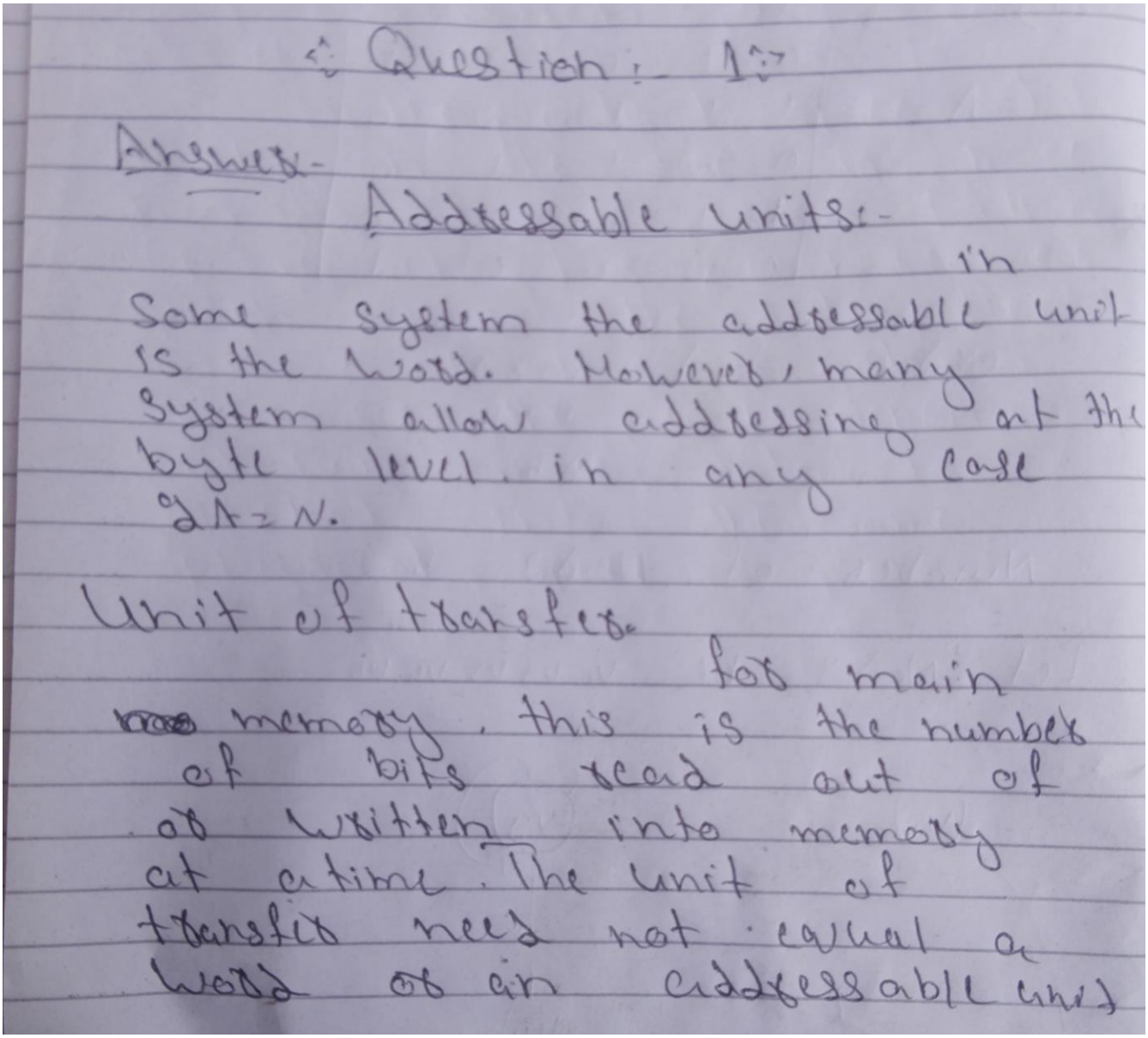
Name: Sajawal Khan

ID: 14756

Department: BS(cs) 4th

Paper: Computer Architecture

Q.1 Give answers to each of the following:



Question :- 1:-

Answer:-

Addressable units:-

In some system the addressable unit is the word. However, many system allow addressing at the byte level. in any case A = N.

