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Wireless Networks

Semester # 8th

Degree # BSCS

Mid-Term

Q1)a) Find the channel capacity for a channel with a 600-Hz bandwidth and a signal-to-noise ratio of 600 dB?

Solution:-

Bandwidth $B = 600$ Hz.

$SNR_{db} = 600$

we know that

$$C = B \log_2 (1 + SNR)$$

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Here SNR is given in
db 60

So we know that

$$SNR_{db} = 10 \log_{10} (SNR)$$

OR

$$SNR_{db}/10 = \log_{10} (SNR)$$

$$60/10 = \log_{10} (SNR)$$

$$6 = \log_{10} (SNR)$$

$$\text{ANTILOG } 6 = SNR$$

$$SNR = 1 \times 10^6$$

$$C = 600 \log_2 (1 + SNR)$$

$$C = 600 \log_2 (1 + 10^6)$$

$$C = 600 \times 60$$

$$C = 3600 \text{ Hz}$$

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Question 1: b

A digitized system is required to operate at 4800 bps. If a signal element encodes an 8 bit word, what is the minimum required bandwidth of the channel?

Solution:

$$C = 4800$$

$$\log_2 M = 8$$

we know that

$$C = 2B \log_2 M$$

$$4800 = 2B \times 8$$

$$\frac{4800}{16} = B$$

$$B = 300 \text{ Hz}$$

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Question # 3:
(a)

Determine the isotropic free space loss in dB's at 6 GHz for the shortest path to a synchronous satellite from earth (35,863)

At 6 GHz, the wavelength is 0.050m.

Solution:-

$$\lambda = 0.05$$

$$f = 6 \text{ GHz}$$

$$d = 35863 \text{ km}$$

⇒ isotropic free space
(L_{dB})

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$$L_{dB} = -20 \log(\lambda) + 20 \log(\text{diameter})$$

$$= -20 \log(0.050) + 20 \log(35863 \times 10^3)$$

$$= 26.020599 + 151.09293232$$

$$= 177.11 \text{ dB}$$

Some case we add 21.98
with L_{dB}

$$\Rightarrow L_{dB} = 199.09 \text{ dB}$$

(E)

Question # 03 (b)

If the received signal level for a particular digital system is -155 dBW and the receiver system effective temperature is 1600 K, what is E_b/N_0 for a link transmitting 2400 bps?

Solution:-

Particular signal system =
 -155 dBW

Link transmitting 2400 bps

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Temperature 1600K
we know that

$$E_b/N_0 = 155 \text{ dBW} - 10 \log(2400) - 10 \log(1600) + 228.6$$

$$= -155 \text{ dBW} - 10(3.3) - 10(3.2) + 228.6$$

$$= -155 \text{ dBW} - 33 + 228.6$$

$$= -155 + 229.6$$

$$= 74.6$$

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Question # 2
(a)

Answer.

The answer is No, there is no such protocol which can be used by the two blue armies to defeat the red army because there is no way of knowing what each blue army is thinking about the attack.

* If both the blue armies attack the red army which is present in the valley in that case only the red

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Army can be defeated.

* No proper communication between the two blue armies, so by using the unreliable communication they cannot avoid the defeat.

* If the unreliable works properly, one of the blue army commander sends a message of attacking the red army and waits for the acknowledgment from the second blue army commander.

* Again if the unreliable communication works and

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this time if the commander of another blue army, then both blue armies attack the red army simultaneously from opposite sides then the attack can be successful.

* If the unreliable communication won't work i.e. if the order of attack from one blue army commander is missing, then the commander fails to receive the acknowledgment. Hence the attack can be unsuccessful in defeating the red army because the red army can

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defeat either of the
blue armies separately.

Question # 2
(b)

Explain the steps performed by the Receiver with the help of diagram of the TCP/IP protocol Suite?

TCP/IP :-

There are four steps of TCP/IP.

