“ASSIGNMENT NO 1”

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Computer Fundamentals

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Q. 1. Write a detail note on History of computer. Discuss Different generations of Computer.

Introduction of computer:-

The word computer mean “to calculate”. Hence people usually consider a computer to be calculating device that can perform different arithmetic operation at high speed. Although the original objectives of inventing a computer was to create a fast calculating device. We now define computer as a device operate on data (raw fact) because more than 80% of the work done by computer in today’s life. A computer is often called data processing device because it can store, process and retrieve data whenever desired by user.

History of computer:-

Blaise Pascal invented the first mechanical machine in 1662. Later in the year 1671, Baron Gottfried from Germany invented the first calculator for multiplication. Key board machine originated in UN around 1880 and we use them even today. Around Hollerith came up the concept of punched cards that computer used extensively as input medium even late in 1970.At the end of nineteenth century business calculator made their appearance in Europe and America. Charles Babbage, a nineteenth century professor at Cambridge University, is consider the father of modern digital computer. He had employed a group of clerks for preparing mathematical tablets. Soon Babbage became dissatisfied and exasperated with this type of job. In 1822, He start thinking about building a machine that could compute tablets guaranteed to be error free. In this struggles he came out with new ideas of a completely automatically analytical engine for performing basic arithmetic function for any mathematical problem at average speed of 60 addition per minute. But he was unable to produce working

machine because the precision engineering required to manufacture the machine was not available at that period. However his efforts established a number of principles which are basic to design any digital programmable computer. In 1940s DR John von Neumann introduce the “store program” concept that help to overcome hard-wired problem. This basic idea behind this concept is that the sequence of instruction and data can be stored in memory of a computer for automatic operation. Due this feature, we often refer to as stored program digital computer.

First computer as ENIC (Electrical Numerical Integrated and calculator) introduce by John w Manly and prosper Eckert at university of Pennsylvania.

Generation of computer:-

Generation in computer talk provide a framework for growth of industry based of key technologies developed. Originally based on hardware technology but was later extended to software also.

There are mainly five generation of computer.

First generation (1942-1955):-

The early computer were manufacture using vacuum tube as electronic switching device. A vacuum tube was a fragile glass device using filament as a source of electronics and could control and amplify electronic signals. This electronics vacuum tube could perform computation in millisecond and were known as first generation computer.

Most of the first generation computer worked on the principle of storing program instruction along with data of the computer (stored program concept). So that they could automatically execute program without human invention. Memory of these computer used electromagnetic relays, and user fed all data and instruction into the system using punched card. Programmer wrote instruction in machine and assembly languages because of lack of high level languages.

Characteristic:-

- They were Fastest calculating device at that time.
- They were too bulky in size requiring large rooms for installation.
- They used thousands of vacuum tubes that emitted large amount of heat and burn out frequently. Hence the rooms where they were installed had to be air-condition.
- These computer were prone to frequent hardware failure due to thousands of tubes. They had a limited time.
- Since these computer were difficult to program and use they had limited commercial use.

Second generation (1955-1964):-

John Bardeen, Willian Shockley and Walter Brattain invented a new electronic switching device than vacuum tubes.

Second generation computer were manufacture using transistor. They were more powerful, more reliable, less expensive, smaller, and cooler to operate than the first-generation computer. The second generation computer also experience a change in storage technology. Memory was composed of magnetic cores. Large RAM (having storage capacity of few ten of kilobyte) had several magnetic cores string on a mesh of wires. In 1957, researcher introduced magnetic tape as a fastest and more convenient secondary storage medium .later magnetic disk was also developed. In the software technology high-level programming languages (like FORTAN, COBOL, ALGOL and SNOBOL) and batch operating system emerged during second generation. High level languages made the second generation computer easier to program and use than first generation. Batch operating system helped in reducing human intervention while processing multiple jobs resulting in faster processing.

Characteristic:-

- They were more than 10 times faster than first generation computer.
- They were smaller than first generation computers and required smaller space.
- They consumed less power and dissipated less heat than second generation computers. But the room for their installation is still air-conditional because it dissipated little heat.
- They had faster and larger primary and secondary storage as compare to first generation.
- They easier to program so that they had wider commercial use.
- In these computer second generation, thousands of transistors had to be assembled manually by hand into electronic circuit making commercial production of these computer difficult and costly.

Third generation (1964-1975):-

In 1958 By this phase, transistors were now being miniaturised and put on silicon chips (called semiconductors). This led to a massive increase in speed and efficiency of these machines. These were the first computers where users interacted using keyboards and monitors which interfaced with an operating system, a significant leap up from the punch cards and printouts. This enabled these machines to run several applications at once using a central program which functioned to monitor memory.

As a result of these advances which again made machines cheaper and smaller, a new mass market of users emerged during the ‘60s.

Characteristics:-

These computers were cheaper as compared to second-generation computers.

- They were fast and reliable.
- Use of IC in the computer provides the small size of the computer.
- IC not only reduce the size of the computer but it also improves the performance of the computer as compared to previous computers.
- This generation of computers has big storage capacity.
- Instead of punch cards, mouse and keyboard are used for input.
- They used an operating system for better resource management and used the concept of time-sharing and multiple programming.
- These computers reduce the computational time from microseconds to nanoseconds.
- IC chips are difficult to maintain.
- The highly sophisticated technology required for the manufacturing of IC chips.
- Air conditioning is required.

Fourth generation (1975-1989):-

This revolution can be summed in one word: Intel. The chip-maker developed the Intel 4004 chip in 1971, which positioned all computer components (CPU, memory, input/output controls) onto a single chip. What filled a room in the 1940s now fit in the palm of the hand. The Intel chip housed thousands of integrated circuits. The year 1981 saw the first ever computer (IBM) specifically designed for home use and 1984 saw the MacIntosh introduced by Apple. Microprocessors even moved beyond the realm of computers and into an increasing number of everyday products.

The increased power of these small computers meant they could be linked, creating networks. Which ultimately led to the development, birth and rapid evolution of the Internet. Other major advances during this period have been the Graphical user interface (GUI), the mouse and more recently the astounding advances in lap-top capability and hand-held devices.

Characteristics:-

- Fastest in computation and size get reduced as compared to the previous generation of computer.
- Heat generated is negligible.
- Small in size as compared to previous generation computers.
- Less maintenance is required.
- All types of high-level language can be used in this type of computers.
- The Microprocessor design and fabrication are very complex.
- Air conditioning is required in many cases due to the presence of ICs.
- Advance technology is required to make the ICs.

Fifth generation:-

Fifth generation computing devices, based on artificial intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today. The use of parallel processing and superconductors is helping to make artificial intelligence a reality.
Quantum computation and molecular and nanotechnology will radically change the face of computers in years to come. The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of learning and self-organization.

Characteristics:-

- It is more reliable and works faster.
- It is available in different sizes and unique features.
- It provides computers with more user-friendly interfaces with multimedia features.
- They need very low-level languages.
- They may make the human brains dull and doomed.