Unit of transfer.

For main memory, this is the number of bits read out of or written into memory at a time. The unit of transfer need not equal a word or an addressable unit

Question # 2

Answer:-

In computer, Cache algorithm are optimize instruction, or algorithm, that a computer program or a hardware structure can utilize in order to manage a cache of information stored on the computer.

Question # 3

Answer:-

Read operation:-

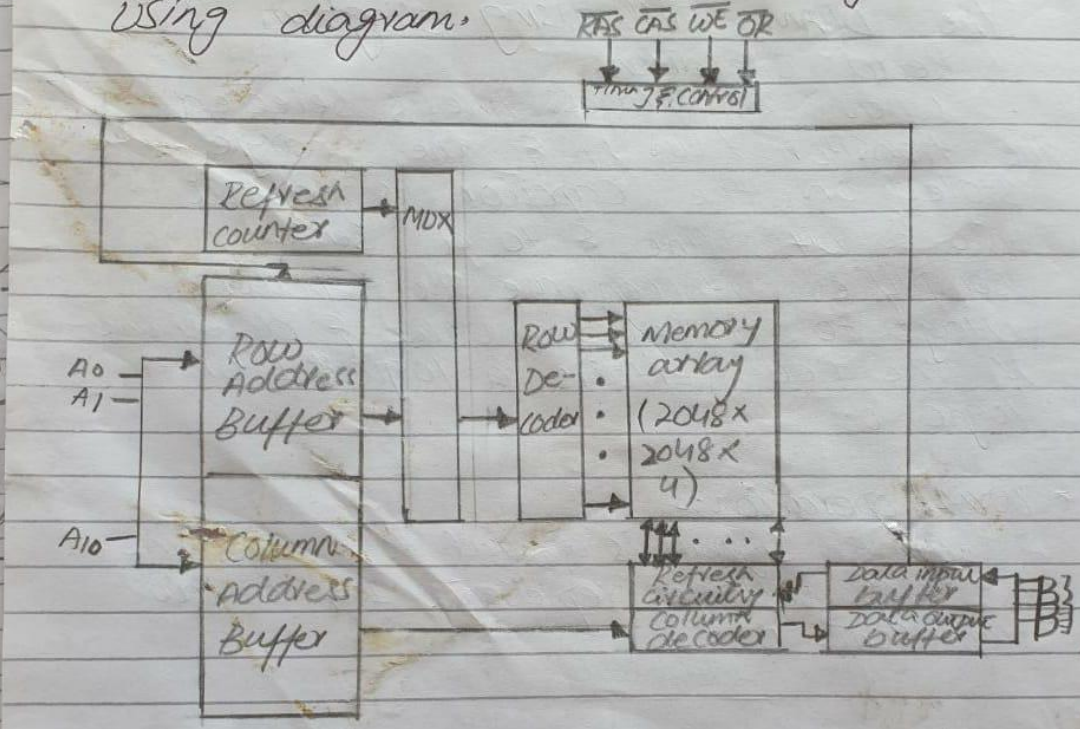
In some of only operation to be performed the word line should be high to perform read operation initially.

Write operation.

Consider the memory bits consist of $\emptyset = 0$ & $\emptyset = 1$

(4)

(d) Discuss 16-Mbit DRAM (4M×4) organization using diagram.



Typical Megabit DRAM (4M×4)

Because only 4 bits are read/written to their DRAM, there must be multiple DRAMs connected to the memory controller to read/written a word of data to the bus.

