Module 11 Example Set 5

1. Assume that each stripe within a certain RAID5 system contains 6 strips or blocks B0, B1, B2, B3, B4 and the corresponding parity strip P0-4.
a) Write down an expression for P0-4 as a function of the other strips.
P0-4 = B0 ^ B1 ^ B2 ^ B3 ^ B4 where ^ denotes the exclusive OR operation.

b) Complete the following equation:
B2 ^ B3 ^ P0-4 = _____
The answer is B0 ^ B1 ^ B4 since
B2 ^ B3 ^ P0-4 = B2 ^ B3 ^ B0 ^ B1 ^ B2 ^ B3 ^ B4
= B2 ^ B2 ^ B3 ^ B3 ^ B0 ^ B1 ^ B4 = 0 ^ 0 ^ B0 ^ B1 ^ B4 = B0 ^ B1 ^ B4

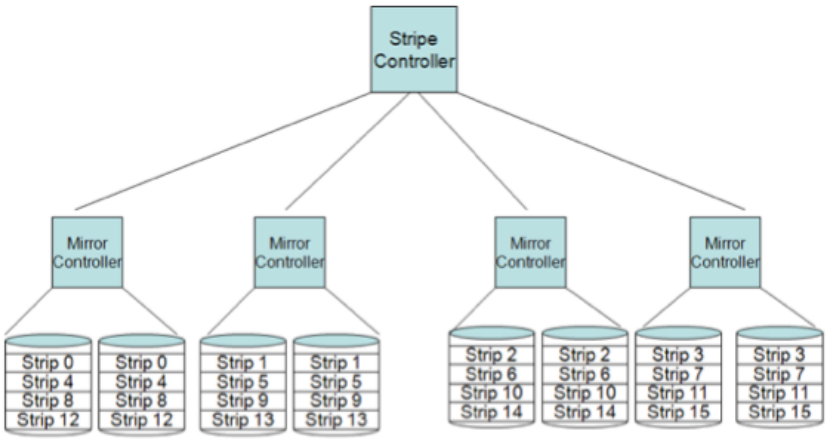
2. Two blocks are to be written in parallel on a RAID system. What restrictions apply if the system is:

a) RAID 4
The two blocks must reside within the same stripe and the parity block for that stripe must be updated at the same time. If the two blocks were in different stripes, the two parity blocks could not be written in parallel since they are on the same disk. Each disk can only perform one read or one write at a time.

b) RAID 5
The two blocks as well as the parity block or blocks to which they correspond must all map to separate disks.

3. A RAID6 system contains 12 stripes each of which contains 6 data strips or blocks. How many separate disks are required for this system.
Each data strip within a stripe would reside on a separate disk and two disks are needed to accommodate the two independent parity functions.
Hence a total of 6+2 = 8 disks would be required.

4. Consider the RAID10 system shown below:



RAID 10

a) What is the minimum number of disks that have to fail to make the system inoperable?

The minimum number is 2. If the two disks in any of the mirrored pairs fail, then the system will be inoperable.

b) What is the maximum number of disks that can fail without making the system inoperable?

The maximum number is 4. One disk in each of the four mirrored pairs can fail and the system can continue to operate by using the mirror images.