EXAM 1

ANSWER ALL THE FOLLOWING QUESTIONS

1) True/ False (12 points)

a- A network service is concerned with the semantics and content of the user data. F

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

c- The higher bit error rate of the network links, the smaller the maximum packet size must be. T

d- The shorter the maximum packet size, the longer is the packet transmission delay. F

e- Bit stuffing is used to prevent incorrect interpretation of the user data field. T

f- The transmission time of a frame of 1 Kbits over a link of 1 Mbps is 1 s. F

g- The propagation delay is a function of the frame length and the propagation speed over a given data link. F

h-Twisted pair cables are easy to install, very cheap and immune to crosstalk problem. T

i- Thin-wire coax are used to connect DTEs in the same office while thick-wire coax are used along a corridor. T

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

k- IP, the internet protocol, is responsible for routing and handling incompatibilities among different networks. T

l- The Simple Network Management Protocol (SNMP) is used to keep track of host names and Internet addresses on the Internet. F

2) Write the *name* of the layer and its *number* in the OSI Model: (10 points)

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

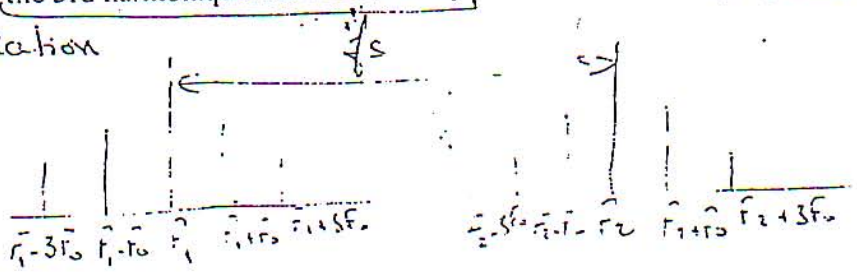
$V = \frac{d}{t}$ prop delay

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

Two-wire open lines (c)	a) used to interconnect very remote areas
Twisted-pair lines (d)	b) used in wireless LANs
Coaxial cables (g)	c) has a Crosstalk problem
Optical fibre (e)	d) used in telephone and data networks
Satellites (a)	e) Immune to electrical noise
Radio (b)	f) used in baseband or broadband modes

4) FSK modulation: First *Draw* then *Estimate* the bandwidth required of a channel to transmit 300bps. Assume the frequency shift is 600Hz, and the fundamental frequency component plus the 3rd harmoniques are received only. (14 points)

FSK modulation
300 bps



$f_s = 600\ Hz$

$3w = f_s + 6F_0$

$F_0 = \frac{BR}{4} = \frac{300}{4} = 75\ Hz$

$3w = 600 + 6 \times 75 = 1050\ Hz$

5) 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*. (8 points)

1 start bit, 2 stop /+ extra bits
1 parity bit
4 bit/s signalling element

$R_s = 300\ baud$

$R = R_s \cdot 4 = 4 \cdot 300 = 1200\ bps$

? → 12 ∴ useful bit rate $= \frac{8 \times 1200}{12} = 800\ bps$
? ← 1200

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

Originally for Voice transmission (C)

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

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

Interconnect users in a small geographical area (b)

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

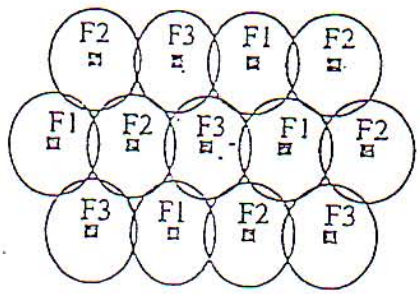
Provide Broadband Communication services (e)

Protocol used for electronic mail (a)

The remote terminal Protocol (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

3) 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 ~~[illegible]~~ 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 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 signal avg. power and noise avg. 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/char)

L = 5000 char

a) BER = 0

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

b.t/invoice = $20 \times 260 \times 8 = 41600$ bits

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

b) BER = 10^{-4}

$P_f = 1 - (1-P)^N = 1 - 1 + NP = NP$

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

$N_P = \frac{1}{1-P_f} = \frac{1}{1-0.208} = \frac{1}{0.8} = 1.25$: $742.85 \times 1.25 = 928.57$ s.