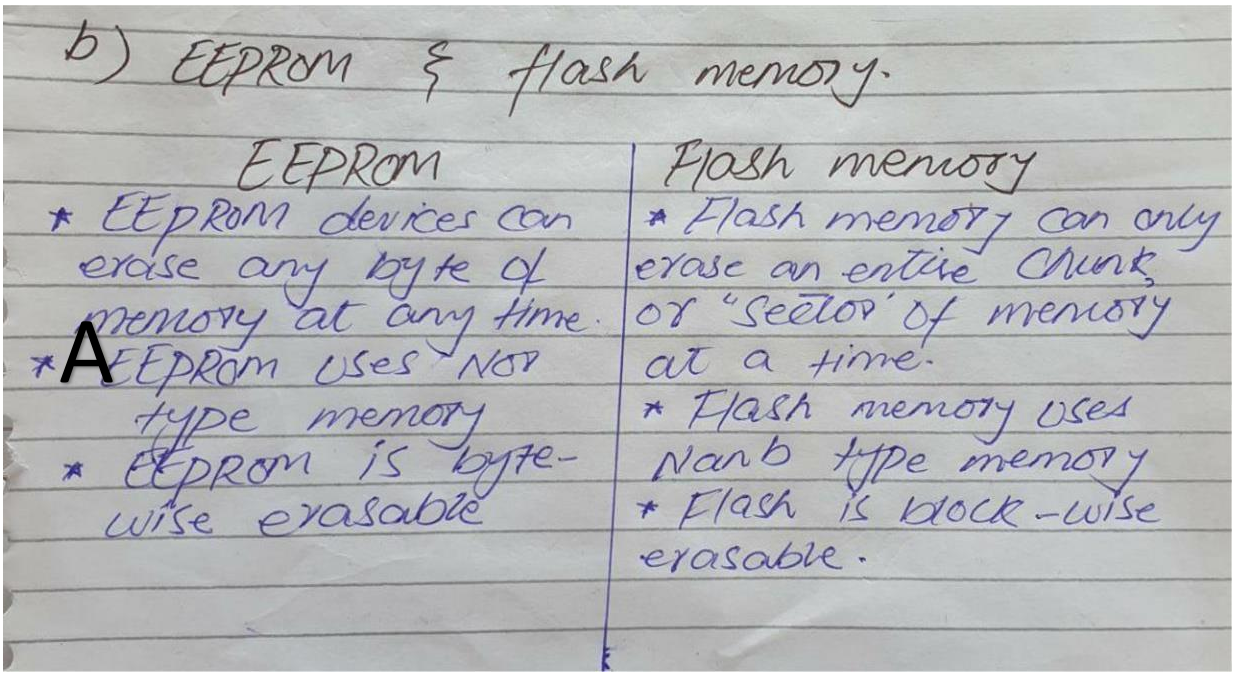
All the DRAMs require a refresh operation A simple technique for refreshing is in effect to disable the DRAM chip while all data

Question :- 5 :-

Answer :-

The actual space data track on the disc is more tightly wound then with a CD - ie, it has a narrower pitch than the data track on a CD. This is also increases the real density allowing more data to be packed into the same physical space.

Q.2 Differentiate each of the following in detail :



b) EEPROM & flash memory.

EEPROM	Flash memory
* EEPROM devices can erase any byte of memory at any time.	* Flash memory can only erase an entire chunk, or "sector" of memory at a time.
* EEPROM uses NOR type memory	* Flash memory uses Nand type memory
* EEPROM is byte-wise erasable	* Flash is block-wise erasable.

A

(b) (i) Hard failures:-

in this context hard failures are errors that occure through process defects and/or circuit bugs hard failures are repeatable with the correct sequence of actions within the microcontrollers.

(ii) Soft errors:-

occurs through no failure of the circuit or defect but due to an external source that causes the data to change.

(a) Magnetic & write mechanism.

Read:-

The traditional read mechanism exploits facts that a magnetic field moving relative to a coil produces an electrical current in the coil. When the surface of the disk passes under the head, it generates a current of the same polarity as the one already recorded. The structure of the head for reading in this case essentially the same as for writing therefore the same head can be used for both such single head are used in floppy disks systems & in older rigid systems. Contemporary rigid disk system read mechanism. Involving a separate read head positioned for convince close to the write head. The read head consists

Of a partially Sheilded magnetoresistive Sensor (MR). The MR material has an electrical resistance that depend on direction the magnetization of the medium moving under it. By passing a current through the MR Sensor, resistance changes are ~~direction~~ detected as voltage signals. The MR design allows higher frequency operation which evidates to greater storage densities & operating speeds.

