CSC 425
Fall 98

done

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EXAM 1

Answer All the following Questions:

1) Choose the type of data communication required for the following cases:

e 2 computers in the same room
a 2 DTEs in different parts of a town
f More than 2 DTEs in a building
b Several DTEs in different sites
c Distant DTEs for the same company
d Voice & data in an all-digital mode

a) PSTN + 2 modems
b) wide area network (WAN)
c) leased transmission lines
d) ISDN
e) point-to-point wire link
f) local area network (LAN)

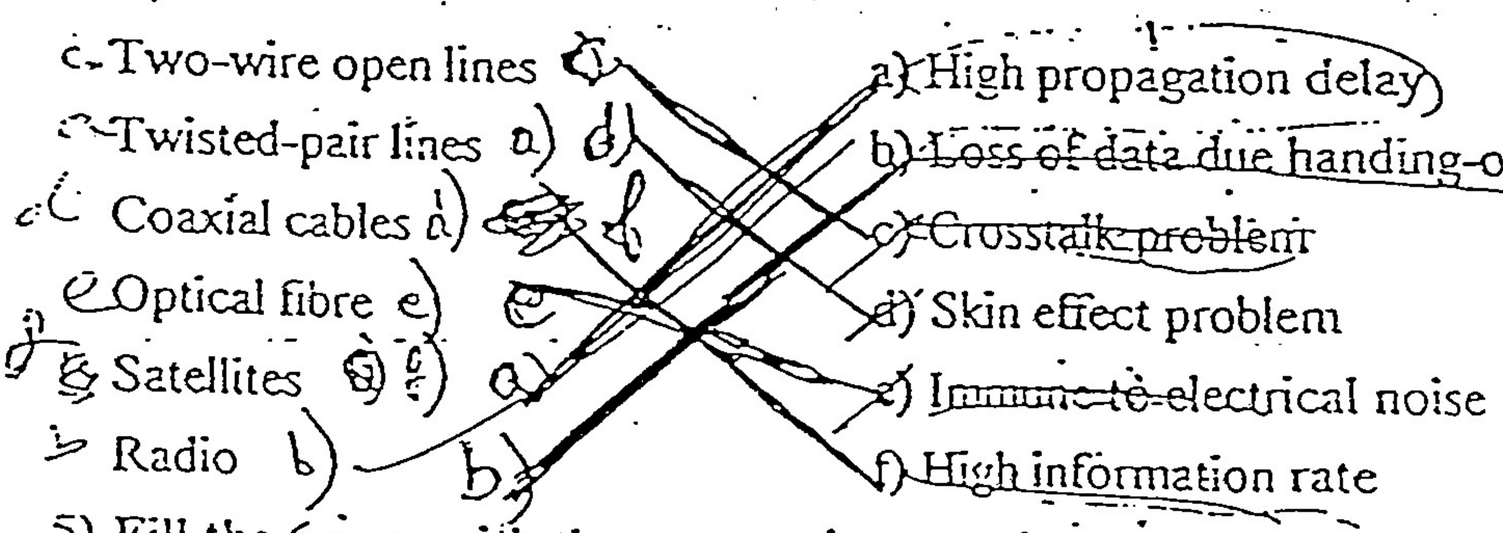
2) Fill the 8 gaps with the appropriate word : network, layers, Application, protocol, local, peer, layer

The ISO broke the communication subsystem into seven layers. Each of these perform one of the two generic functions: network dependent functions and Application oriented functions. They operate according to a defined protocol (set of rules) by exchanging messages, both local data and additional control information, with a corresponding peer (similar) layer in a remote system.

3) Write the name of the layer and its number in the OSI Model:

Network	Routing, addressing, call set-up and clearing, internetworking	Network (layer 3)
Transport	End-to-end message transfer (connection management, error control, flow control)	Transport (layer 4)
Physical	Mechanical and electrical network interface definitions	Physical (layer 1)
Presentation	Transfer syntax negotiation, data representation transformations	Presentation (layer 6)
Session	Dialog and synchronization control for application entities	Session (layer 5)
Application	File transfer, electronic mail, concerned with the data semantic	Application (layer 7)
Link	Data link control (framing, data transparency, error control)	Link (layer 2)

4) Match the transmission media to the appropriate property:



5) Fill the 6 gaps with the appropriate word :

The bandwidth is the range of frequencies present in a signal.
Any periodic function is represented by an infinite sum of sinusoidal frequencies.
The maximum signalling rate is equal to twice the bandwidth.
The channel capacity is the maximum bit rate that can be transmitted on a channel and is a function of bandwidth and noise on the channel (Shannon-Hartley law).

