

(D)

Come

CSC 425

Donny

Et khawaj

ID # 975943

Dr. H. Maalouf

# NETWORK EXAM 1

1) True/ False (10 points)

- F a- In a frame, the header usually contains an error checking component. F
- T b- TCP/IP supports routing, and is commonly used as an internetworking protocol. T
- F c- The trailer of a frame of a packet contains the destination address. F
- F (X) d- The shorter the maximum packet size, the longer is the packet transmission delay.
- T (X) e- Bit stuffing is used to prevent incorrect interpretation of the user data field. T
- T (X) f- The propagation delay is a function of the frame length and the propagation speed over a given data link. T
- T (X) g- Twisted pair cables are easy to install, very cheap and immune to crosstalk problem. T
- (h) i- Every network adapter card sees all packets sent on its segment, but it only interrupts the computer if the packet's address matches its individual address.
- F (X) j- 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. F
- F (X) k- A data link layer provides error detection and end-to-end acknowledgement across multiple links. F

(7)



2) Match the OSI layer to the appropriate function, and give every layer its number in the OSI Model (8 POINTS):

- 7 Application layer ~~d) d~~ a) Ensures messages are delivered error free and in order.
- 2 Data Link layer ~~e) g~~ b) Determines route from source to destination.
- 3 Network layer ~~b) b~~ c) Packet sent as a bit stream.
- 6 Presentation layer ~~e) e~~ d) Represents services that directly support user applications.
- 4 Transport layer ~~a) a~~ e) Deals with formatting, display and encryption.
- 1 Physical layer ~~c) c~~ f) Provides synchronisation between user tasks.
- 5 Session layer ~~f) f~~ g) Deals with framing, data transparency and error control.

(3)

$$(64Kbps \times 32) = 2.048$$

3) How many voice channels can we group using time-division multiplexing to form a 2.048 Mbps channel (assuming 2 channels are used for synchronisation and signalling). (4 POINTS)

$$(64(x+2) = 2.048Mbps)$$

*[Handwritten scribble]*

*[Handwritten scribble]*

4

701

64

4) Match the transmission media to the appropriate property: (7 POINTS)

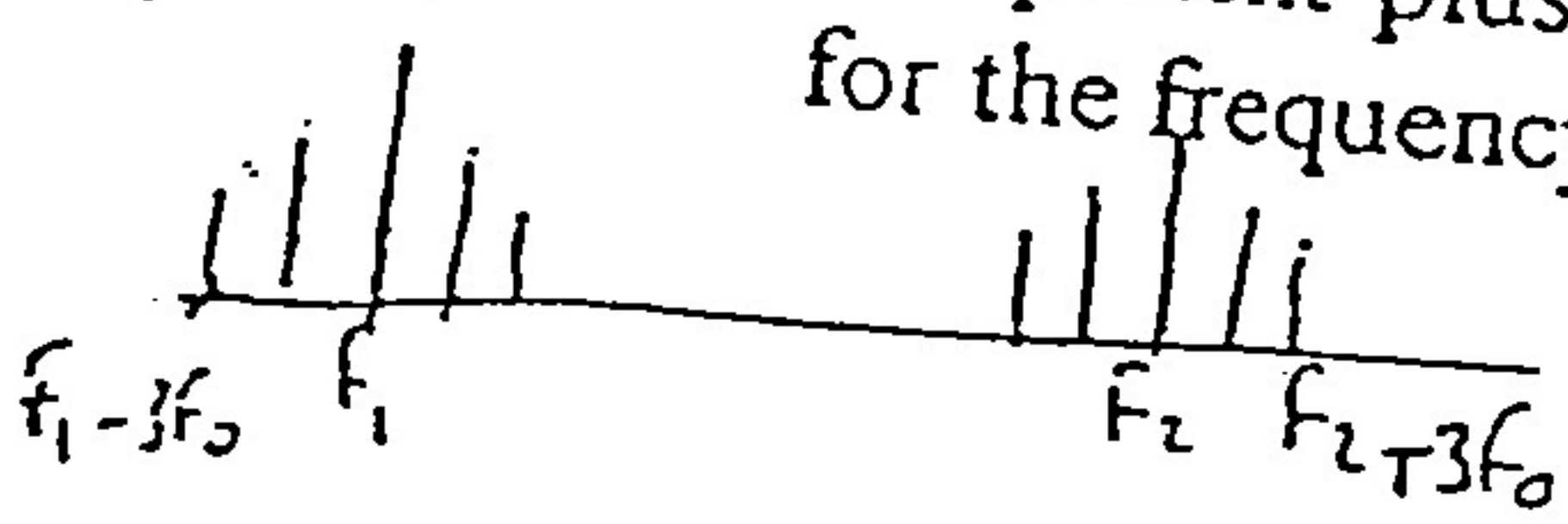
- |                            |   |
|----------------------------|---|
| (d) (d) Infrared           | a) High propagation delay                         |
| (f) (f) 2-wire open lines  | b) Immune to electrical noise                     |
| (e) (e) Twisted-pair lines | c) Bandwidth from 9 KHz to 275 GHz                |
| (g) (g) Coaxial cables     | d) restricted to one room                         |
| (b) (b) Optical fibre      | e) used in telephone and data networks            |
| (a) (a) Satellites         | f) local connections only                         |
| (c) (c) Radio              | g) used for baseband and broadband communications |