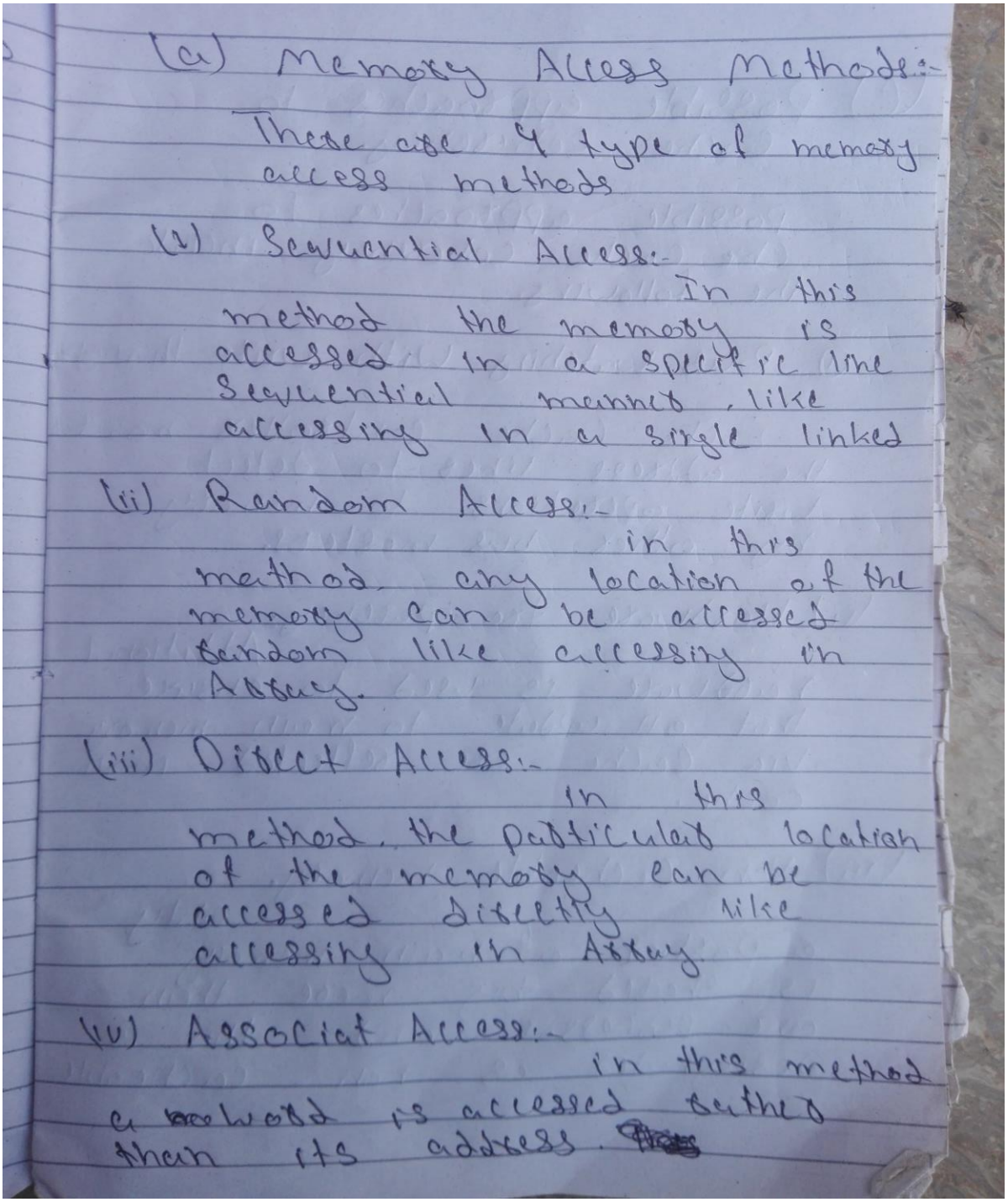
Write:-

The write mechanism exploits the facts that electricity flowing through a coil produce a magnetic field. Electric pulses are sent to the write head & the resulting magnetic patterns are recoded on the surface below, with different pattern for positive & negative currents. The write head itself is madeup of easily magnetizable material & is in the shape of rectangular in doughnut with a gap along one side & a few turns of

(c) MD DVD and Blu ray DVD

MD DVD players are much cheaper than Blu-ray machines but blu-ray disc have more storage space and more advanced protections against piracy. Both version deliver sharp resolution Blu ray has 25 GB capcity is more expensive.

