[ANSWERSHEET]

[Wireless Networks]

[Module: BScs 8th semester]

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Name: FARHAN KHAN **ID: 13004**

Q no1:(a)

Answer:

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Q 1 (a):

Solution: Given data:

$$B = 600\ Hz$$

$$SNR_{dB} = 600$$

→ As Shanon's formula

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

→ First we convert SNR_{dB} to SNR

So $SNR_{dB} = 10 \log_{10} (SNR)$

$$\frac{SNR_{dB}}{10} = \log_{10} (SNR)$$

$$\frac{600}{10} = \log_{10} (SNR)$$

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

$$SNR = 10^{60}$$

Putting values:

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

$$C = 600 (0 + 60)$$

$$C = 600 \times 60 \Rightarrow 3600\ bps.$$

Q no1:(b)

Answer:

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Q 1 (b):

Solution:

Given data:

$C = 4800$ bps.

$\log_2 M = 8$

As Nyquist formula:

$C = 2B \log_2 M$

Putting the values:

$4800 = 2B \times (8)$

$4800 = B(16)$

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

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

$B = 300$ Hz.

Q no2:(a)

Answer:

What I think is, if the two blue armies can see each other at the opposite sides and they send two messengers from both sides at the same time and the messengers exchange their message at a mid-point so they can pass their messages to each other.

Otherwise as per my research it is not possible between the two blue armies to communicate properly and there is no such protocol so for that reason they can't be able to avoid defeat.

Q no2:(b)

Answer:

There are five layers in TCP/IP protocol suite: As it is on the receiver side so we will start form Physical layer:

- **Physical layer:** This layer is the physical interface between data transmission device and transmission medium. In this layer da data will be in digital form(bits).

- **Network Access layer:** In this layer exchange of data occur between the end system and the network, A network interface device, usually a line card, adaptor or port is used to connect the physical wires or fibers to the computer so that it can communicate with other computers, in this layer many bits combine and form a frame, so in this layer data will be in frames.

- **Internet layer:** This layer takes care of sending the data through the shortest route if more than one route is available. In addition, if a route through which a datagram is to be sent has problems, the datagram is sent through an alternate route, in this layer data will be in packet form. Packet is made up of many frames.

- **Transport layer:** The transport layer is responsible for error-free, end-to-end delivery of data from the source host to the destination host. It can provide for a reliable connection. It can also carry out error checking, flow control, and verification.
  In this layer many frames collect and form segments.

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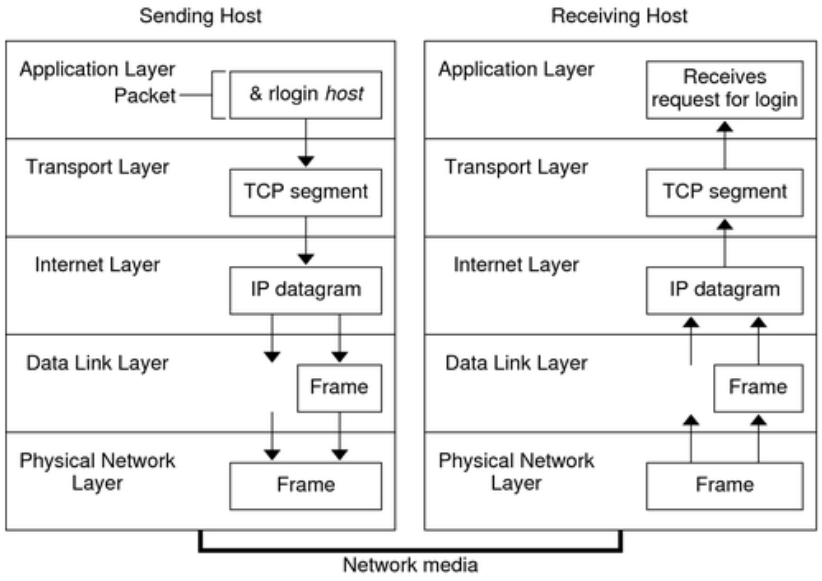
- **Application layer:** The application layer is the highest abstraction layer of the TCP/IP model that provides the interfaces and protocols needed by the users. In this layer data is converted to the human readable form.

On the receiver side the data comes from the transmission medium to the **physical layer** in bits, then the data transfer to the **network access layer** in frames, then that frames collect and form packets in **internet layer**, then in the **transport layer** data become in many segments and finally many segments get collect and form a human understandable data, so in **application layer** data is the original form in which the sender sent it.