Q. 2 Differentiate and discuss different microprocessor of computer from Pentium-1 to Core i7.

Pentium microprocessor:-

Pentium was introduced on March 2, in 1993. Pentium succeeded the Intel 486; The 4 indicates the fourth generation microarchitecture in the microprocessor's history. Pentium refers to an Intel's single-core x 86 microprocessor, which is based on the fifth-generation micro-architecture. This processor's name was derived from the Greek word Penta, means five.

The original Pentium processor was succeeded by the Pentium MMX in 1996. This processor has a data bus of 64 bits. A standard single transfer cycle can read or write up to 64 bits at a time. The Burst read and writes back cycles are supported by the Pentium processors. These cycles are used for cache operations and transfer 32 bytes (size of the Pentium cache line) in 4 clocks. All cache operations are burst cycles for the Pentium.

The following chart below lists the cache levels and speeds for each type of processor.

General Specifications				
Processor Type	**CPU Speeds (MHz)**	**L1 Cache**	**L2 Cache**	**Cache Speed**
Pentium Pro	150, 180, 200	16 KB	256 KB	CPU Speed

Pentium Pro 512KB	200	16 KB	512 KB	CPU Speed
Pentium Pro 1MB	200	16 KB	1 MB	CPU Speed
Celeron	333, 366, 400, 433, 466, 500, 533, 600,733, 850, 900, 950, 1000	32 KB	128 KB	L1 cache runs at CPU Speed
Pentium II	233, 266, 300, 350, 400, 450	32 KB	512 KB	Ã‚Â½ CPU Speed
Pentium III	450, 500, 550, 600, 667, 700, 733, 750, 800, 866, 933, 1000, 1100	32 KB	512 KB or integrated 256K advanced Transfer cache (on some versions of processor)	Ã‚Â½ CPU Speed or CPU speed
Pentium IV	1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000	32KB	256KB advanced Transfer cache	L1 cache runs at CPU speed

Core i3, i5 or i7:-

Every computer has a processor and the processor is the brain of the computer. Intel Core processors are among the best you can buy, but choosing which of the 3 (i3, i5 and i7) different models best suits your needs can be confusing. Generally speaking a Core i3, i5 or i7 that has a newer architecture is faster than the older-architecture processor that it replaces.

Intel's current core processors are divided into three ranges ; Intel Core i3, Intel Core i5 and Intel Core i7. Different processor families have different characteristics that determine their levels of efficiency. The more cores there are, the more tasks (known as threads) can be served at the same time. But, Core i7 does not have seven cores nor does Core i3 have three cores. The numbers are simply indicative of their relative processing powers. Their relative levels of processing power are based on a collection of criteria involving their number of cores, clock speed (in GHz), size of cache, as well as some new Intel technologies like Turbo Boost and Hyper-Threading. Therefore, let's break down these concepts to understand them better.

Classification:-

- An Intel Core i3 to provide adequate performance for basic tasks
- An Intel Core i5 to provide good performance for most tasks
- An Intel Core i7 to provide great performance for the most demanding of tasks

Core i3, i5 or i7 are differentiated on the base these quality:-

- Number of cores
- Clock speed
- Hyper-Threading
- Turbo Boost
- Cache memory

You'll find some examples of the processors below.

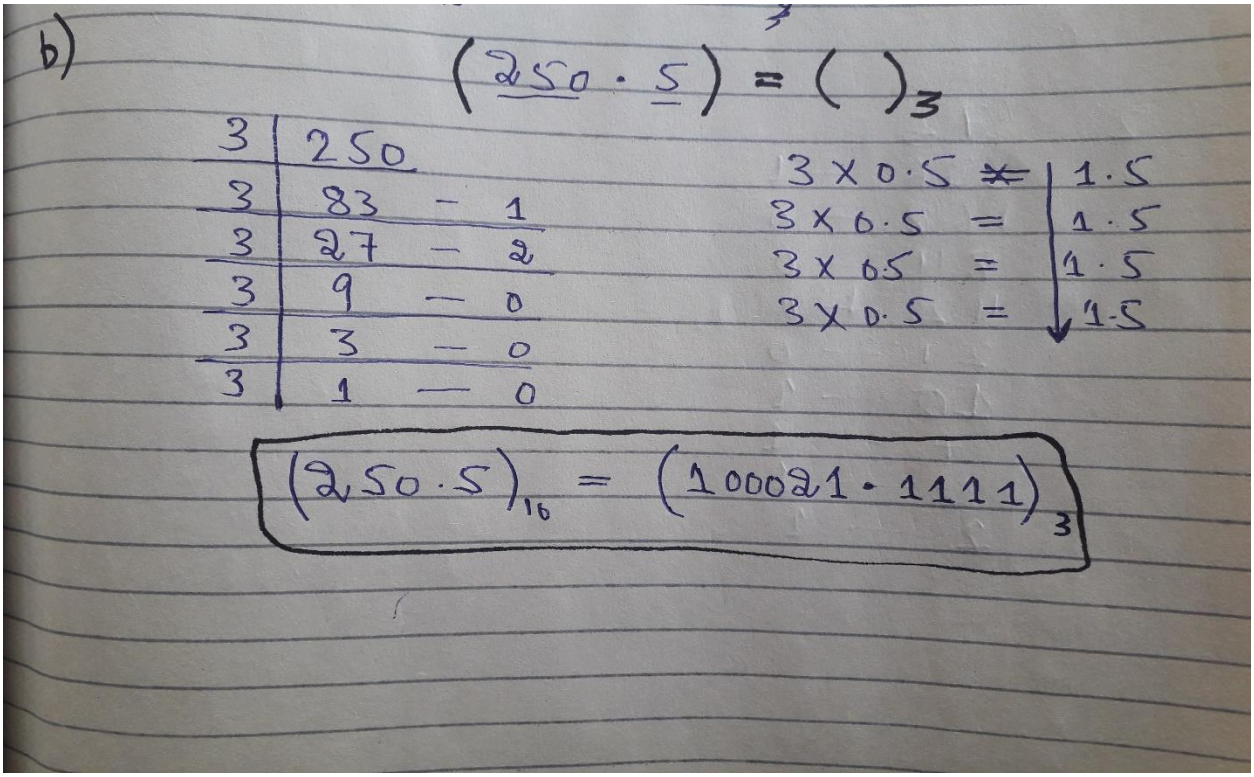
Model:	i7-8700K	i5-8600K	i3-8350k
Cores:	6 / 12	6 / 6	4 / 4
Base Freq:	3.7	3.6	4.0
Turbo Freq:	4.7	4.3	N/A
Cache:	12MB	9MB	8MB
TDP:	95W	95W	91W
Price:	£295 / $359	£220 / $260	£140 / $170

Q3. Solve the following.

a. Write the first 20 decimal digits in base 2 (binary).

Decimal	Binary
1	01
2	10
3	11
4	100
5	101
6	110
7	111
8	1000
9	1001
10	1010
11	1011
12	1100
13	1101
14	1110
15	1111
16	10000
17	10001
18	10010
19	10011
20	10100

b. Convert the decimal number 250.5 to base 3, base 4, base 7, base 8, and base 16.