Q.3 Differentiate each of the following:



(a) Memory Access Methods:-

There are 4 type of memory access methods

(i) Sequential Access:-

In this method the memory is accessed in a specific line Sequential manner, like accessing in a single linked

(ii) Random Access:-

in this method any location of the memory can be accessed random like accessing in Array.

(iii) Direct Access:-

in this method, the particular location of the memory can be accessed directly like accessing in Array.

(iv) Associat Access:-

in this method a ~~word~~ word is accessed rather than its address.

(iv) Principle of locality:

The principle of locality states that data in the vicinity of a referenced word are likely to be refferenced in the near future.

"OR"

An implication of locality is that we can predict with reasonable accuracy what instructions and data a program will use in the near future based on its accesses in the recent past.

(C) Possible approaches to Cache Coherency.

1. Possible approaches to Cache Coherency include the following.

① Bus watching With Write through

Each cache controller monitor the address lines to detect write operations to memory by other bus masters.

(ii) Hardware transparency:

Additional hardware is used to ensure that all update to main memory via cache are reflected in all cache.

(iii) Non-Cacheable memory.

only a portion of main memory is shared by more than one processor and this is designated as non-cacheable

* ~~Flash memory components~~ to SSDs:-

(+) partical issues peculiar

These are two practical issues peculiar to SSD's that are not faced by HDD's.

* SDD performance has a tendency to slow down as the device is used:-
  - The entire block must be read from flash memory & placed in a ram buffer.
  - Before the block can be written back to flash memory, the entire block of flash memory must be erased.
  - The entire block from the buffer is now written back to flash memory.
* Flash memory becomes unusable after a certain number of writes:-
* Techniques for prolonging life:
* Front ending the flash with a cache to delay & group write

