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ID# 13213

SUBJECT : WIRELESS NETWORKS

Question 1 (a)

Answer:

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

$SNR=1x10^{60}$

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

$C=600\log_2(1x10^{60})$

c=600x60

c=3600 Hz

NAME : MIAN AHSAN JAN

ID# 13213

SUBJECT : WIRELESS NETWORKS

Question 1 (b)

Answer:

C=4800

$\log_2 M=8$

We know that

$C=2B\log_2 M$

4800=2Bx8

4800/16=B

B=300 Hz

Q2 (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 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.

NAME : MIAN AHSAN JAN

ID# 13213

SUBJECT : WIRELESS NETWORKS

- 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.

Question 2 (b)

Answer:

Physical layer: It connect the adjacent devices.

Network layer: It provide the addressing communication through connection of internet.

Internet layer: It connects the different network together.

Transport layer: The data is checked by this layer either it is in correct form or not.

Application layer: It convert that complex data in to readable text.

First the data comes in physical layer and then shifted to network layer were different addressing provide after that data comes to inter layer where different network unit. Then transport layer check the data and sent to application layer where it is again converted into readable text.

NAME : MIAN AHSAN JAN

ID# 13213

SUBJECT : WIRELESS NETWORKS

Question 3 (a)

Answer:

Pi = 0. 0

F = 6 GHz

d=35863km

Isotropic free space (Ldb)

Ldb = -20log (^limda) + 2log(diameter)

-2log(0.050) + 20log(35863x10^3)

26.020599+151.092 = 177.11db

Some case we add 21.98 with ldb

Ldb = 199.09db

Question 3 (b)

Answer:

Ratio of Signal energy per bit to Noise Power Density per Hertz = Eb / No

Received signal power (SdBW) = -155 dBW

Receiver system effective noise temperature (T) = 1600K

Link transmitting rate(R) = 2400 bps Boltzmann's constant (k) = 1.38 x 10-23 J/K

Now we Calculate the Ratio of Signal energy per bit to Noise Power Density per Hertz in decibel notation.

(Eb / No)dB = SdBW - 10log R - 10log k - 10log T

NAME : MIAN AHSAN JAN

ID# 13213

SUBJECT : WIRELESS NETWORKS

= -156 - 10log 2400 - 10log (1.38 x 10-23) - 10log 1600

= -156 - 10(3.38) - 10(-22.86) - 10(3.20)

= -156 - 33.8 + 228.6 - 32

= 6.8

(Eb / No)dB = 6.8 dB

Question 4 (a)

Answer:

Acronyms stand for:

GEO: Geostationary earth orbit

LEO: Low Earth orbit

MEO: Medium earth orbit

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.

NAME : MIAN AHSAN JAN

ID# 13213

SUBJECT : WIRELESS NETWORKS

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.

Question 4 (b)

Answer:

Let satellite altitude be S = 36786 km

Uplink delay is calculated as T = S/C where C is the speed of light

NAME : MIAN AHSAN JAN

ID# 13213

SUBJECT : WIRELESS NETWORKS

(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) = 24524ms

Question 4 (c)

Answer:

Below are common Satellite Subsystems:

Propulsion:

- Propulsion The propulsion system is part of the components that get the satellite into orbit. Other chemical or electrical motors are also used to move the satellite back into the correct orbit when either atmospheric drag, magnetic fields or the solar winds deflect the satellite out of its correct trajectory.

Power:

- Power Solar panels are used in combination with batteries to provide a constant source of electrical power on the satellite.

Communication:

- Communications The communications subsystem uses transmitters, receivers or transponders (transmitter and receiver in one component). The communications subsystem handles all transmit and receive communications functions.

Superstructure:

- Superstructure The satellite must survive the violent forces of the rocket ride into space. The superstructure of the satellite not only supports it in space, but reduces the shock and vibration the internal components might suffer during the launch.

Thermal:

- Thermal The whole point of the thermal system is to regulate the temperature of the satellite's components. Too hot or too cold, or too great a swing in temperature will prematurely end the useful life of a satellite.

Altitude and Orbital Control:

- Attitude & Orbital Control The attitude & Orbital control system allows the satellite to remain pointed correctly. These are often very small motors compared to the propulsion system.

Telemetry Tracking and Command:

- Telemetry Tracking & Command The satellite must inform the satellite operations center what its current state is, and where it is located in orbit. Often a simple 'beacon' system is used to allow the ground station to track the satellite in orbit.