$(250.5)_{10} = (\ )_4$

4	250	
4	62	— 2
4	15	— 2
4	3	— 3
	0	— 3

$4 \times 0.5 = 2.0$
$4 \times 0 = 0.0$
$4 \times 0 = 0.0$
$4 \times 0 = 0.0$

$(250.5)_{10} = (3322.0000)_4$

$(250.5)_{10} = (\ )_7$

7	250	
7	35	— 5
	5	— 0

$7 \times 0.5 = 3.5$
$7 \times 0.5 = 3.5$
$7 \times 0.5 = 3.5$
$7 \times 0.5 = 3.5$

$(250.5)_{10} = (505.3333)_7$

$(250.5)_{10} = (\ )_7$

8	250	
8	31	— 2
8	3	— 7

$8 \times 0.5 = 4.0$
$8 \times 0 = 0.0$
$8 \times 0 = 0.0$

$(250.5)_{10} = (372.4000)_8$

$(250.5)_{10} = (\quad)_{16}$

16	250
	15 — 10
	0 — 15

$16 \times 0.5 = 8.0$

$16 \times 0.0 = 0.0$

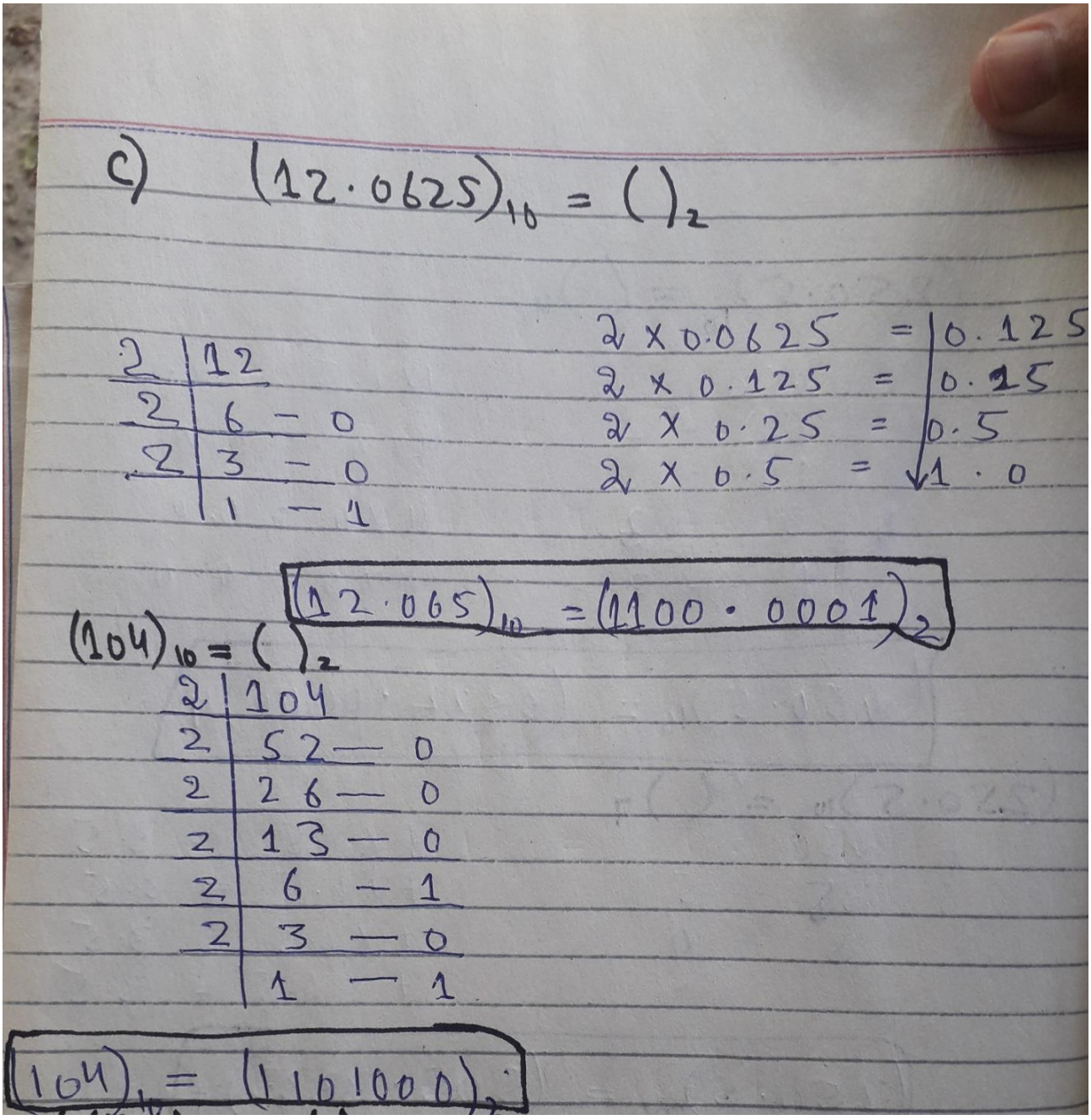
$16 \times 0.0 = 0.0$

$\therefore F = 15$

$\therefore A = 10$

$$(250.5)_{10} = (FA.80000)_{16}$$

c. Convert the following decimal numbers to binary: 12.0625, 104, 673.23, and 1998.



$(673)_{10} = (\quad)_2$

2 | 673	
2 | 336 — 1	$2 \times 0.23 = 0.46$
2 | 168 — 0	$2 \times 0.46 = 0.92$
2 | 84 — 0	$2 \times 0.92 = 1.84$
2 | 42 — 0	$2 \times 0.84 = 1.68$
2 | 21 — 0	$2 \times 0.68 = 1.36$
2 | 10 — 1	
2 | 5 — 0	
2 | 2 — 1	
1 — 0	

