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**Course: wireless network**

Q.1-part A: find the channel capacity for channel with a 600-Hz bandwidth and signal-to-noise ratio of 600 dB?

Bandwidth B = 600 Hz.

$SNR_{db} = 600$

We know that

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

Here SNR is given in db

So we know that

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

Or

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

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

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

Or

Antilog60 = SNR

$SNR = 1 \times 10^{60}$

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

$C = 600 \log_2 (1 \times 10^{60})$

$C = 600 \times 60$

$C = 3600Hz$

Q 1 part –B: A digitized system is operated at 4800 bps. If a signal element encodes an 8-bit word, what is the minimum required bandwidth of the channel?

Using Nyquist's equation: $C = 2B \text{ Log}_2M$

We have C = 4800 bps

and

$\log_2 M = 8$,

Because a signal element encodes a 8 bit- word

Therefore,

C = 4800 = $2B\log_2 M$

C = 4800

4800 = 2B x 8

B = $\frac{4800}{2 \, x \, 8}$

B = 300Hz

The minimum required bandwidth of the channel is = 300Hz.

Q2-part.A:

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 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 this time If the commander of one blue army receives the acknowledgment from 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 works i.e. If the order of attack from one blue army commander is missing, then the commander of another blue army commander fails to receive the acknowledgment. Hence the attack can be unsuccessful in defeating the red army because the red army can defeat either of the blue armies separately.

Q.2-part.B:

Physical layer: it can transmit bits over a medium to provide mechanical and electrical specification.

Network layer: it can move packets from source to destination to provide internetworking. It can also provide the addressing communication through connection of internet.

Internet layer: it connects the different network together.

Transport layer: it can provide reliable process-to-process message delivery and error recovery in this layer the data is checked by the layer either it is incorrect from or not.

Application layer: it can allow access to network resources it convert data into the readable form.

Q.3-part A:

Pi = 0.0

f = 6 GHz

d= 35863

Isotropic free space (LdB)

Path to satellite from earth=35863km

LdB = -20 log (pi) + 20 log (diameter)

= 20 log (0.050) + 20 log (35863 x 103)

= 26.020599 + 151.09293232

= 177.11 dB

Some cases we add 21.98 with dB

LdB = 199.09 dB

Q.3part-B:

Particular signal system = -155dbw

Link transmitting 2400bps

Temperature 1600k

We know that

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

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

= -155dbw -33 -32 + 228.6

= -155 + 229.6

= 74.6

Q.4-part A

GEO: geostationary earth orbit

MEO: medium earth orbit

LEO: low earth orbit

Propagation delay:

GEO: for single hope 270 millisecond/hope

MEO: 100millisecond/hope

LEO: varie but almost 4.3,4.5 millisecond/hope

Number of satellite for global coverage:
GEO: 3

MEO: 10 to 18

LEO: 48 to 60

Differences between GEO, LEO, AND MEO satellites

GEO (Geostationary orbit)

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

They are the biggest and largest compared to LEO and MEO satellites hence they have the biggest footprint.

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

They also have the greatest visibility among the others types of satellites MEO and LEO.

Have the greatest latency basic they are the furthest.

They also have a long life compared to LEO.

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 basing 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 visibility among the others types of satellites GEO and LEO.

They are the smallest compared to GEO and LEO.

They are the 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 to eight hours.

They have a low Handoffs.

Have a long life than LEO.

Deployment of these satellites is required between eight to twenty.

They have a medium latency compared to LEO and GEO.

Q.4-part B:

Let satellite altitude be S = 36786 km

Uplink delay is calculated as

T = S/C where C is the speed of light

(36786 x 103) / (3 x 103)

= 12262ms

Round Trip delay is calculated as

T = 2S/C

where C is the speed of light

(36786 x 103 x 2) / (3 x 103)

= 24524m

Q.4-part C:
there are wo main types of subsystem

A) Space segment subsystem

The system present in space is called space sub system. All the communications of the city or the country to other are through these segments. Many power antennas are working in space.

B) Earth segment subsystem

It is also called ground segment they transmit a signal to satellite and reception of signal from satellite.

The subsystem would be present in the ground segment which would have the ability for accessing the satellite repeater in a manner for providing the communication among the users. Here the earth segment is otherwise known as ground segment.

This would mostly have 2 function where in such transmission of a signal for the satellite as well as reception of the signal from that the satellite.

In the earth segment, the earth station would be major subsystem.