EXAM 2

ANSWER ALL OF THE FOLLOWING QUESTIONS

1) True/ False (18 points)

a) A group of either seven or eight bits comprise either a byte or octet. False

b) The decibel is a ratio that can express either a linear gain or linear loss. True — False

c) Exact multiples of a frequency are called harmonics. True

d) Through the use of filters, it is possible to separate multiple transmissions occupying the same frequency spectrum. False

e) The higher bit error rate of the link, the smaller the maximum packet size must be. True

f) The shorter the maximum packet size, the longer is the packet transit delay. False

g) The smaller the maximum packet size, the smaller the size of memory buffers required for storage. True

h) HDLC is used as a foundation for LAPB and LAPD and not LLC. False

i) In HDLC, a station places its own address in the address field when it transmits a command. False

j) The poll/ final (P/F) bit in a HDLC frame, is only recognised when it is set to 1. True

k) CSMA/CD is very efficient for heavy traffic because of the decrease collisions. False

l) Twisted pair cables are easy to install, very cheap and immune to crosstalk problem. True

m) Thin-wire coax are used to connect DTEs in the same office while thick-wire coax are used along a corridor. True

n) With coax, duplex data communication can be provided only when two separate cables are used, one for the transmit channel and the other for the receive channel. False

o) A hub topology is a variation of the bus although it appears like a star. True

p) In LANs the throughput is higher with larger frame size which is due to the smaller overhead. True

q) All LAN protocols perform well under medium to heavy traffic. False

r) Token bus is the most efficient under varying work loads. False ring
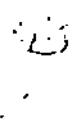
2) Match the definition with the appropriate HDLC term: (6 points)

a) Combined station can transmit without prior permission
b) Secondary station can transmit without prior permission
c) Secondary station must receive permission to transmit.

1) Normal response mode (NRM)
2) Asynchronous balanced mode (ABM)
3) Asynchronous response mode (ARM)

3) Match the Protocol to the appropriate property: (6 points)

Data Link protocol for X.25 networks   a) LAPD

Data Link protocol for ISDN signaling channel   b) MAC

HDLC derivative used with LANs   c) UDP

Provide minimum Transport layer service   d) LAPB

Bottom sublayer of layer 2   e) LLC

Connectionless-mode network service   f) IP

4) Match the transmission media to the appropriate property: (6 points)

Infrared   a) High propagation delay
Twisted-pair lines b) Bandwidth from 9 KHz to 275 GHz
Coaxial cables   c) Restricted to one room
Optical fibre   d) used in telephone and data networks
Satellites   e) Immune to electrical noise
Radio   f) used for baseband and broadband communications.

5) Match the exact technique used to solve the following problems: (6 Points)

Intersymbol interference can be reduced by   a) space diversity
Adjacent channel interference can be reduced by   b) optical bandpass filter
Rayleigh Fading can be dealt with by   c) multi-subcarrier modulation
Problem of intentional interference is solved by   d) spread spectrum techniques
Interference by light sources is reduced by   e) 4-way handshake procedure
Absence of receiver in coverage area is detected   f) 3-cell repeat pattern technique