(E) Discuss the CD read and write operation.-

Read operation:-

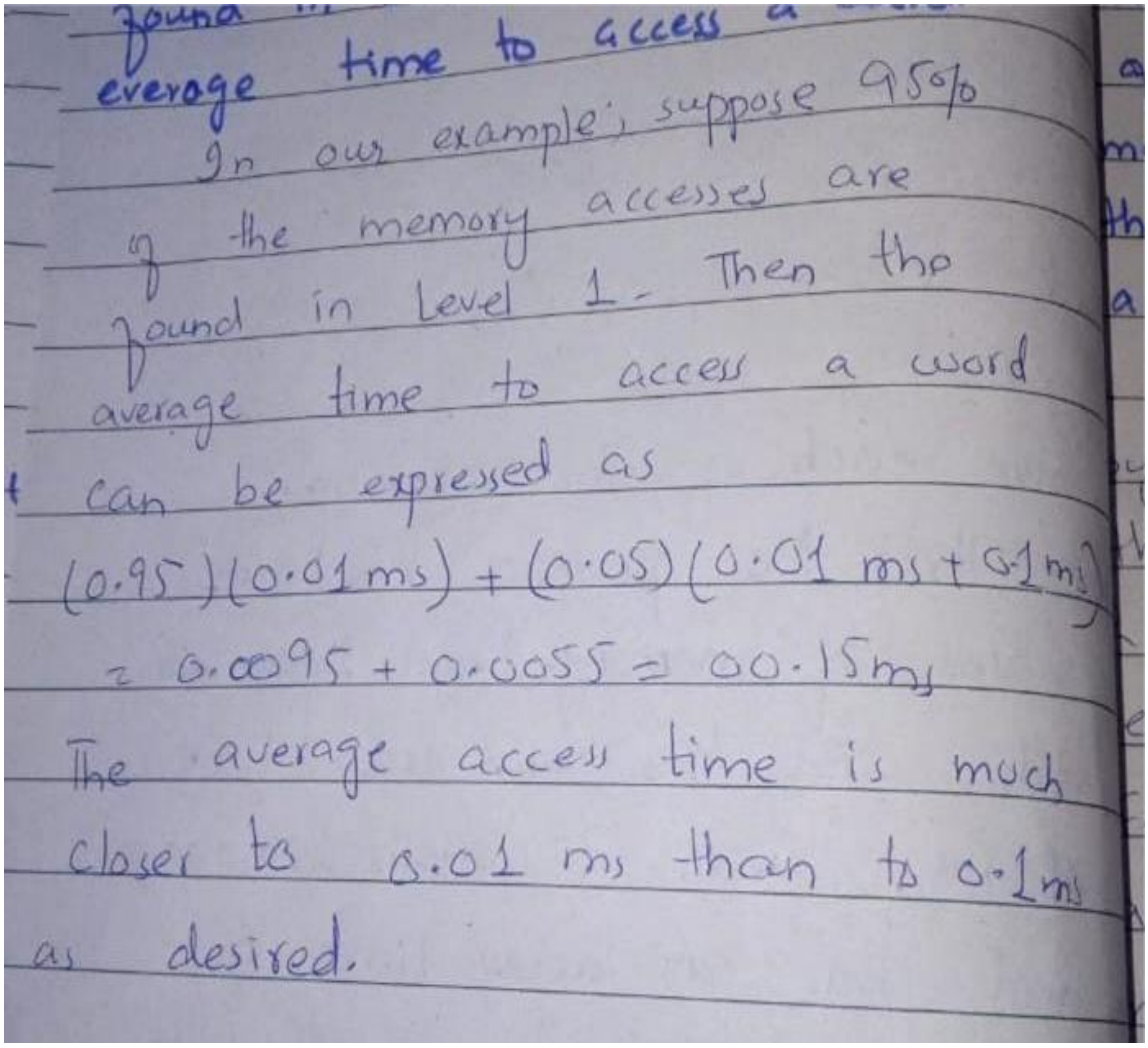
Information is retrieved from a CD or CD-Rom by a low-powered laser housed in an optical-disk player or drive unit. The laser shines the clear polycarbonate while a motor spins the disk past it.

Write operation:-

Recall that on a magnetic disk, information is recorded in concentric tracks. With the simplest constant angular velocity (CAV) system the number of bits per track is constant.

Q.4 Solve each of the following:

(i) Suppose that the processor has access to two levels of memory. Level-1 contains 1000 words and has an access time of 0.01 µs; level-2 contains 100,000 words and has an access time of 0.1 µs. Assume that if a word to be accessed is in level 1, then the processor accesses it directly. If it is in level 2, then the word is first transferred to level 1 and then accessed by the processor. Suppose 95% of the memory accesses are found in level 1. Then find the average time to access a word.