$(673.23)_{10} = (1010100001.00111)_2$

$(673.23)_2 = (1010100001)$

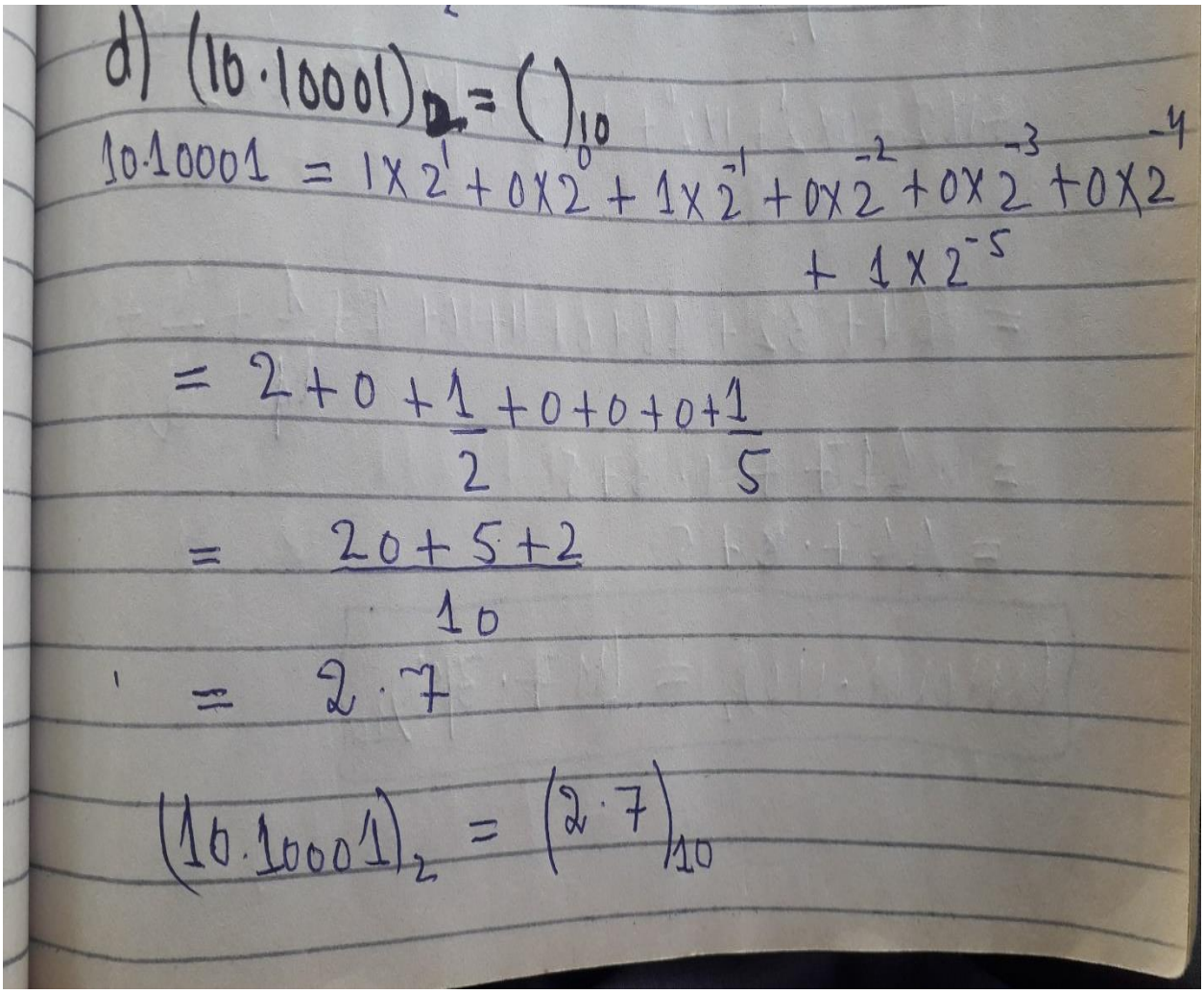
$(673.23)_2 = (1010100001)$

$(1998)_{10} = (\quad)_2$

2	1998	
2	999	— 0
2	499	— 1
2	249	— 1
2	124	— 1
2	62	— 0
2	31	— 0
2	15	— 1
2	7	— 1
2	3	— 1
2	1	— 1
	0	— 1

$(1998)_{10} = (11111001110.0000)_2$

d. Convert the following binary numbers to decimal: 10.10001, 101110.0101, 1110101.110, and 1101101.111.



$(101110.0101)_2 = (\quad)_{10}$

$(101110.0101)_2 = 1\times2^5 + 0\times2^4 + 1\times2^3 + 1\times2^2 + 1\times2^1$
$+ 0\times2^0 + 0\times2^{-1} + 1\times2^{-2} + 0\times2^{-3} + 1\times2^{-4}$

$= 32 + 0 + 8 + 4 + 2 + 0 + \frac{1}{4} + 0 + 0 + \frac{1}{16}$

$= 46 + 0.3125$

$= 46.3125$

$\boxed{(101110.0101)_2 = (46.3125)_{10}}$

$(1110101.110)_2 = (\quad)_{10}$

$(1110101.110)_2 = 1\times2^6 + 1\times2^5 + 1\times2^4 + 0\times2^3$
$+ 1\times2^2 + 0\times2^1 + 1\times2^0 + 1\times2^{-1} + 1\times2^{-2} + 0\times2^{-3}$

$= 64 + 32 + 16 + 0 + 4 + 0 + 1 + \frac{1}{2} + \frac{1}{4} + 0$

$= 117 + 0.875$

$= 117.875$

$\boxed{(1110101.110)_2 = (117.875)_{10}}$

$(1101101.111)_2 = (\quad)_{10}$

$= 1\times2^6 + 1\times2^5 + 0\times2^4 + 1\times2^3 + 1\times2^2 + 0\times2^1 + 1\times2^0 +$
$+ 1\times2^{-1} + 1\times2^{-2} + 1\times2^{-3}$

$= 64 + 32 + 0 + 8 + 4 + 0 + 1 + \frac{1}{8} + \frac{1}{4} + \frac{1}{2}$

$= 109 + 0.875$

$= 109.875$

$(1101101.111)_2 = (109.875)_{10}$

e) Convert the following:

i) 225.225 to binary

$\frac{225}{I} \cdot \frac{225}{II}$

2 | 225	
2 | 112	— 1
2 | 56	— 0
2 | 28	— 0
2 | 14	— 0
2 | 7	— 0
2 | 3	— 1
2 | 1	— 1