Diagram:



Q no3:(a)

Answer:

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Q3 (a)

Solution: Given:-

$d = 35863$

$\lambda = 0.050\ m$

$f = 6\ GHz$

$$FSPL = 10 \log_{10} \left(\frac{4\pi df}{c}\right)^2$$

$$= 20 \log_{10} \frac{4\pi fd}{c}$$

$$FSPL = 20 \log_{10}(d) + 20 \log(f) + 20 \log_{10}\left(\frac{4\pi}{c}\right)$$

$$FSPL = 20 \log_{10}(d) + 20 \log(f) + 20 \log_{10} - 147.55$$

if frequency is in GHz & dB is in km then:

$$FSPL = 20 \log_{10}(d) + 20 \log(f) + 20 \log_{10} + 92.45$$

Putting values:

$$FSPL = 20 \log_{10}(35863) + 20 \log_{10}(6) + 92.45$$

$$= 20(4.554) + 20(0.778) + 92.45$$

$$= 91.08 + 15.56 + 92.45$$

$$FSPL = 199.09 \quad Ans.$$

Q no3:(b)

Answer:

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Q. 3 (b):

Solution: Given:

Signal System = -155 dbw

Link transmition = 2400 bps

Temprature = 1600K

$$Eb/No = -155\ dbw - 10 \log(2400) - 10 \log(1600) + 228.6$$

$$= -155\ dbw - 10(3.3) - 10(3.2) + 228.6$$

$$= -155\ dbw - 33 - 32 + 228.6$$

$$= -155 + 229.6$$

$$= 74.6.$$

Q no4:(a)

Answer:

GEO: It stands for geostationary earth orbit. Geo satellites have the unique property of remaining permanently fixed in exactly the same position in the sky as viewed from any fixed location on Earth, meaning that ground-based antennas do not need to track them but can remain fixed in one direction. Such satellites are often used for communication purposes. Propagation delay of it is 270 millisecond/hope. 3 GEO satellites needs for global coverage.

MEO: It stands for middle or medium earth orbit. This satellite system is used in telecommunications. MEO satellites orbit the earth between 1,000 and 22,300 miles above the earth's surface. These are mainly used in geographical positioning systems and are not stationary in relation to the rotation of the earth. Propagation delay of it is 100millisecond/hope. 10-18 satellites are needed for global coverage.

LEO: It stands for Low earth orbit. It is used in telecommunication, which orbit between 400 and 1,000 miles above the earth's surface. They are used mainly for data communication such as email, video conferencing and paging. They move at extremely high speeds and are not fixed in space in relation to the earth. Propagation delay of it varies but it is almost 4.3, 4.5 millisecond/hope. 48-60 satellites are needed for global coverage.

Q no4:(b)

Answer:

the propagation delay, we have to take the light speed of into account. This speed reaches up to 186.282 miles/s or 299.762 Km/s. The speed orbital of the satellite depends on the altitude above the Earth. In particular, the speed of the orbital required to maintain at the orbit is 36786 Kms. In other words, when we divide the orbital speed over the light speed, we can obtain the delay for both uplink and downlink. Uplink delay or downlink delay approximately 0.1227273637085421 sec and total of delay for both uplink and downlink one way approximately 240. Total round-trip 480ms.

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Q. No 4 (b):

Solution: Given:

altitude $S = 36.78$ Km

as $T = S/C$ $\because C$ = Speed of light.

Put values:

$$T = \frac{36786 \times 10^3}{(3 \times 10^3)}$$

uplink = 12262 ms

Now Round trip:

$$T = \frac{2S}{C}$$

$$T = \frac{(36786 \times 10^3 \times 2)}{(3 \times 10^3)}$$

Round trip = 24524 ms.

Q no4:(c)

Answer:

A satellite communication consists of mainly two segments. Those are space segment and earth segment. So, accordingly there will be two types of subsystems:

➔ **Space segment subsystems:**

The subsystems present in space segment are called as space segment subsystems. All the communication of one city or one country to other are through these segments.

Following are the space segment subsystems.

- AOC Subsystem
- TTCM Subsystem
- Power and Antenna Subsystems

➔ **Earth segment subsystems:**

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

Earth segment performs mainly two functions. Those are transmission of a signal to the satellite and reception of signal from the satellite. Earth stations are the major subsystems that are present in earth segment.

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