1) Application Layer

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2) Transport Layer

3) Internet Layer

4) Network Access Layer

Network Layer:

1) Lowest layer of the all.

2) Protocol is used to connect to the host, so that the packets can be solve it.

3) Varies from host to host and network to network.

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Internet Layer:

- 1) Selection of a packet switching network which is based on a connectionless internetwork layer is called an internet layer.
- 2) It is the layer which holds the whole architecture together.
- 3) It helps the packet to travel independently to the destination.
- 4) IP (internet protocol) is used in this layer.

Transport Layer:

- 1) The applications : can read and write to the transport layer.
- 2) Transport layer adds header information to the data.
- 3) Transport layer breaks the message (data) into small units so that they are handled more efficiently by the network layer.
- 4) Transport layer also arrange the packets to be sent, in sequence.

Application Layer:

1) TELNET:

is two-way communication protocol which allows connecting to a remote machine and run application on it.

2) FTP:

(File transfer protocol)

is a protocol, that allows file transfer amongst computer users connected over a network.

It is reliable, simple and efficient.

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SMTP:

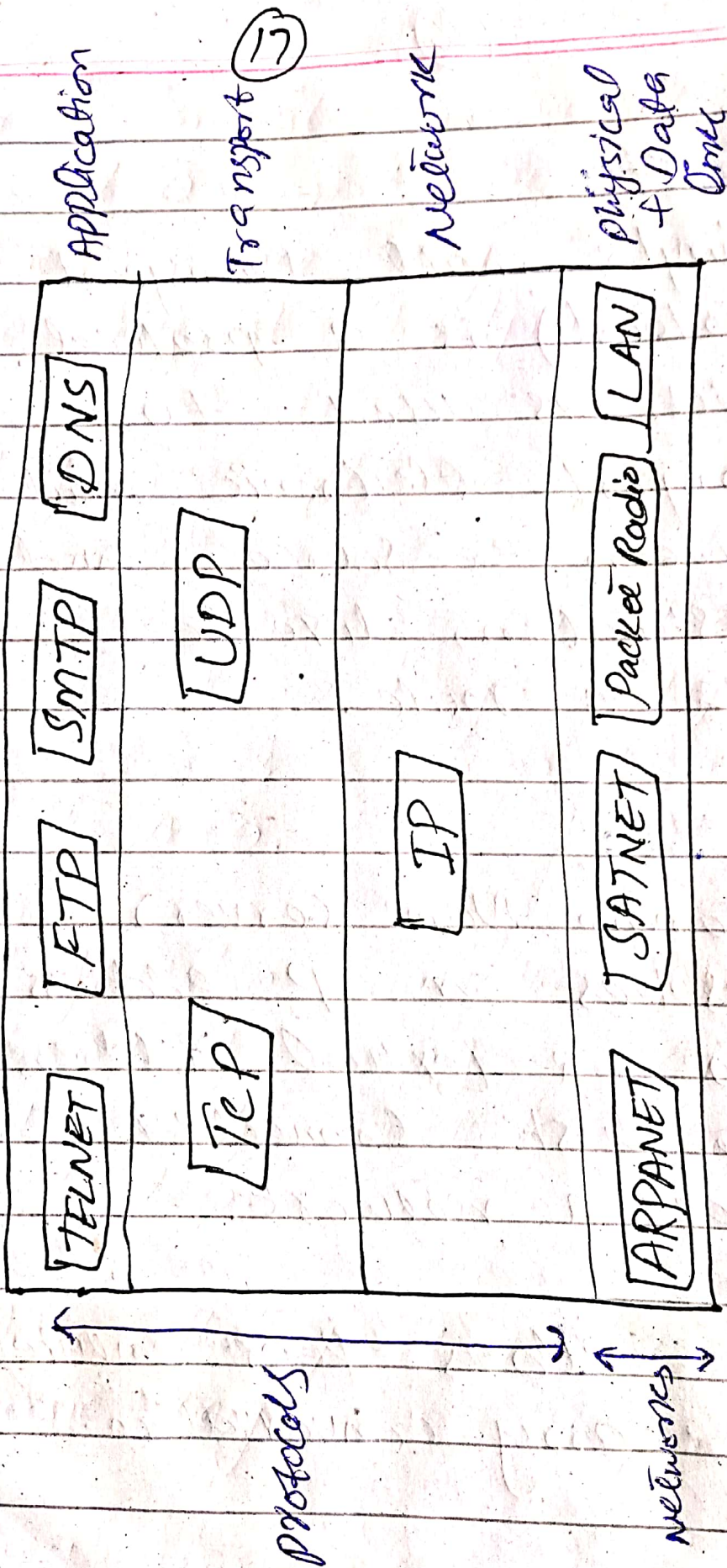
(Simple mail transport protocol) is a protocol, which is used to transport electronic mail between a source and destination, directed via a route.

