

I begin with the name of Allah,
Who is Most kind, Most
Merciful.

Final Exam

Name: Mohammad Bilal

ID: 14956

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Q.1

Q1) Key characteristics of Computer memory systems:

- 1- Location: * Refers to whether memory is internal and external.
 - * Internal memory is often equated with main memory.
 - * Processor requires its own local memory.
- 2- Capacity: memory is typically expressed in terms of bytes or words.
 - * Common word lengths are 8, 16, and 32 bits.
- 3- Unit of transfer: for internal memory the unit of transfer is equal to the number of electrical lines into and out of the memory module.
- 4- Capacity and Performance
 - * The two most important characteristics of memory.

5: Physical type of memory.

The most common forms are:

- * Semiconductor memory (RAM)
- * Magnetic surface memory (disk and tape)
- * Optical (CD & DVD)
- * Magneto-optical

b)

Ans: b)

One of the central caching policies is known as write-through. This means that data is stored and written into the cache and to the primary storage device at the same time. One advantage of this policy is that it ensures information will be stored safely without risk of data loss.

Ans: C

The evolution of cache organization is seen clearly in the evolution of Intel microprocessors. The 80386 does not include an on-chip cache. The 80486 includes a single on-chip of 8KB, using a line size of 16 bytes and a four-way set-associative organization.

Ans: d

Physical characteristics of Disks

1. The storage capacity of a single disk ranges from 10 MB to 10 GB. A typical commercial database may require hundreds of disks.

2. Each disk platter has a flat circular shape.

The disk surface is logically divided into tracks which are subdivided into sectors. The arm can be positioned over any one of the tracks.

The platter is spun at high speed. To read information, the arm is positioned over the correct track.

Ans: e

RAID schemes:

Whether hardware or software RAID is available in different schemes or RAID levels. The most commonly levels are RAID 0, 1, 5, 6, and 10. RAID 0, 1, and 5 work on both HDD and SSD media.

Each scheme or RAID level provides

Raid 0 - user and system data are distributed across all of the disks in the array. It is nonredundant.

Raid 1 - involves mirroring. $2 \times N$ disks are required for this level with the data mirrored on the disks.

Raid 2 - has redundancy via hamming code. It utilizes a parallel access technique along with RAID 3. Hamming codes used to correct single bit errors.

Raid 3 - requires only a single redundant disk. A parity bit is computed for the set of individual bits.

Raid 4 - utilizes independent access technique. Each member disk operated independently, unlike RAID 2 and 3. RAID 4 uses a bit by bit parity strip. There is a parity disk.