6) Map the following services to the type of protocol (8 points)

(c) Originally for Voice transmission (c) (c)

(f) Provide Reliable Transport layer service (Internet Protocols) (f) TCP

(g) Provide minimum Transport layer service (Internet Protocols) (g)

(b) Interconnect users in a small geographical area (b) (b)

(h) It is a "best-effort" delivery service (h) (h)

(e) Provide Broadband Communication services (e)

(a) Protocol used for electronic mail (a) (a)

(d) The remote terminal Protocol (d) (d)

a) SMTP

b) LAN

c) PSTN

d) TELNET

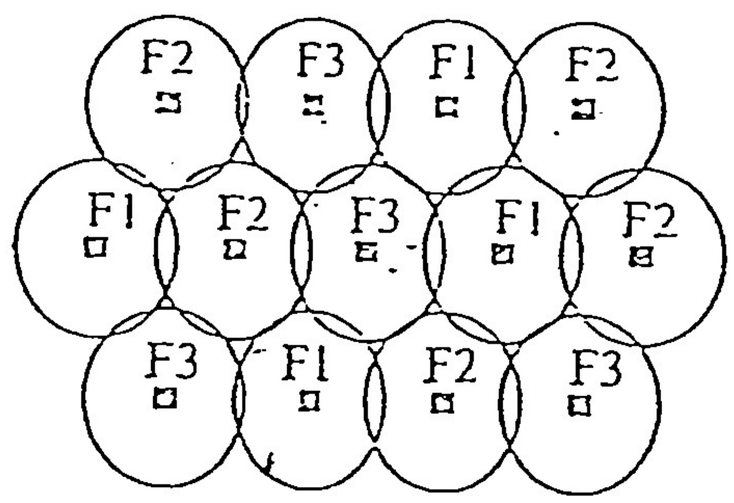
e) ISDN

f) TCP

g) UDP

h) IP

7) What is the problem with the following radio cellular network: (6 points)



Neighboring cells

Cochanel interference

8) Fill the 10 gaps with the appropriate word : (10 points)

The ISO broke the communication subsystem into seven protocol layers. Each of these, perform one of the two generic functions: Network -dependent functions and Application oriented functions. They operate according to a defined protocol (set of rules).

The bandwidth is the range of frequencies present in a signal.
Any periodic function is represented by an infinite sum of sinusoidal frequencies.
The maximum signaling rate is equal to twice ? the bandwidth.
The channel capacity is the maximum bit rate that can be transmitted on a channel and is a function of signal-to-noise and noise sig. power (Shannon-Hartley law).

9) Fill in the following words in the appropriate box: long distance, low cost, complexity, multimedia, one channel, simplicity, RF modem costs, no interference among sharing users , few hundred meters only. (10 points)

	Baseband	Broadband
Advantages	simplicity . low cost	-long distance multimedia No interference
Disadvantages	few hundred meters only One Channel	Complexity Rf modem costs

10) How long will it take to transmit 1000 invoices (file transfer time) between 2 cities running synchronous modems at 56 Kbps. Assume that each frame is 250 characters long, with 10 control characters per frame and 8 bits per character. Assume the average length of each invoice is 5000 characters.

a) First Assume the BER = 0

b) Then assume that the BER= 10^{-4}

(16 points)

1000 invoices

Synchronous modems block

Each frame 250 ch + 10 control (8 b.t.s/char)

L = 5000 char

a) BER = 0

$$\#\text{ of frames/invoice} = \frac{5000}{250} = 20 \text{ frames/invoice}$$

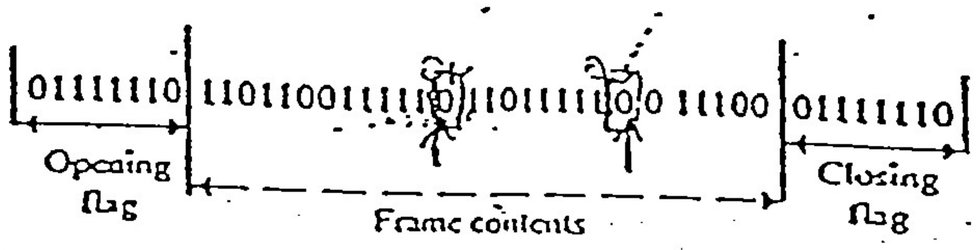
$$\text{frame} = 20 \times 260 \times 8 = 41600 \text{ bits}$$

$$\text{Time to transmit 1000 invoices} = \frac{1000 \times 41600}{56000} = 742.85 \text{ s.}$$

