CM1205 ANSWERS 2014

SECTION A

Question 1

a) The problem that arises is Bus contention where two or more devices are sharing a common resource such as memory or disk.

b) AX=Accumulator
     BX = Base Register
     CX= Counter register
     DX=Data Register

c)

Shift CS 4bits right add IP
03E00H
  1F20H
Ans: 05D20H

d) The square brackets implies that you get the value from the location 3000 and store it in AX i.e. CONTENTS OF.

e) Mutual Exclusion, Progress and Bounded Waiting.

f) Two problems with using semaphores are: Deadlock and starvation.

SECTION 2

Question 2

a) The decimal equivalents of 20H and 80H are 32 and 128 respectively

$$32 \times 128 = 4096$$
$$4096 = 1000H$$

Upon completion of MUL CL. AX contains the result 1000H

b) The register used in conjunction with the AX register during 16-bit multiplication is the DX register. The upper half of the value 647D2710H is stored in DX the lower half in AX
DX = 647DH and AX = 2710H

c) 55AAH = 0101010110101010
1234 Decimal = 10011010010

d) Address modes:
   Register/Register
   Immediate Addressing
   Direct Addressing
   Indexed Addressing

e) The outer loop (XYZ) is executed 32 times. (CX = 20H = 32)
   The inner loop (ABC) is executed 9 times.
   Therefore the NOP instruction will execute 9 x32 = 288 times

Question 3
  a) RAID stands for Redundant Array of Inexpensive Disks
  b) ANY TWO of the following
     RAID 0

Disk 1   Disk 2   Disk 3   Disk 4
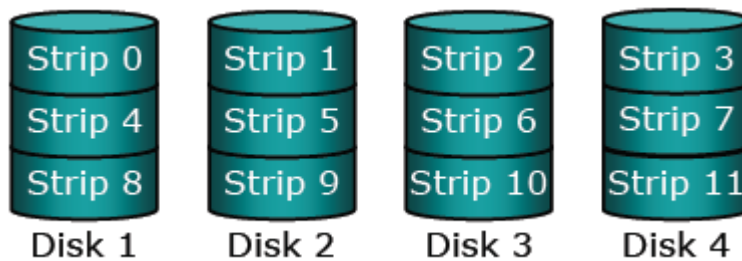
- Each strip is a number of contiguous sectors
- High data-rate
- Large requests can be dealt with in parallel
- Can also handle simultaneous requests
- No redundancy or robustness to disk failure
- So not really a true RAID design
- Poor response for many small sector requests
 RAID 1

Main Data   Backup
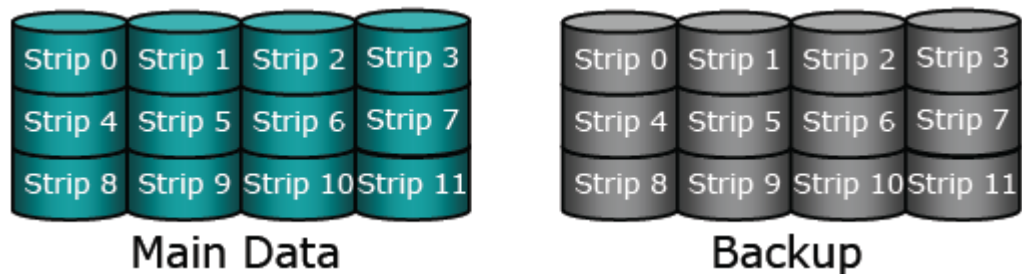
- Duplicate all the disks in the RAID 0 design
- If a drive crashes, can simply replace and copy the backup
- Read performance can be twice as good
- Main disadvantage is the number of disks needed

RAID 2

Data Disks   Error Correction Disks
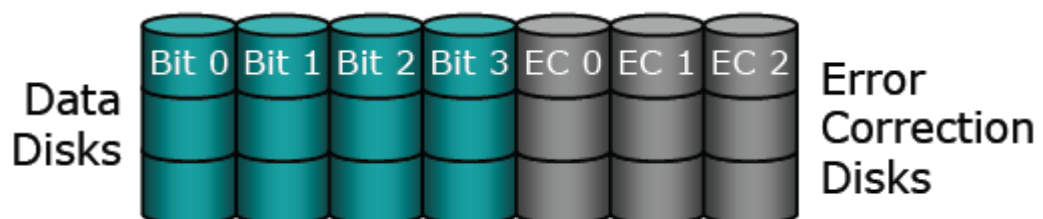
- Each byte split into two 4-bit segments then add 3 error correction bits to each
- Synchronise the arm and rotational position of the 7 drives
- Fast, as can read/write 1/2 byte each cycle
- Robust, as error-correction allows any drive to fail
- With 32 drives and 6 parity drives, overhead is 19%
- Disadvantage: hard to synchronise drives