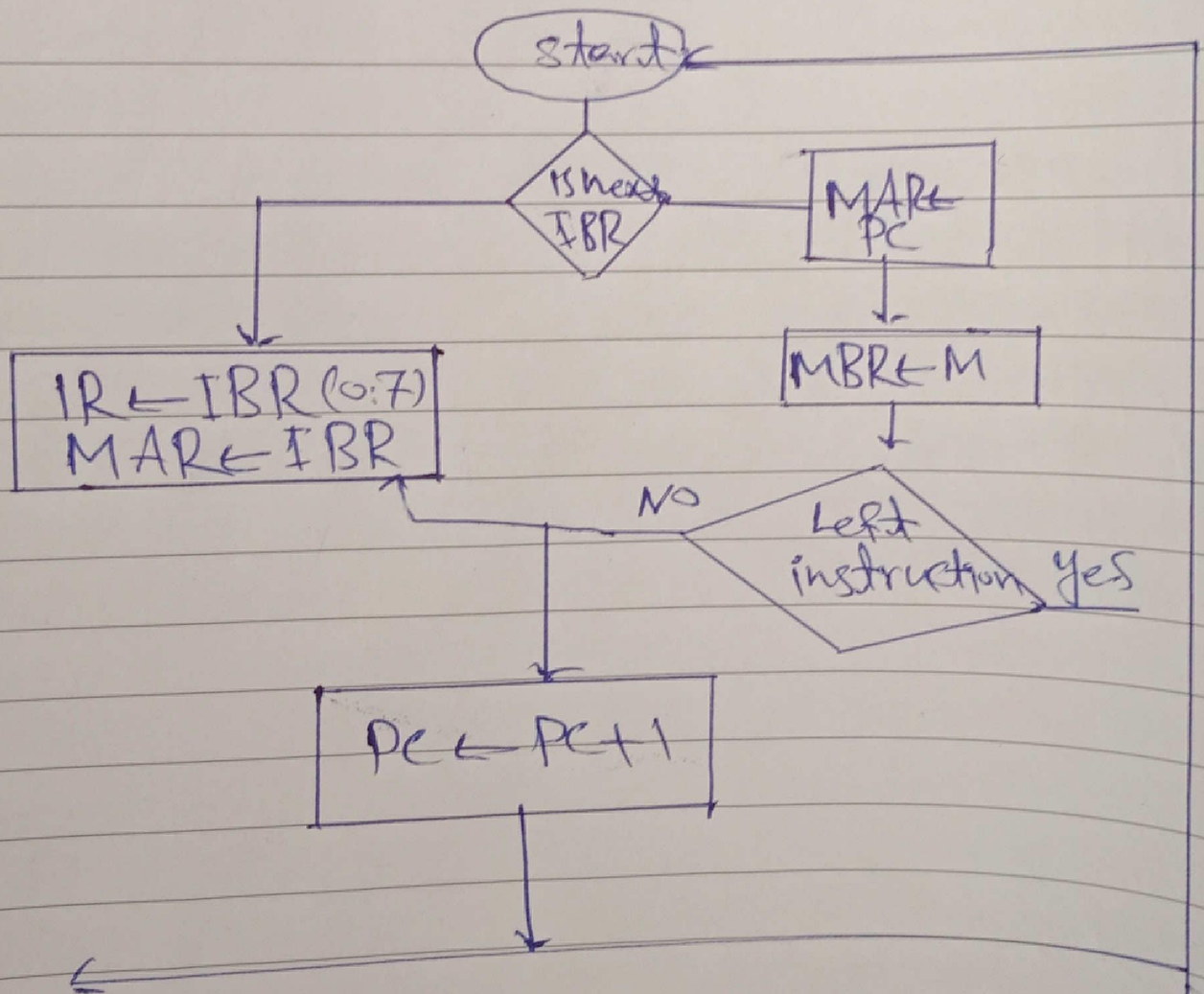
Raid 5 - Parity strips for this raid are distributed across all the disks.

Raid 6 - Requires $N+2$ disks since two different parity calculations are carried out. 3 disks would have to fail for there to be data loss.

Q.2: Draw and explain each of the following.