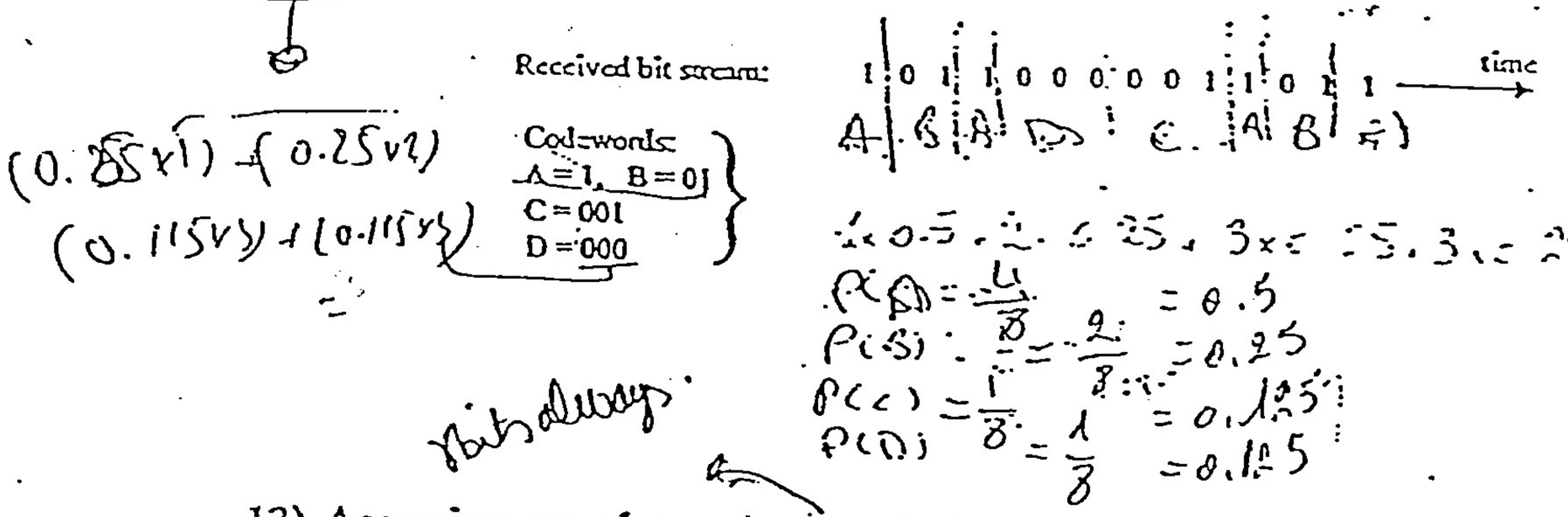
b) BER = 10^{-4}

$$P_{error} = 1 - (1-P)^N = 1 - 1 + NP = NP$$

$$P_{error} = \underbrace{260 \times 8}_{N} \cdot \underbrace{10^{-4}}_{P} = 2080 \cdot 10^{-4} = 0.208$$



11) Decode the following Huffman coded string of characters and calculate the average number of bits per codeword.



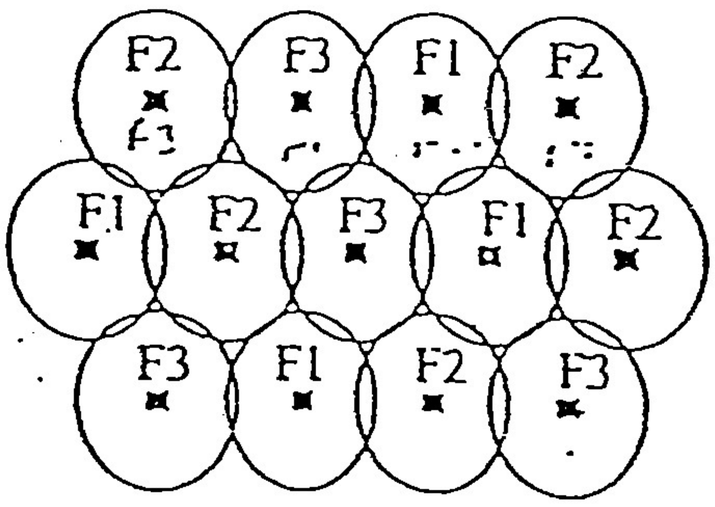
12) Assuming asynchronous transmission, one start bit, two stop bits, one parity bit, and four bits per signalling element, derive the useful information rate in bps if the signalling rate is 300 *baud*.

13) Assume a continuous RQ protocol with no errors. What should the minimum value of the send window K be in order to have a link utilisation U equal to 1, when the propagation delay and the transmission time are equals.