6) Link Management. Fill in the appropriate type of frame between the 2 peer link layers in the following time sequence diagram. (6 Points)
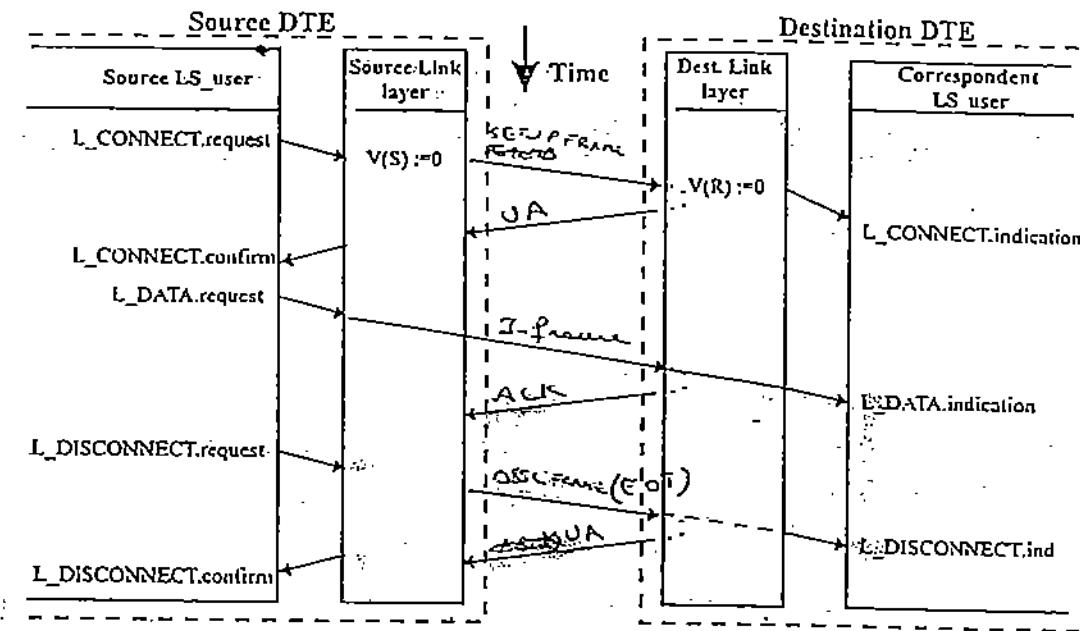
7) Adding the link management functions affects continuous RQ protocol specifications. Complete the following state transition diagram. (6 Points)
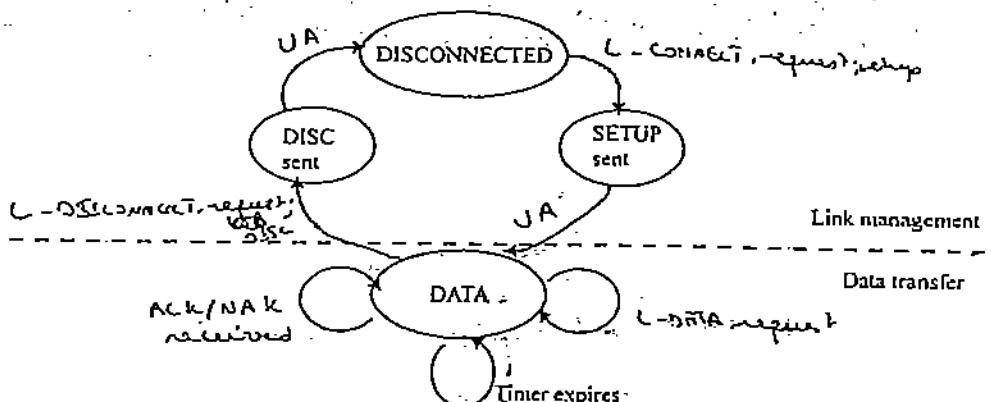
8) Calculate in decibels the mathematical expression of the difference Δ between 2 received signal powers in free space when they are received from 2 different distances d_1 and d_2. What should be the relationship between d_2 and d_1 so that $\Delta \approx -12$ dB.

(10 Points)

$$P_{received} = \frac{P_{transmitted}}{(4\pi f c / d)^2}$$

$$\Delta = 10 \log\left(\frac{P_2}{P_1}\right) = 10 \log\left(\frac{d_1^2}{d_2^2}\right) = 20 \log\left(\frac{d_1}{d_2}\right) \quad db$$

$$20 \log\left(\frac{d_1}{d_2}\right) = -12 \Rightarrow \log\left(\frac{d_1}{d_2}\right) = -0,6$$

$$\Rightarrow \frac{d_1}{d_2} = 10^{-0,6} \Rightarrow \boxed{d_1 \approx 0,25 \, d_2} \quad (m)$$

9) HDLC protocol, write the appropriate values in the V(S) and V(R) counters:

Sender (P)						Receiver (S)		

Sender-(P)

Retrans. list   V(S) V(R)

0   0

1 / 0   I(0,0)

N(R) = 1
I(0) ackn.

RR (1)

2 / 0   I(1,0)

3 / 0   I(2, 0 / P=1)

I(1) timeout . retransmission
3 / 0   I(1, 0 / P=1)

RR (2 / F=1)

N(R) = 2
I(1) ackn.