RAID 3
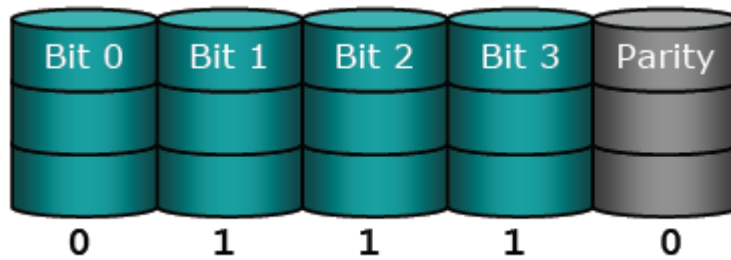
- Simpler version of RAID 2
- Still requires drive synchronisation
- Parity drive provides robustness
- Know which drive went wrong, so we can correct any single error
- Both RAID 2 and 3 have a high data rate
- But cannot handle parallel IO

RAID 4
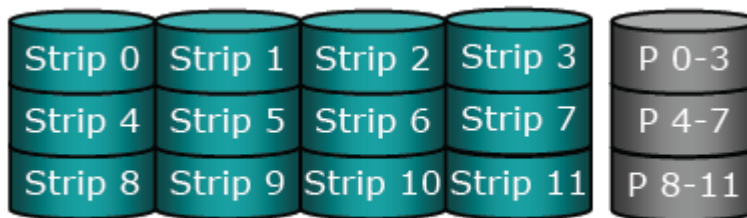
- Like RAID 0, but with strip parity kept on a separate drive
- Does not require drive synchronisation
- Poor performance for small updates
- All drives must be ready to re-compute parity
- Heavy load on parity drive may become a bottle-neck

RAID 5

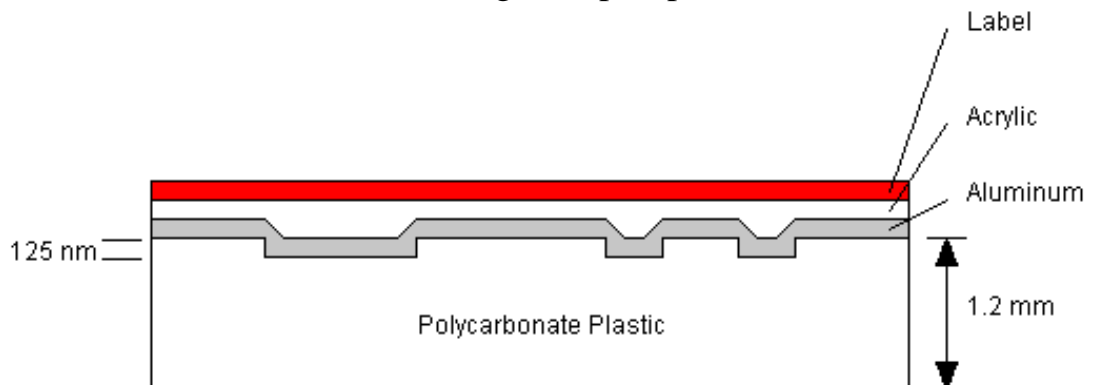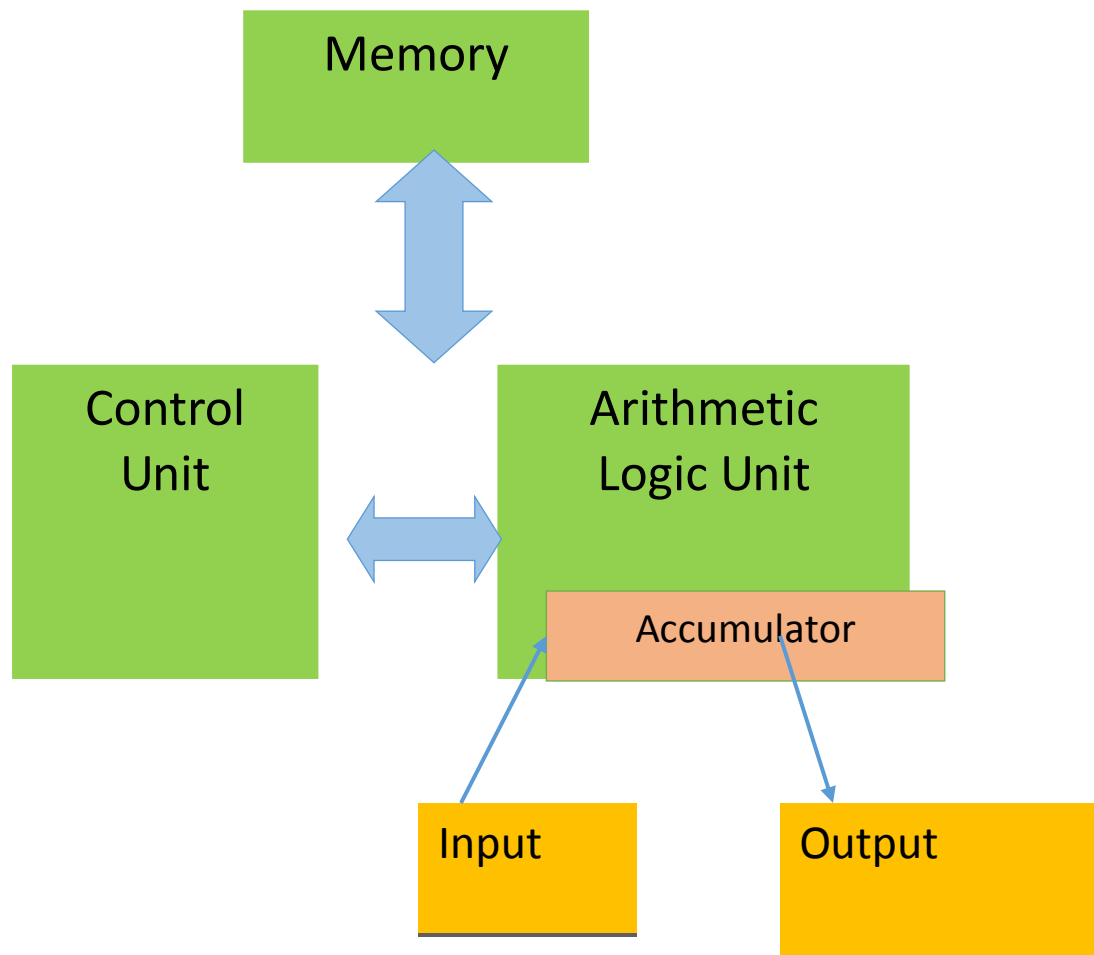| Strip 0 | Strip 1 | Strip 2 | Strip 3 | P 0-3 |
Strip 4	Strip 5	Strip 6	P 4-7	Strip 7
Strip 8	Strip 9	P 8-11	Strip 10	Strip 11
Strip 12	P 12-15	Strip 13	Strip 14	Strip 15
P 16-19	Strip 16	Strip 17	Strip 18	Strip 19