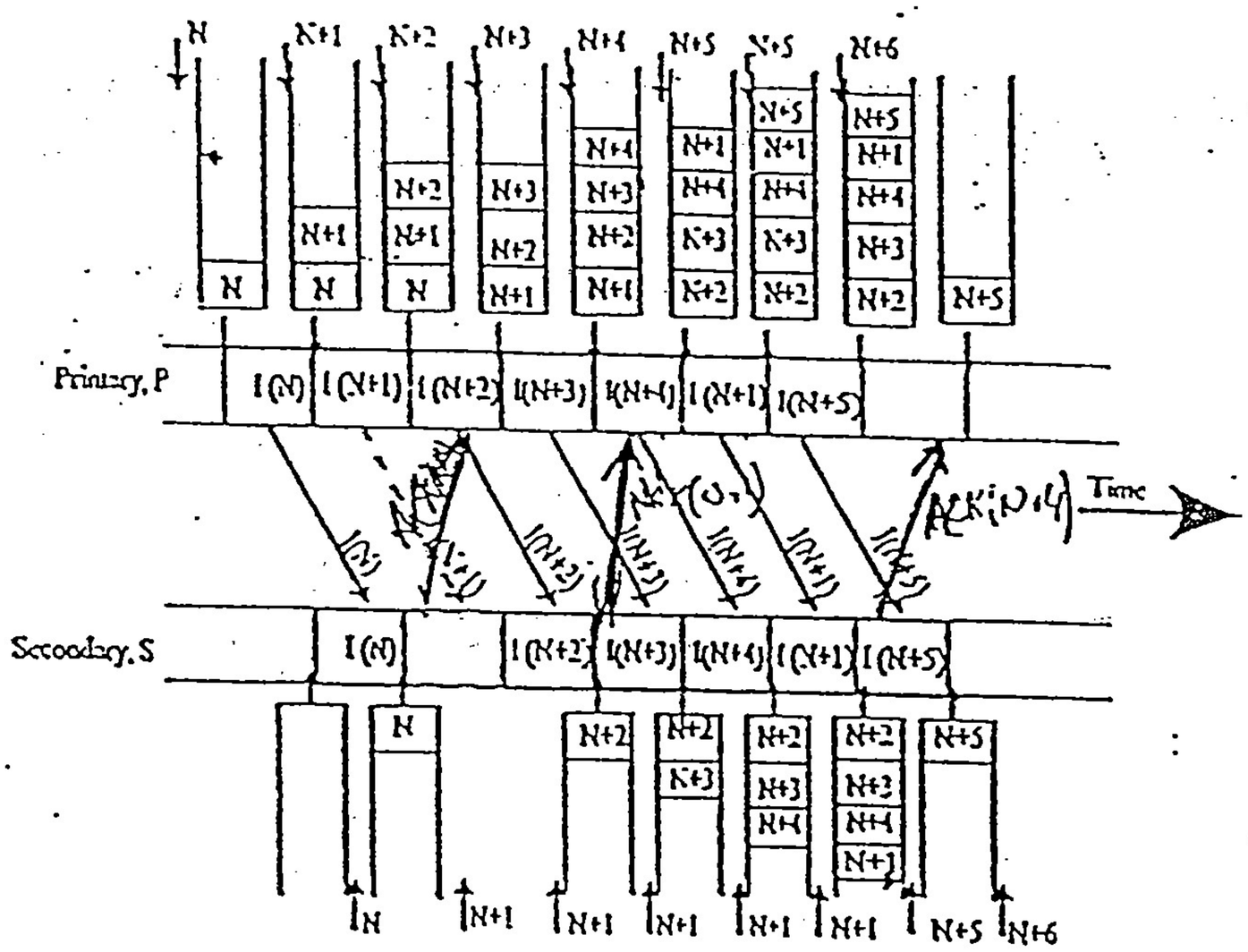
$$T_{tx} = T_p \Rightarrow a = \frac{T_p}{T_{tx}} = 1$$

$$U = 1 \quad \text{for} \quad K \geq 1 + 2a \Rightarrow K_{min} = 1 + 2a = 3$$

14) What is the problem with the following radio cellular network:



15) *Selective Repeat* scheme. Draw the appropriate ACK/NAK-frames on the diagram:



16) Find the 3 errors in the state transition diagram of the (primary) *idle RQ* protocol.

Incoming Events: *LDATAreq*: L_DATA request service primitive received.
ACKRCVD: ACK-frame received from S. *TEXP*: Wait-ACK timer expires.
NAKRCVD: NAK-frame received from S.
States: *IDLE*: idle, no message transfer in progress.
WTACK: waiting an acknowledgement.
Outgoing Events: *TxFrame*: Format and transmit an I-frame.
RetxFrame: Retransmit I-frame waiting ACK.
LERRORind: frame discarded for reason specified.
Specific Actions: [1] start_timer. [2] Increment Vs (send sequence variable).
[3] Stop timer. [4] Increment RetxCount. [5] Increment ErrorCount.
[6] Reset RetxCount to zero.