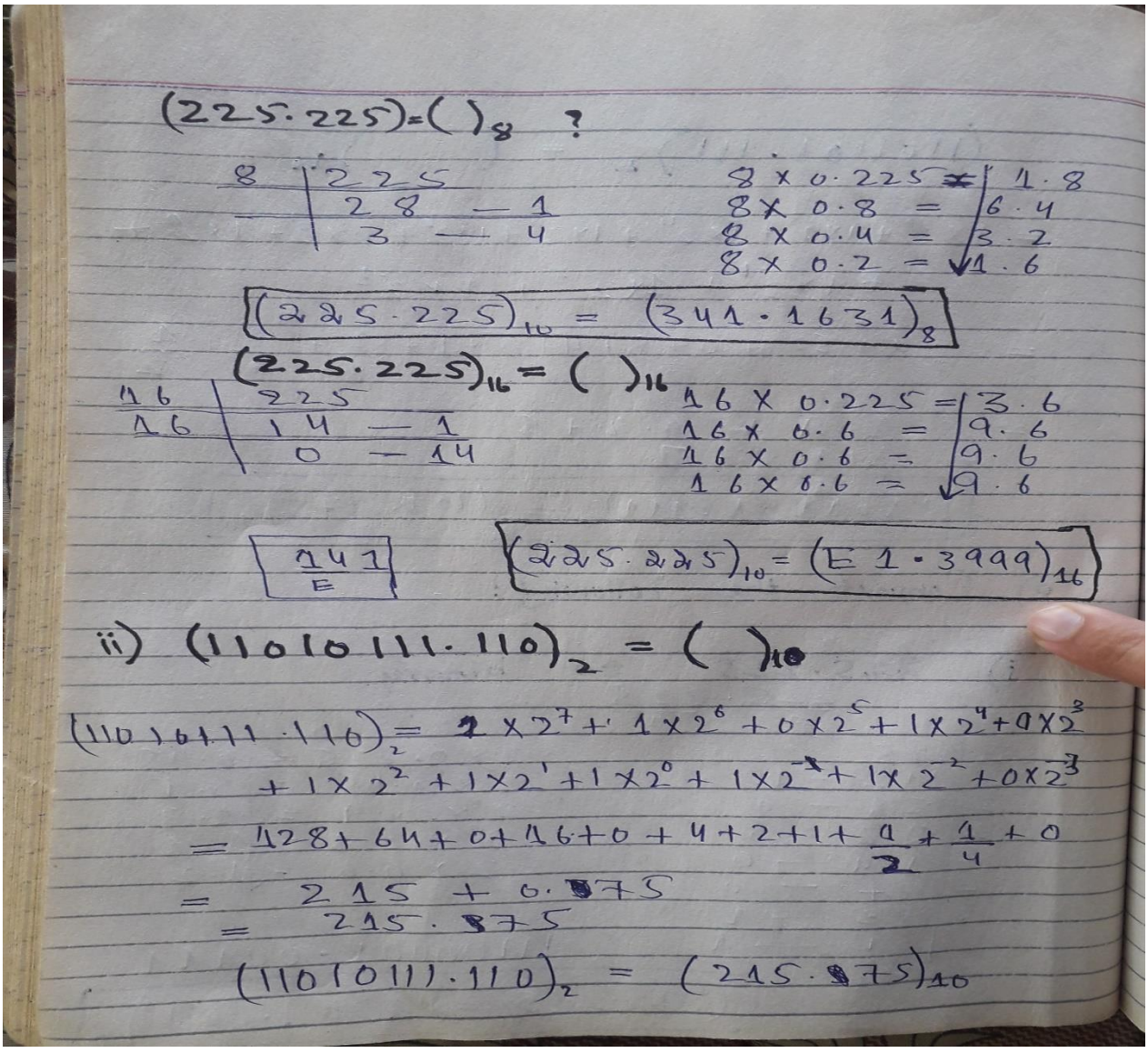
$2\times0.225 =$	0.45
$2\times0.45 =$	0.9
$2\times0.9 =$	1.8
$2\times0.8 =$	1.6
$2\times0.6 =$	1.2

11100001 · 00111

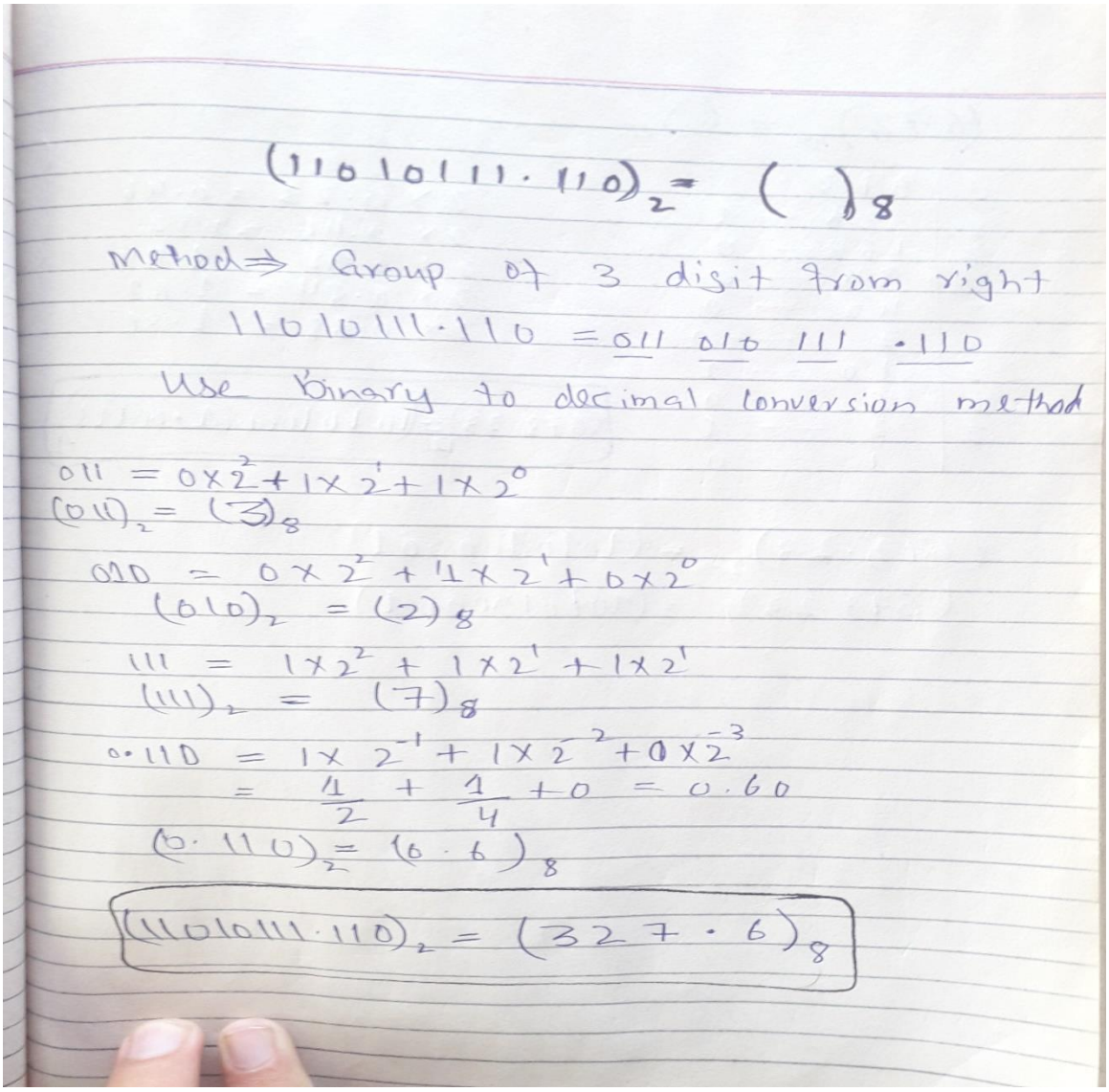
$(225.225)_{10} = (11100001.00111)_2$

e. Convert the following numbers from the given base to the bases indicated:

i. decimal 225.225 to binary, octal, and hexadecimal



ii. binary 11010111.110 to decimal, octal, and hexadecimal



$(11010111.110)_2 = (\ )_8$

Method ⇒ Group of 3 digit from right

$11010111.110 = \underline{011}\ \underline{010}\ \underline{111}\ .\underline{110}$