5) Map the following services to the type of protocol (8 POINTS)

- |  |                |
|--|----------------|
| (c) Used for monitoring and configuring network devices.                 | a) SMTP        |
| (f) Provide <u>Reliable</u> Transport layer service (Internet Protocols) | b) <u>FTP</u>  |
| (g) Provide <u>minimum</u> Transport layer service (Internet Protocols)  | c) <u>SNMP</u> |
| (b) Transfer files from one computer to another                          | d) TELNET      |
| (h) It is a "best-effort" delivery service                               | e) ISDN        |
| (e) Provide Broadband Communication services                             | f) TCP         |
| (a) Protocol used for electronic mail                                    | g) UDP         |
| (d) The remote terminal Protocol   | h) IP          |

Rs

6) FSK modulation: First Draw then Estimate the bandwidth required of a channel to transmit 400bps. Assume the frequency shift is 800Hz, and the fundamental frequency component plus the 3rd harmoniques are received only. Finally Select possible values for the frequency of the 2 carriers. (10 POINTS)



$f_0 = 100 \text{ Hz} = \frac{Bw}{4}$   
 $f_s = 800 \text{ Hz}$   
 $W = f_s + 6f_0 = 1400 \text{ Hz}$

7) Assuming asynchronous transmission, one start bit, two stop bits and one parity bit, derive the useful information rate in bps if the signalling rate is 400 baud and the number of signal levels is 8. (6 POINTS)

$m = \log_2 8 = 3$   
 $R = 400 \times 3 = 1200$   
 $m = \log_2 M$   
 $m = \log_2 16 = 4$   
 $m = \log_2 10 = 3.32$

8) Decode the following Huffman coded string of characters and calculate the average number of bits per codeword. (6 POINTS)

Received bit stream: 1|0|1|1|0|0|0|0|1|1|0|1|1

Codewords: A=1, B=01, C=001, D=000

Decoding: A|B|A|D|C|A|B|A

Average number of bits:  $P_A = \frac{4}{8} = 0.5$  &  $P_B = \frac{2}{8} = 0.25$  &  $P_C = P_D = \frac{1}{8} = 0.125$

$\text{Avg \# of bits} = 0.5(1) + 2(0.25) + 3(0.125) + 3(0.125) = 1.75$

9) A company generates 600 invoices per day. Determine the appropriate minimum modem transmission speed in bps based on the following conditions:

- The peak load is twice the bits per day average transmission load.
- There is a need for 50% growth.
- All transmissions are to be done in a 6-hour workday. Assume each invoice is 5000 characters long. Also assume asynchronous transmission with one start bit, two stop bits and one parity bit.

(12 pts)

(8 POINTS)

10) Consider a LAN with a total cable length of 2.5 Km, a frame size of 1200 bits and a total end-to-end delay of 0.4 ms. If you assume the propagation speed is  $2 \times 10^8$  m/s and the transmission rate is 10 Mbps. Calculate the following:

- The transmission delay.
- The propagation delay. Is the propagation delay negligible?
- The processing and queuing delay (together).

a)  $\frac{1200}{10 \cdot 10^6} = \frac{12}{10^8}$  sec

b)  $\frac{2500}{2 \times 10^8} = 12.5 \times 10^{-6}$  sec

(8 POINTS)

c)  $12 \times 10^{-4} + 12.5 \times 10^{-6} + 0.4 \times 10^{-3}$

11) It is required to transmit 1000 invoices 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) How long will it take to transmit these 1000 invoices (file transfer time),

- First assume the BER = 0
- Then assume that the BER =  $10^{-4}$

done below

In order to decide whether to connect the 2 cities with analog leased lines or dial-up circuits you should answer the following questions:

b) Calculate the cost of dial-up connection between the 2 cities. Assume a month with 23 working days and the average dial-up rate is \$ 0.3 per minute, one minute minimum.

c) If the cost of an analog leased line between the 2 cities is \$300 per month, what invoice rate should a given city generates per day in order that the crossover from a dial-up circuit to analog leased circuit is really cost efficient? (25 POINTS)

6

8

5

5

X