ans: a

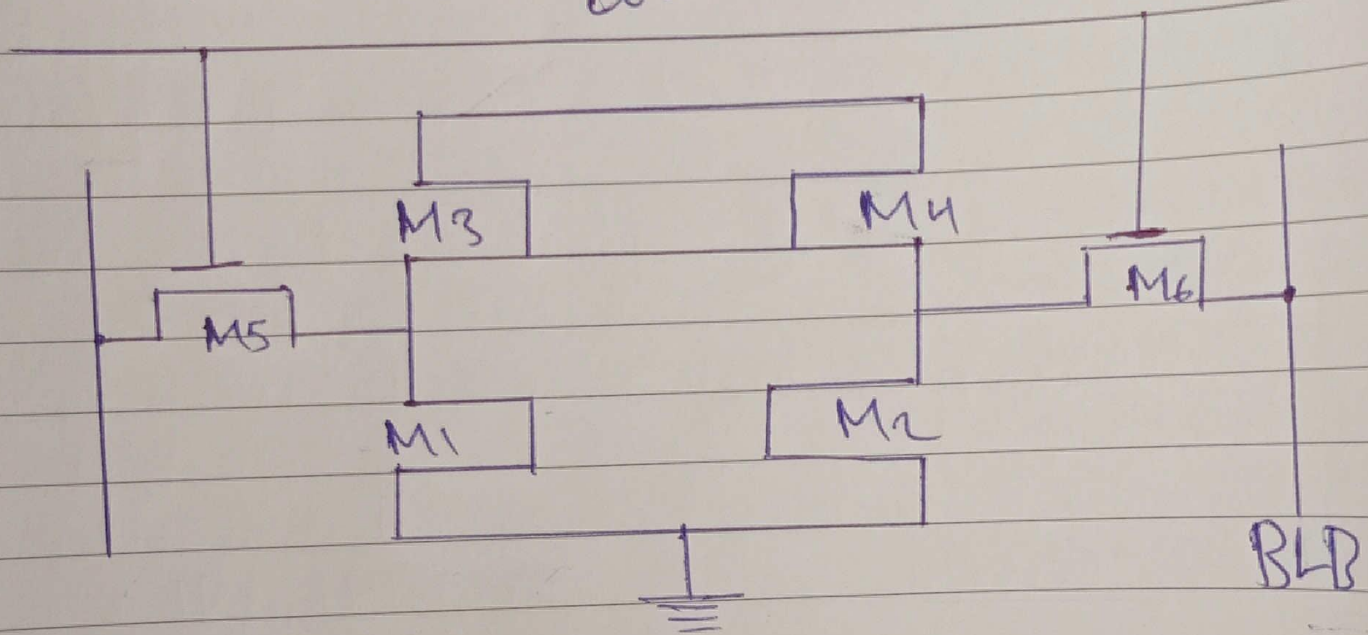
Flowchart of IAS operation



The IAS operates by repetitively performing an instruction cycle as shown in figure.

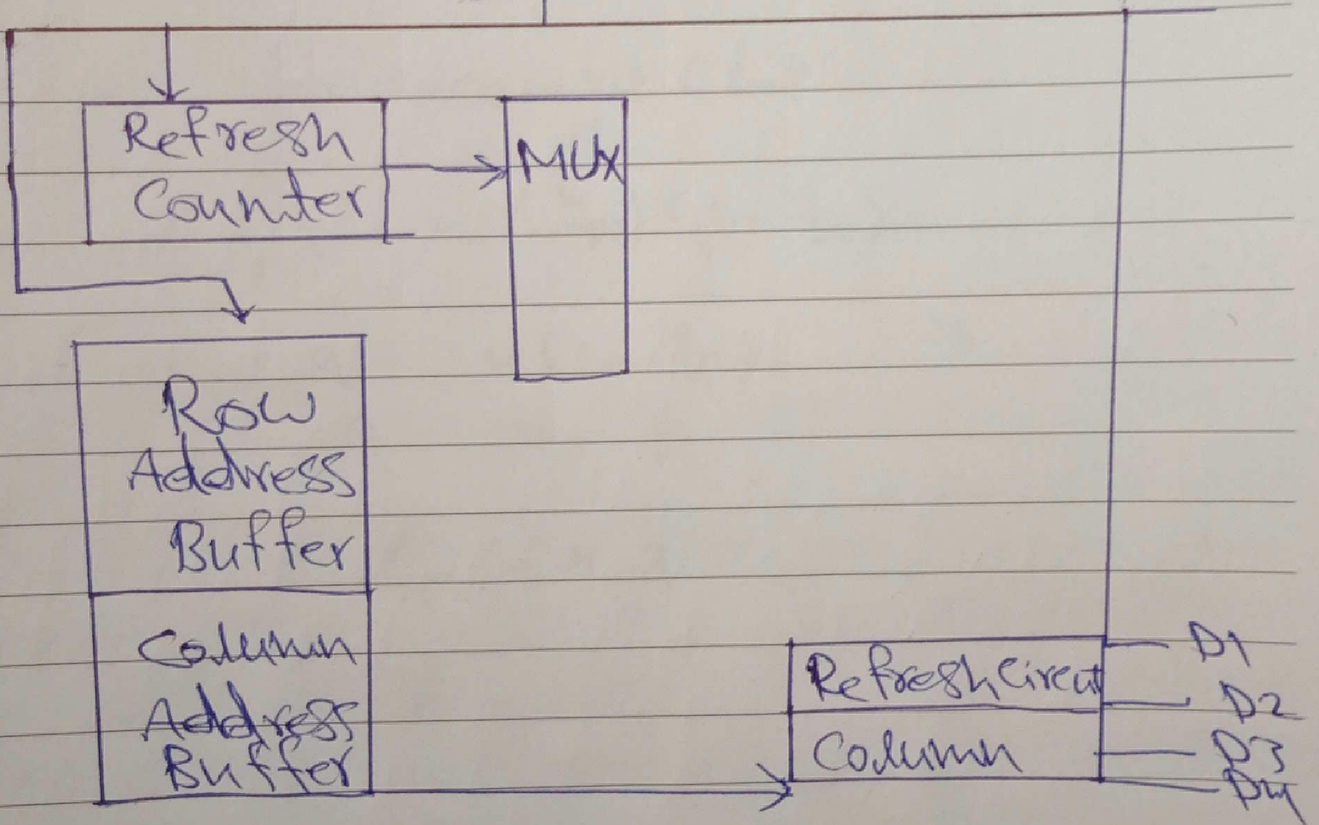
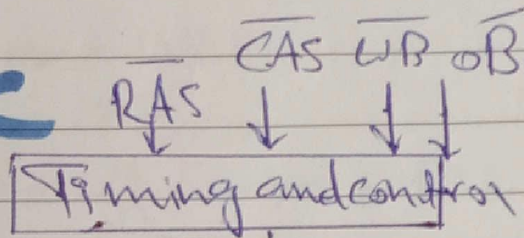
Ans: b

