**1. (25=5+10+10)** Complete the table below in relation to **the two most important** differences between virtual circuit (VC) and datagram based packet switching.

|  |  |  |
| --- | --- | --- |
| **Issue ?** | **VC** | **Datagram** |
| 1 |  |  |
| 2 |  |  |

**2. (25=5+10+10)** About noiseless and noisy communications channels

**(i)** Compute the max data rate possible in a noiseless channel with 30 KHz bandwidth if the signal is binary.

**(ii)** For the same noiseless channel, what would be the data rate if the signal had 16 levels.

**(iii)** Just write the mathematical equation to compute the signal to noise ratio to transmit a 1024 Kbps digital signal in a noisy communications channelwith 8 MHz bandwidth. Use only numeric values in your expression.

**3. (25=10+15)** . Show details of your computation for both parts of the question.

(i) A metallic cable assembly system consists 3 hops (cable segments), each hop with 50dB attenuation, and 2 repeaters (amplifiers) with 45dB gain. Compute the overall attenuation/gain of the cable assembly. Show your work.

**(ii)** If some signal injected into above cable assembly has 35dB signal to noise ratio (SNR) and each cable segment has 5dB SNR and each repeater has 1dB SNR, then what is the SNR of signal at the other end of cable assembly.

**4. (50=20+30)** Given B Hz overall available bandwidth shared by N stations and assuming 1 bps/Hz,

1. Compute capacity per station if sharing is by TDM/FDM
2. If sharing is by CDMA and m chips/bit are used, first compute capacity per station and then discuss under which conditions CDMA performs better than FDM/TDM.

**5. (75=15+30+30)** In a communications subnet, messages or packets travel from source A to destination D in 3 hops, that is in communication channels A-B, B-C and C-D. Data rate of all three hops is 64Kbps, message size is 8000bytes and the propogation delay at each hop is 10 milliseconds.

1. First draw a detailed time-space diagram to show the transmission of the 8000bytes message **from A to B, in just one hop**.

**You must draw time-space diagrams and must show details of your answer for the following two cases.**

1. Compute total time to transmit the 8000bytes message from A to D, if the subnet is message switched. Ignore message processing times.
2. Compute total time to transmit the 8000bytes message from A to D, if the subnet is datagram based packet switched and packet size is 16000bits. Ignore packet processing times.