- Like RAID 4, but distribute parity blocks over all drives
- Can be difficult to reconstruct the contents of a drive if one fails though

c) A CDROM Drive uses a small plastic-encapsulated disk that can store data
   A CD consists of four layers
- The biggest part is clear polycarbonate (nominally 1.2mm)
- There is a very thin layer of reflective metal (usually aluminum) on top of the polycarbonate
- Then a thin layer of some protective material covering the reflective metal
- A label or some screened lettering on top of protective material

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        Memory


Control              Arithmetic
Unit                 Logic Unit

                  Accumulator


        Input              Output
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QUESTION 4

a) CLUSTER is the smallest unit that can be **allocated** to a file in a modern hard drive, it is made up of 1 or more SECTORS the actual number of sectors is system dependant.
SECTOR is the smallest unit found on a Hard Drive usually 512 bytes of information is stored.

• MASTER BOOT RECORD The Master Boot Record is at the start of the disc and is 512 bytes in size (1 sector).
Master boot record contains the Partition table.
Each Partition entry is 16 bytes long
It also contains a piece of self executing code that is loaded at boot time and is responsible for locating the active partition and loading the boot loader program within that partition.
End of MBR marker will always be 0x55AA

b) Fixed partition memory
   Advantage
       Simple
   Disadvantage
       The degree of multiprogramming is constrained.
       The size of each process is bounded.Suffers **internal fragmentation**
       Memory that is internal to a partition but is not being used

c) The three placement strategies are:
   First-fit: allocate the first hole large enough.
   Best-fit: allocate hole with the smallest leftover.
   Worst-fit: allocate the largest hole.

d) Little endian refers to how INTEL processors store a value in memory, the bytes are swapped. Least significant bit goes to the lower memory location on left, most significant bit to the right. i.e value 1234 is store 3412.

e) **Non-preemptive Scheduling**: Once the system has assigned a CPU to a process, the system cannot remove that CPU from that process
   Simpler
   Up to the process to release the CPU
   Preemptive Scheduling: The system can remove the CPU from the running process.
   Need extra hardware (timer)
   What if the process is in the middle of updating some data?