Use binary to decimal conversion method

$011 = 0\times2^2 + 1\times2^1 + 1\times2^0$

$(011)_2 = (3)_8$

$010 = 0\times2^2 + 1\times2^1 + 0\times2^0$

$(010)_2 = (2)_8$

$111 = 1\times2^2 + 1\times2^1 + 1\times2^1$

$(111)_2 = (7)_8$

$.110 = 1\times2^{-1} + 1\times2^{-2} + 0\times2^{-3}$

$= \frac{1}{2} + \frac{1}{4} + 0 = 0.60$

$(.110)_2 = (.6)_8$

$(11010111.110)_2 = (327.6)_8$

$(11010111.110)_2 = (\quad)_{16}$

Making four digit group

$(11010111.110)_2 =$ 0011 0101 0111 0.110

$(0011)_2 = 1\times2^3 + 1\times2^2 + 0\times2^1 + 1\times2^0$

$(1101)_2 = D_{16}$

$(1011)_2 = 0\times2^3 + 1\times2^2 + 1\times2^1 + 1\times2^0$

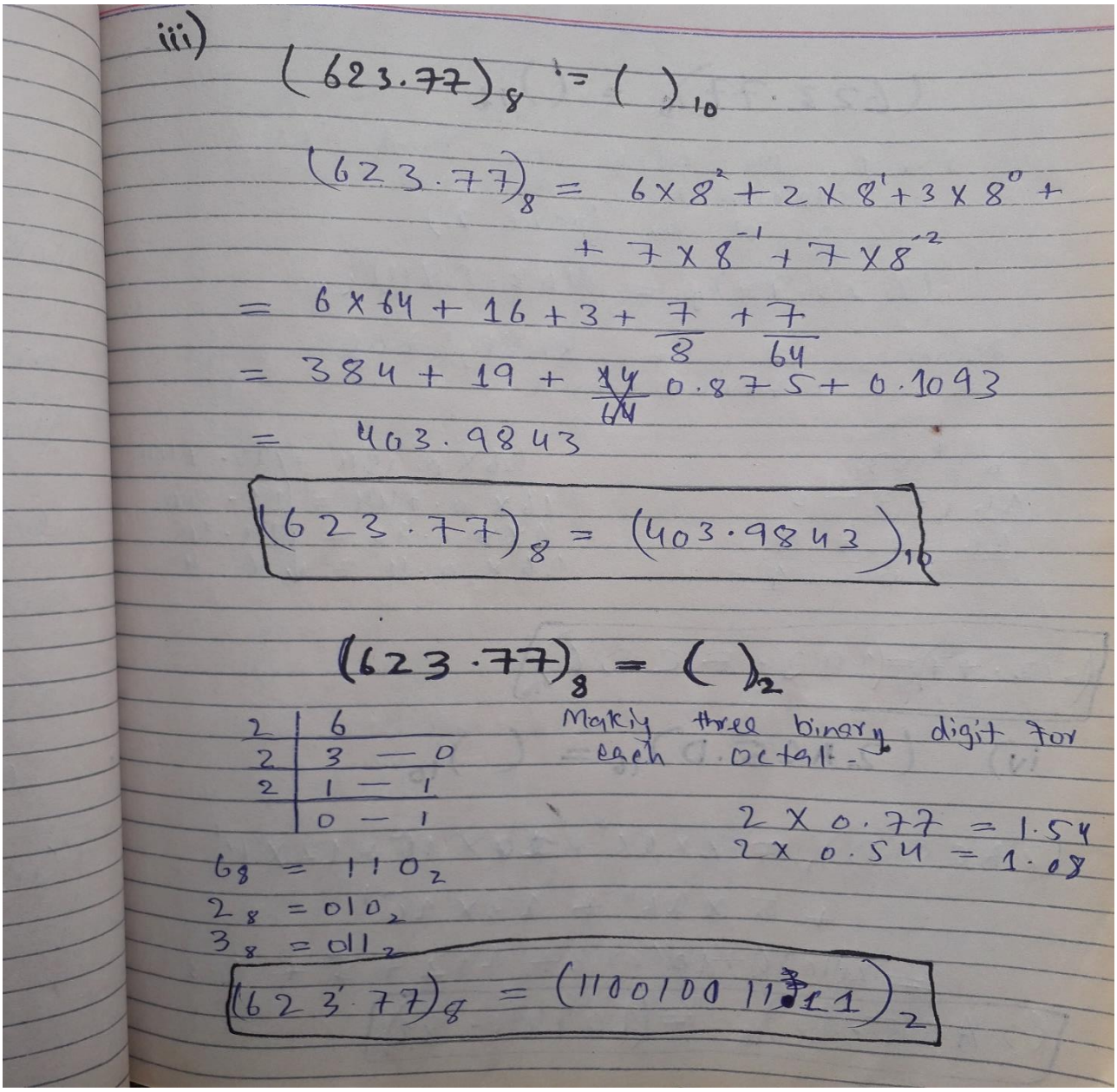
$(1011)_2 = 7_{16}$

$(0110)_2 = 1\times2^{-1} + 1\times2^{-2} + 0\times3^{-3}$

$(.110)_2 = C_{16}$

$(11010111.110)_2 = (D7 \cdot C0)_{16}$

iii. octal 623.77 to decimal, binary, and hexadecimal



iii)

$(623.77)_8 = (\ )_{10}$

$(623.77)_8 = 6\times8^2 + 2\times8^1 + 3\times8^0 + 7\times8^{-1} + 7\times8^{-2}$

$= 6\times64 + 16 + 3 + \frac{7}{8} + \frac{7}{64}$

$= 384 + 19 + \frac{44}{64} + 0.875 + 0.1093$

$= 403.9843$

$(623.77)_8 = (403.9843)_{10}$

$(623.77)_8 = (\ )_2$

2 |	6
2 |	3 — 0
2 |	1 — 1
	0 — 1

Make it three binary digit for each octal.

$6_8 = 110_2$

$2_8 = 010_2$

$3_8 = 011_2$

$2 \times 0.77 = 1.54$

$2 \times 0.54 = 1.08$

$(623.77)_8 = (110010011.11)_2$

$(623.77)_8 = (\quad)_{16}$

First we have to find its decimal, as we find in (part 2)

$(623.77)_8 = (403.984)_{10}$

Now, we can easily find hexadecimal

16	403	
16	25	3
16	1	9
	0	1

$16 \times 0.984 = 15.744$
$16 \times 0.744 = 11.90$
$16 \times 0.90 = 14.4$
$16 \times 0.4 = 6.4$