I(2) timeout . retransmission   I(2, 0 / P=1)

N(R) = 3   RR (3 / F=1)
I(2) ackn. 3   0

Receiver (S)

V(S) V(R)

0   0

0 / 1   N(S) = V(R) .. frame accepted

0 / 1

0 / 1   N(S) ≠ V(R) .. frame rejected

0 / 2   N(S) = V(R) .. frame accepted

0 / 3   N(S) = V(R) .. frame accepted
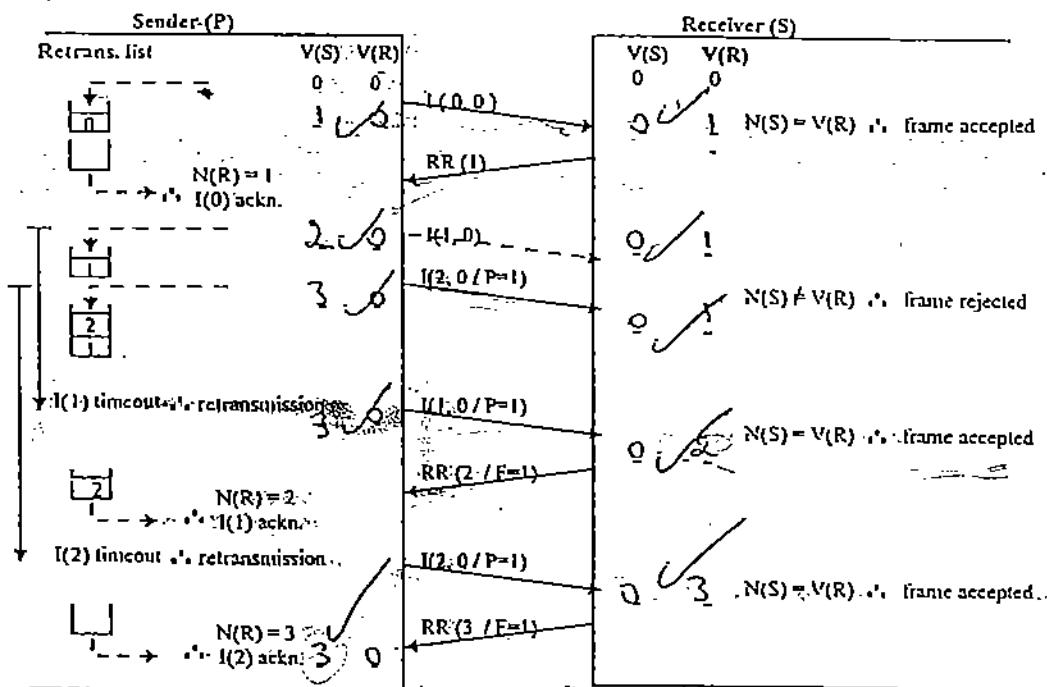
(8 Points)

10) In radio LAN CSMA/CD (comb) is used as a MAC protocol. In the following diagram 3 nodes A, B and C are in contention for the channel and the pseudorandom codes generated by each are shown. Using the diagram answer the following questions:
a) *who* completes the contention process successfully and starts first to transmit its frame?
b) *when* each of the 2 other nodes senses a signal and *from* which node (s). (6 Points)

Comb

Node A   Frame?
1 1 0 1 0
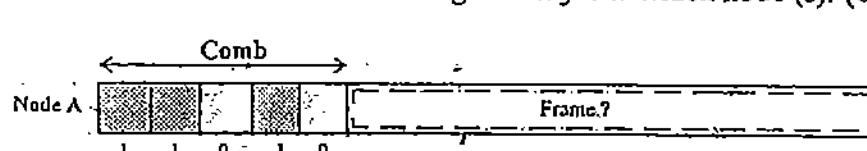
① hey B senses a signal from A & C and stops

Node B   Frame?
1 0 0 0 0
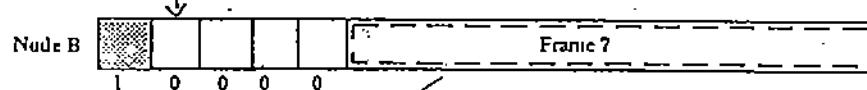
② hen C senses a signal from A and stops

Node C   Frame?
1 1 0 0 0
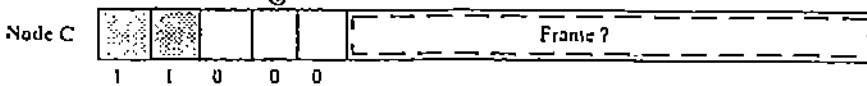
a) Node A starts first because whenever it listens nobody is transmitting.