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

$S/N = 10^{(SNR_{dB}/10)}$
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
SNR_{dB} = 10*log(S/N)
SNR_{dB} = 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