# Intro to Communications

Homework 1

## Question 1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Layer Number** | **Layer Name** | **Connectivity or Control** | **PDU Name** | **Multiplex Address** | **3 Keywords associated with layer** |
| 1 | Physical | Connectivity | Bit | Channel ID | Modulation, Shannon, SNR |
| 2 | Link | Control | Frame | MAC | Correction, collision, frame sync |
| 3 | Network | Connectivity | Packet | IP | Routing, TCP/IP, WAN |
| 4 | Transport | Control | Segment/datagram | Port | Multiplexing, reliability, segmentation |

## Question 2

### Part 1

C = B\*lg(1+S/N)

C = 900000 \* lg(1 + 100000) = 14948689.4 bits/s = 14.95 Mbps

### Part 2

Max bitrate = 7.2 Mbps = 7.2\*10^6  
Max symbol rate = 9\*10^5\*2 = 1.8\*10^6  
Bits per symbol = 7.2/1.8 = 4

S/N = 10^(SNRdB/10)  
C = B\*lg(1+S/N)  
7200000 = 900000 \* lg(1 + S/N)  
lg(1 + S/N) = 7200000 / 900000 = 8  
S/N + 1= 2^8  
S/N = 2^8 - 1 = 255  
SNRdB = 10\*log(S/N)  
SNRdB = 10\*log(255) = 24.065 dB

### Part 3

The capacity and the max symbol rate doubled.

### Part 4

It could set the symbol rate and bits per symbol such that their product is equal to the maximum shannon bit rate.

Symbol rate = 1800000  
Bits per symbol = bitrate/symbol rate = 14948689/1800000 = 8

## Question 3

There are 3 collision domains and 3 broadcast domains.

False  
False  
True  
True  
False  
False