DNS:

(Domain Name Server)

resolves an IP address into a textual address for hosts connected over a network.

- * It allows peer entities to carry conversation.



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Question # 4 (a)

Explain what GEO, LEO and MEO satellite are. Compare the three types with respect to factors such as size and shape of orbits, signal power, frequency reuse, propagation delay, number of satellites for global coverage, and handoff frequency?

GEO (Geostationary earth orbit)

* They have the same velocity with the Earth while they orbit it at around 35000 kilometers.

* They are the biggest

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and Largest Comparison
to LEO and MEO satellite
Orbits. Hence they have
the biggest footprint.

* They are efficient for they
use few satellites to have
a full coverage of the
earth. Hence their deployment
is cheaper than in LEO
and MEO.

* They also have the greatest
visibility among the other
types of satellite MEO
and LEO.

* Have the greatest latency
basic they are the furthest.

* They also have a long life
compared to LEO.

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- * They are the least expensive to deploy.
- * Orbit period is about 24 hours -

LEO (Low earth orbit)

- * They orbit the Earth at about 500 to 1500 Kilometers.
- * They have the lowest latency because they are the closest to Earth.
- * They need a lot of satellites to cover the Earth compared to GEO and MEO.
- * They also have the least

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visibility among the others types of satellites GEO and LEO.

* They are the smallest compared to GEO and LEO.

* They are most expensive to deploy.

* Have a short satellite life.

MEO (medium Earth Orbit)

* They orbit the earth at about 5000 to 12000 kilometers.

* They orbit the earth at a duration of two

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to eight hours.

- * They have a low Handoffs
- * Have a long life than LEO.
- * Deployment of these satellites is required between eight to seventy.
- * They have medium latency compared to LEO and GEO.

Question # 4
(C)

what are the different satellite subsystems? Explain Briefly each of them?

Satellite Subsystem:

In satellite subsystem, various operation take place. Among which, the main operations are orbit controlling, attitude of satellite, monitoring and controlling of other sub-systems.

* They are two main types of satellite system segments.

1) Space segment subsystems.

2) Earth segment subsystems.

Space Segment Subsystems:-

The subsystems present in space segment are called space segment subsystems.

* Following are the space segment subsystems.

- AOC subsystem.
- TTCM subsystem
- Power and Antenna subsystems.
- Transponders.

Earth Segment Subsystems:-

The subsystems present in the ground segment have to ability to access the satellite repeater in order to provide the communication between the users. Earth segment is also called as ground segment.

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Question # 4 (b)

Find an Uplink and Round trip Delay of GEO Satellite having an altitude of 36,786 km?

Solution:-

Let satellite altitude be $s = 36786$ km

Uplink delay is calculated as

$$T = s/c$$

where c is the speed of light

$$(36786 \times 10^3) / (3 \times 10^8) = 12262 \text{ ms}$$

Round Trip delay is calculated as
 $T = 2s/c$ where c is the speed of light.

$$(36786 \times 10^3 \times 2) / (3 \times 10^8) = 24524 \text{ ms}$$