuffing.

(a) 00000100 01000111 11100011 11100000 01111110
(b) 01111110 01000111 11100011 11100000 11100000 11100000 01111110
01111110
(c) 01111110 01000111 110100011 111000000 011111010 01111110

6. What are the differences among switch, bridge and hub with diagrams?



Repeaters are analog devices connected to two cable segments. A signal appearing on one of them is amplified and put out on the other. Repeaters do not understand frames, packets, or headers. They understand volts

A hub has a number of input lines that it joins electrically. Frames arriving on any of the lines are sent out on all the others. If two frames arrive at the same time, they will collide, just as on a coaxial cable. In other words, the entire hub forms a single collision domain. All the lines coming into a hub must operate at the same speed. Hubs differ from repeaters in that they do not (usually) amplify the incoming signals and are designed to hold multiple line cards each with multiple inputs, but the differences are slight. Like repeaters, hubs do not examine the 802 addresses or use them in any way.

A bridge connects two or more LANs. When a frame arrives, software in the bridge extracts the destination address from the frame header and looks it up in a table to see where to send the frame. a bridge may have line cards for different network types and different speeds.

Switches are similar to bridges in that both route on frame addresses. In fact, many people uses the terms interchangeably. The main difference is that a switch is most often used to connect individual computers, each switch port usually goes to a single computer, switches must have space for many more line cards than do bridges intended to connect only LANs.