End Of Chapter 11 Calculation Exercises

Q1) As described in the text, the PCI-Express bus consists of thirty-two “lanes“. As of January 2009, each lane is capable of a maximum data rate of 500 MB per second. Lanes are allocated to a device 1,2,3,8,16, or 32 lanes at a time.

Assume that a PCI-Express bus is to be connected to a high-definition video card that is supporting a 1920 x 1080 true color (3 bytes per pixel) progressive scan monitor with a refresh rate of 60 frames per second. How many lanes will this video card require to support the monitor at full capability?”

Ans) Number of pixels per frame = 1920\*1080=2073600

Given, the number of bytes per pixel = 3

So, no. of bits per pixel = 3\*8 = 24 bits/pixel

Refresh rate of the video = 60 frames per second

So, the video data rate is 2073600\*24\*60=2985984000 bits per second

Dividing by 8,

373248000 bytes/second

Dividing by 1024 again,

355.95Mbytes/second

Each lane in the PCI express bus is capable of transmitting 500 MB per second.

But our video transmission rate is only 355.95 MB per second.

So, we will need only one single lane for the video card to support the monitor at full capability as 500 MB/second is greater than required 355.95 MB per second.

Q2) How many PCI-Express lanes are required to support a 10 Gb per second Ethernet card?

Ans) One PCI-Express lanes are required to support 10 GB per second Ethernet card.