SRAM Cell WL



A typical SRAM cell made up six MOSFETs. Each bit in a SRAM is stored on four transistors (M1, M2, M3, M4) that form two cross-coupled inverters. This storage cell has two stable states which are used to denote 0 and 1.

Ans: C



16-Mbit DRAM (4x4): In this case, 4 bits are read or written at a time. Logically, the memory array is organized as four square arrays of 2048 by 2048 elements. Various physical arrangements are possible. In any case, the elements of the array are connected by both horizontal (row) and vertical lines.

Ans: d

Magnetic disk read/write system
Disk read/write heads are the small part of a disk drive which move above the disk platter and transform the platter's magnetic field into electrical current (read the disk) or vice versa, transform electrical current into magnetic field (write the disk)

Q.3

Ans: a

split cache: separate cache for data and instructions. Advantage of split cache is eliminates contention between INS fetch and execute unit.

Supports Pipelining and speculative execution

Unified Cache: data and instructions are cached in the same cache. Advantage of unified cache is balances possible imbalance between amount of data and instructions in a program.

only one cache needs to be manufactured.

Ans: b:

Solid-state drives and hard-disk drive,

A hard-disk drive (HDD) is an old school storage device that uses mechanical platters and a moving read/write head to access data.

A solid-state drive (SSD) is a newer faster type of device that stores data on instantly accessible memory chips.

Ans: c

CAV vs MZR

For the constant angular velocity (CAV) system, the number of bits per track is constant. An increase in density is achieved with multiple zoned recording in which the surface is divided into a number of zones, with zones farther from the center containing more bits than zones closer to the center.

Ans: d

HD DVD and Blu-ray DVD

The major difference between Blu-ray and HD DVD is capacity - that is, both Blu-ray and HD DVD can store more information than current DVDs on the same size 12cm optical disc we're all used to.

Blu-ray and HD DVD both use a blue laser, which has a shorter wavelength than red ones. The shorter wavelength coupled with improved lenses, results in a smaller beam enabling a higher amount of data to be written to each disc.

Q.4

Ans: a

Address	FEDCBAH
1- Tag/Line/word	FB/2EEEE/3
2- Tag/Word	2EEEEEE/3
3- Tag/set/word	1771EEE/3

Ans: b

Position	12	11	10	9	8	7	6	5	4	3	2	1
Bits	D8	D7	D6	D5	C8	D4	D3	D2	C4	D1	C2	C1
Block	1	0	1	0		1	1	1		0		
Codes	1010	1101	1010			0111	0111	0101				

The check bits are in bit number 8, 4, 2, and 1.

check bit 4 calculated by value in bit number 12, 11, 10 and 9

- * Check bit 8 calculated by value in bit numbers 12, 11, 10 and 9
- * Check bit 2 calculated by value in bit numbers 16, 10, 7, 6, and 3
- * Check bit 1 calculated by value in bit numbers 16, 9, 7, 5 and 3
- * Thus, the check bits are 0010

Ans: C

- * Average seek time = 4ms
- * Average rotational delay = 2ms
- * Time to read first track (500 sectors) = 4ms

if sequential organization is considered 2500 sectors are occur on all of sectors on 5 adjacent tracks
 5 tracks \times 500 sectors / track = 2500 sect
 or

- * Total time to read the first track (500 sectors)
 $4 + 2 + 4 = 10\text{ms}$