$(623.77)_8 = (193.FCD6)_{16}$

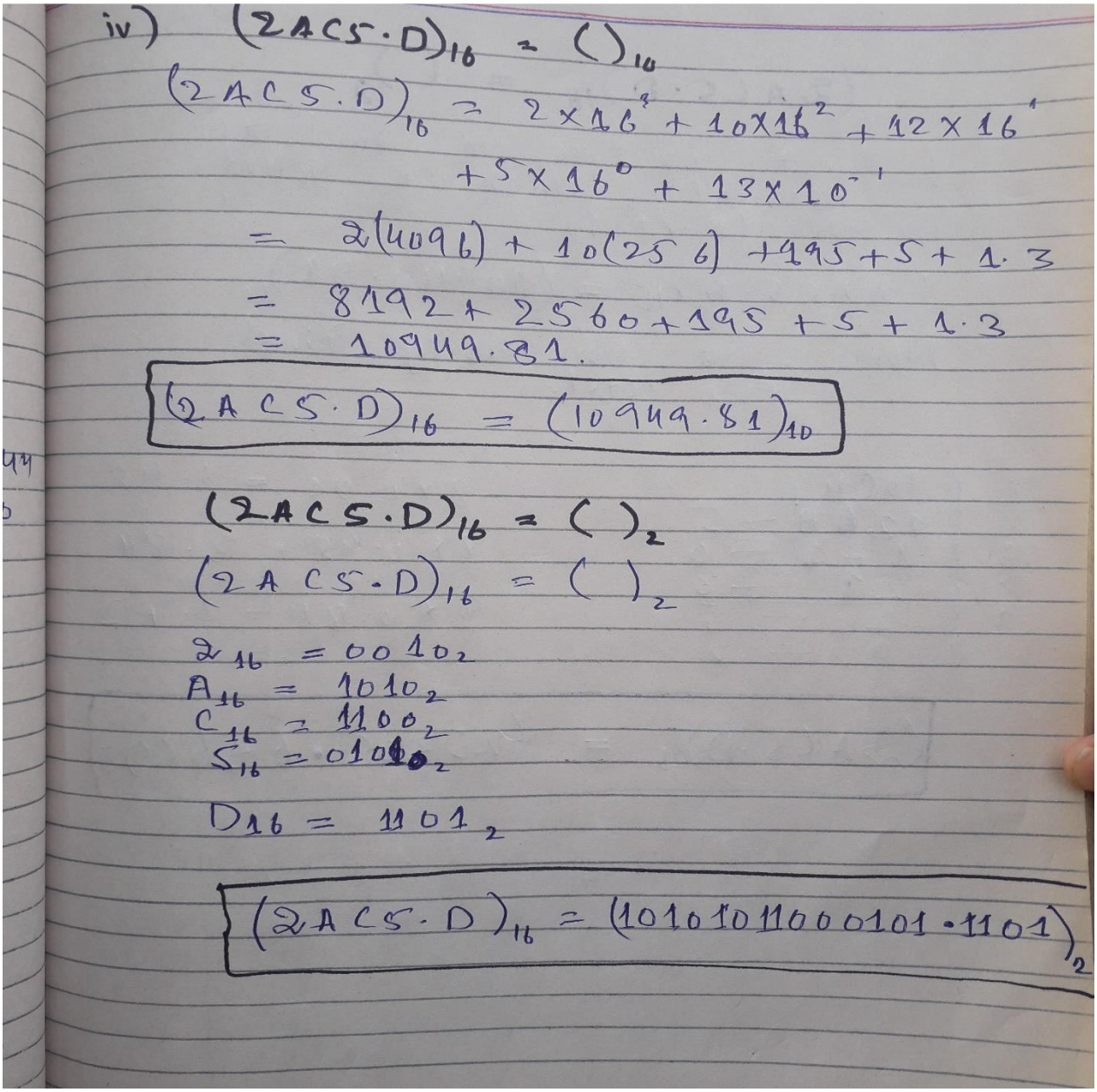
iv) $(2AC5.D)_{16} = (\quad)_{10}$

$(2AC5.D)_{16} = 2 \times 16^3 + 10 \times 16^2 + 12 \times 16^1 + 5 \times 16^0 + 13 \times 10^{-1}$

$= 2(4096) + 10(256) + 192 + 5 + 1.3$

$(2AC5.D)_{16} = (10949.81)_{10}$

iv. hexadecimal 2AC5.D to decimal, octal, and binary



iv) $(2AC5.D)_{16} = (\quad)_{10}$

$(2AC5.D)_{16} = 2\times16^3 + 10\times16^2 + 12\times16^1 + 5\times16^0 + 13\times10^{-1}$

$= 2(4096) + 10(256) + 195 + 5 + 1.3$

$= 8192 + 2560 + 195 + 5 + 1.3$

$= 10949.81.$

$(2ACS.D)_{16} = (10949.81)_{10}$

$(2ACS.D)_{16} = (\quad)_2$

$(2ACS.D)_{16} = (\quad)_2$

$2_{16} = 0010_2$

$A_{16} = 1010_2$

$C_{16} = 1100_2$

$S_{16} = 0101_2$

$D_{16} = 1101_2$

$(2ACS.D)_{16} = (1010101100010 1.1101)_2$

$(2AC5.D)_{16} = (\quad)_8$

First we have to find its decimal, which is solved in (part 1)

$(2AC5.D)_{16} = (10949.81)_{10}$

Now, we can easily find its octal.