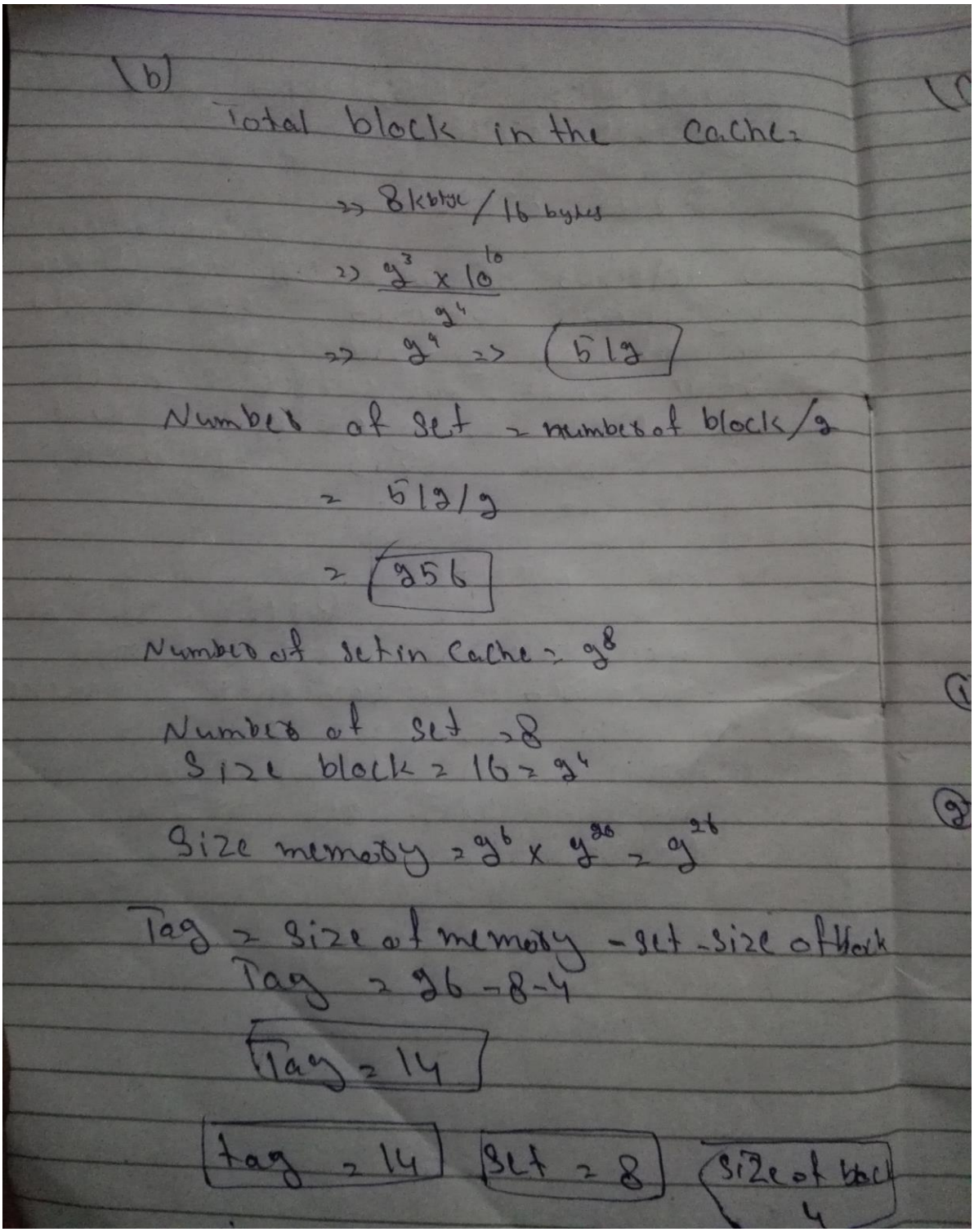
found ...
everage time to access a ...
In our example, suppose 95% of the memory accesses are found in Level 1. Then the average time to access a word can be expressed as

