EXAM 1

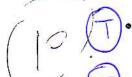### 1) TRUE/ FALSE   (14 POINTS)

(F) • Errors may be detected in a serial transmission by examining the start bit. F

(F) • With coax, duplex communications can be provided only when 2 separate cables are used, one for the transmit and the other for the receive channel. F

(T) • Layers four and five of the ISO reference model are implemented in the end systems but not in the routers in the network core. T

(T) • In a serial asynchronous transmission, the start bit is always low. T

(F) • Twisted-pair cooper wire is no longer present in computer networks. T

(F) • A data link layer provides error detection and end-to-end acknowledgement across multiple links. F

(F) • The application layer deals with formatting, display and encryption of data. F

2) INFORMATION RATE   (8 POINTS)

Assume that a telephone call requires a 64 kbps *duplex* link (uncompressed voice channel) and that there are 700 000 telephone subscribtions in Lebanon. Make an estimation of the total information rate, in bit per second, for the whole country during the "busy" hour, when the probability of a household generating a call during that hour is 0.2.

3) FREQUENCY DIVISION MULTIPLEXING   (8 POINTS)

Calculate the bit rate required to send 132 digitized *voice* channels by FDM on a satellite system? Assume 2 additional channels are used for control information.

4) APPLICATION LAYER PROTOCOLS   (8 POINTS)

What are the Application Layer protocols used by the following services

• E-mail   SMTP

• Remote Terminal protocol   TELNET

• File Transfer   FTP

• WWW   HTTP

5) MULTIPLE CHOICE   (14 POINTS)

a)   Serial and parallel transmission

- Differ in how many bits are transferred per character.

- Are used in synchronous and asynchronous systems, respectively.

- (•) Differ in whether the bits are on separate wires or all on one wire.

b) What is one main difference between synchronous and asynchronous transmission?

- The bandwidth required is different.

- The pulse heights are different.

- The clocking is mixed with the data in asynchronous transmission.

- (•) The clocking is derived from the data in synchronous transmission.

c)   What is multiplexing?

- The process of increasing bandwidth on a channel.

- A technique that enables more than one data source to share the use of a common line.

- (•) The capability to share frequency by time.

d)   The PCM sampling rate is 8,000 samples per second because

- That represents the maximum rate that the technology supports.

- This rate allows unique values.

- (•) This rate allows the faithful reconstruction of an analog voice signal.

e)   Which of the following represents one unsolved problem with satellite systems?

- (•) Coverage

- Privacy

- Access

f)   A protocol is a set of rules governing a sequence of events that must take place

- (•) Between peers.

- Between non-peers

- Across an interface

g) Which of the following is Layer 1 of the OSI model?

- Link layer

- (•) Physical layer

- Application layer

6) BANDWIDTH CALCULATION   (16 POINTS)

A data source that sends data at a rate of 4800 bits/s is attached to a communication
channel. Calculate the minimum required bandwidth (in Hz) of the channel if:

a) Noise cannot be neglected; here assume that the signal to noise ratio is 20 dB.

b) Noise can be neglected; here assume that the signaling rate is 2400 baud

7) USEFUL BIT RATE   (16 POINTS)

A 1.28 Mbps link is serving several DTEs using TDM. Every frame trasmitted on that
link is made of 20 bytes. Answer the following after taking the following assumptions:

- Each byte is made of 8 bits including one framing bit and one handshaking bit.

- Byte number 1 in every frame is used for control information.

a)   How many users can be multiplexed on that link. Sketch the frame .

b)   What is the useful bit rate per user.

8) END-TO-END DELAY AND THROUGHPUT   (16 POINTS)

We are sending a 10 Mbytes file from a source host to a destination host. The link
between source and destination have a transmission rate of 10 Mbps. Assume that the
propagation speed is 2.10^8 meters/sec, and the distance between them is 20 000 km.

- Calculate the end-to-end (total) delay.

- How many messages per second can this system handles if it has a throughput of
  2.5 Mbps, and the messages are 70 characters long using ASCII 8 bit-code.