$(0.95)(0.01\,ms) + (0.05)(0.01\,ms + 0.1\,ms)$

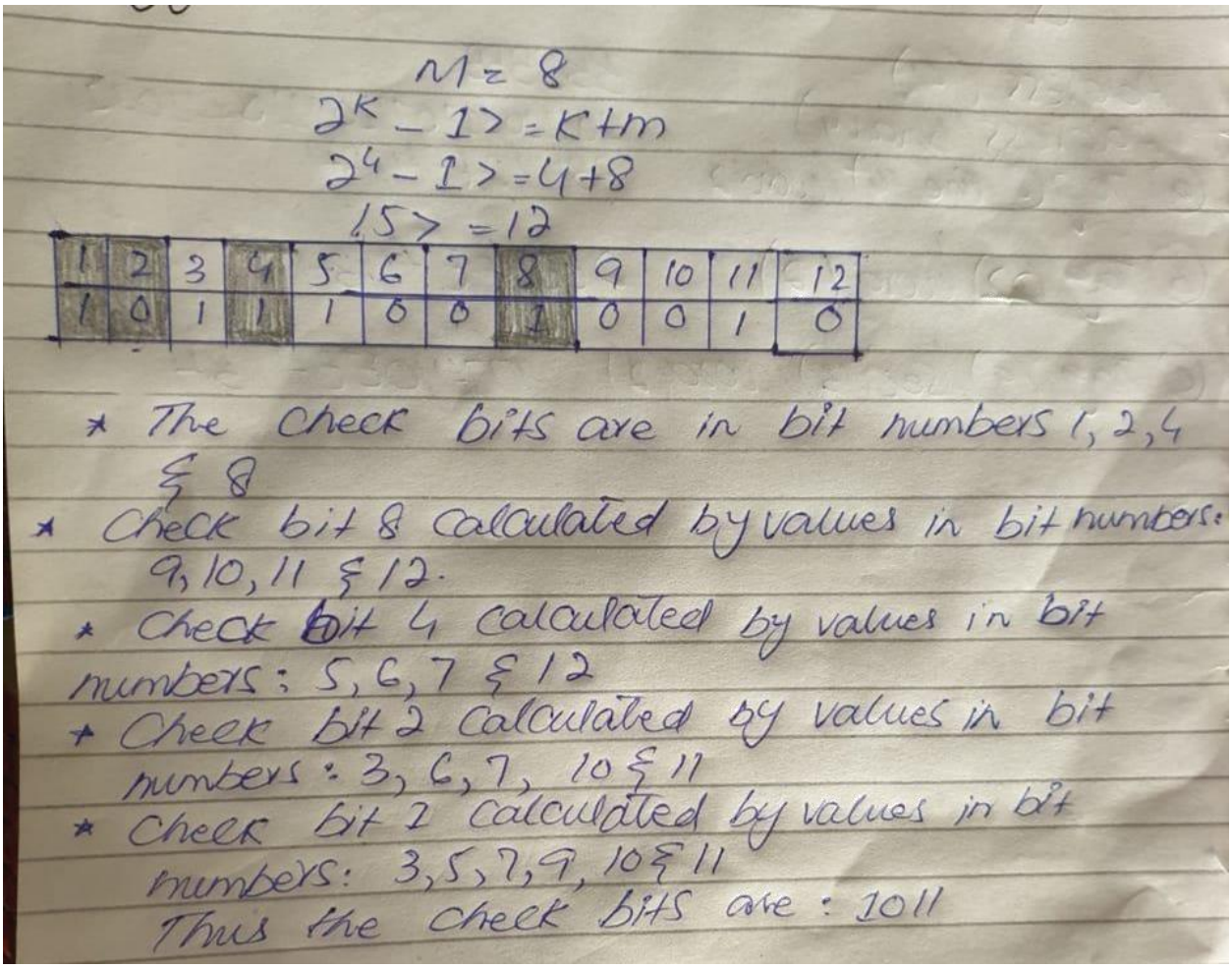
$= 0.0095 + 0.0055 = 00.15\,ms$

The average access time is much closer to 0.01 ms than to 0.1 ms as desired.

b) Show the tag, Set, and word values for a two-way set-associative cache if the main memory address is 9F3A7Ch.



c) Suppose an 8-bit data word (M) stored in memory is 10101010. Using the Hamming algorithm, determine what check bits (k) would be stored in memory with the data word.



$M = 8$

$2^k - 1 >= K + m$

$2^4 - 1 >= 4 + 8$

$15 >= 12$

1	2	3	4	5	6	7	8	9	10	11	12
1	0	1	1	1	0	0	1	0	0	1	0

* The check bits are in bit numbers 1, 2, 4 & 8
* Check bit 8 calculated by values in bit numbers: 9, 10, 11 & 12.
* Check bit 4 calculated by values in bit numbers: 5, 6, 7 & 12
* Check bit 2 calculated by values in bit numbers: 3, 6, 7, 10 & 11
* Check bit 1 calculated by values in bit numbers: 3, 5, 7, 9, 10 & 11

Thus the check bits are: 1011

d) Consider a disk with an advertised average seek time of 6 ms, rotation speed of 7,200 rpm, and 512-byte sectors with 500 sectors per track. Suppose that we wish to read a file consisting of 2500 sectors for a total of 1.28 Mbytes. Estimate the total time for the transfer when:

1. The file occupies all the sectors on 5 adjacent tracks

2. The sectors are distributed randomly over the disk