8	10949	
8	1368	— 5
8	171	— 0
8	21	— 3
8	2	— 5
	0	— 2

$8 \times 0.81 = 6.48$

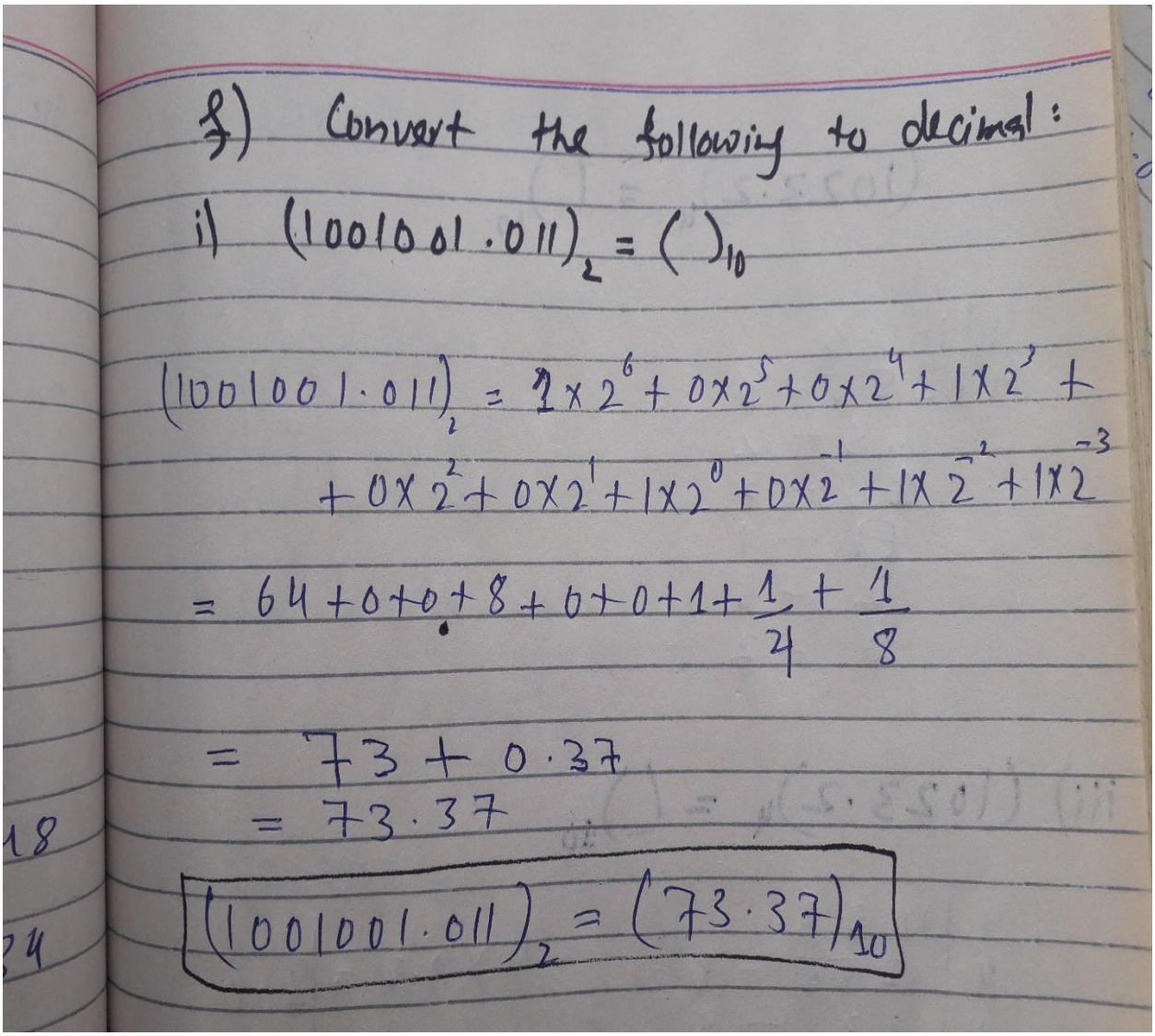
$8 \times 0.48 = 3.84$

$8 \times 0.84 = 6.72$

$\boxed{(2AC5.D)_{16} = (25305.63600)_8}$

f. Convert the following numbers to decimal:

i. (1001001.011) 2



f) Convert the following to decimal:

i) $(1001001.011)_2 = (\ )_{10}$

$(1001001.011)_2 = 1\times2^6 + 0\times2^5 + 0\times2^4 + 1\times2^3 + 0\times2^2 + 0\times2^1 + 1\times2^0 + 0\times2^{-1} + 1\times2^{-2} + 1\times2^{-3}$

$= 64 + 0 + 0 + 8 + 0 + 0 + 1 + \frac{1}{4} + \frac{1}{8}$

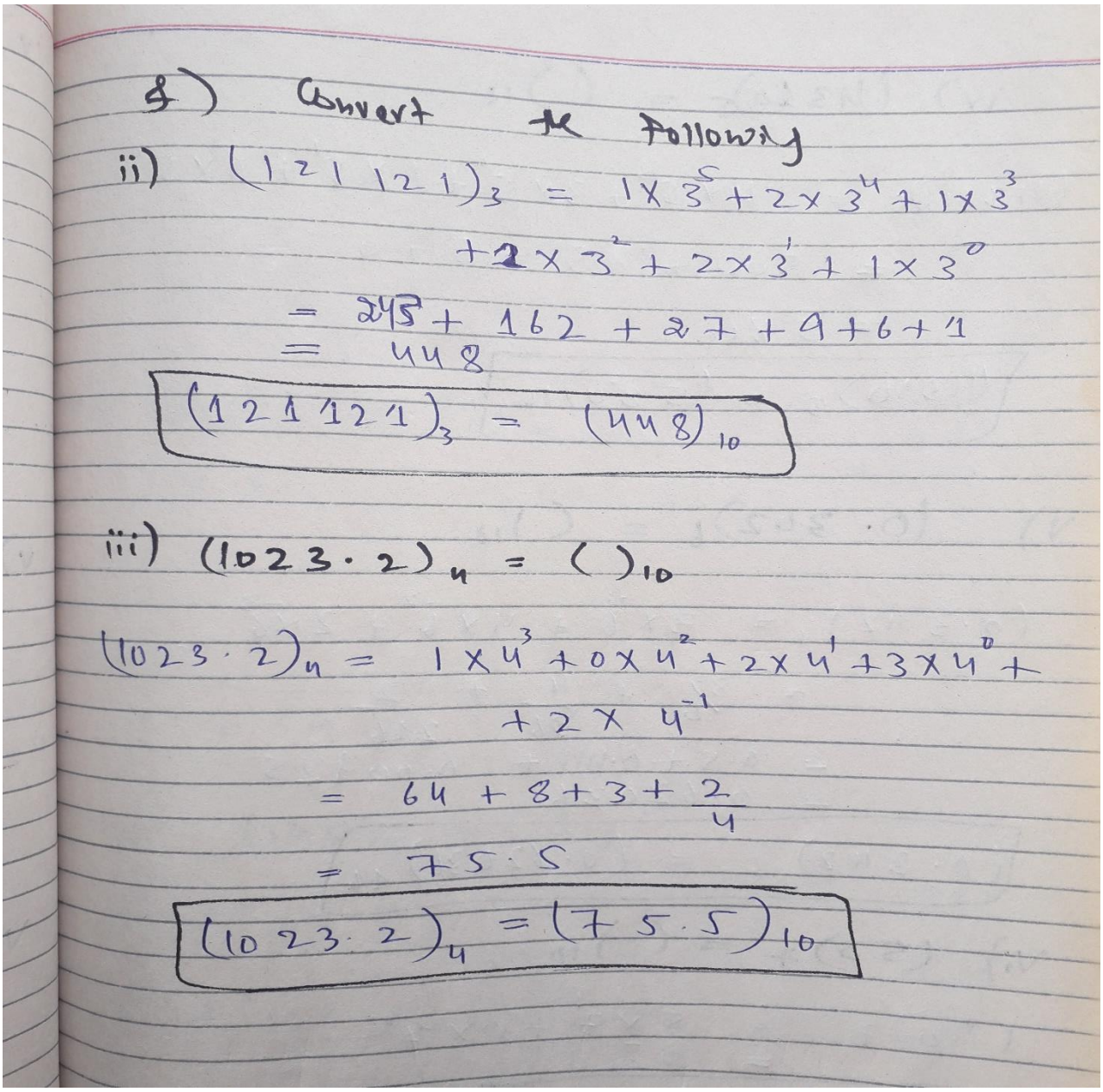
$= 73 + 0.37$

$= 73.37$

$(1001001.011)_2 = (73.37)_{10}$

ii. (12121) 3

iii. (1023.2) 4



g) Convert the following

ii) $(121121)_3 = 1\times3^5 + 2\times3^4 + 1\times3^3 + 2\times3^2 + 2\times3^1 + 1\times3^0$

$= 243 + 162 + 27 + 9 + 6 + 1$

$= 448$

$(121121)_3 = (448)_{10}$

iii) $(1023.2)_4 = (\ )_{10}$

$(1023.2)_4 = 1\times4^3 + 0\times4^2 + 2\times4^1 + 3\times4^0 + 2\times4^{-1}$

$= 64 + 8 + 3 + \frac{2}{4}$

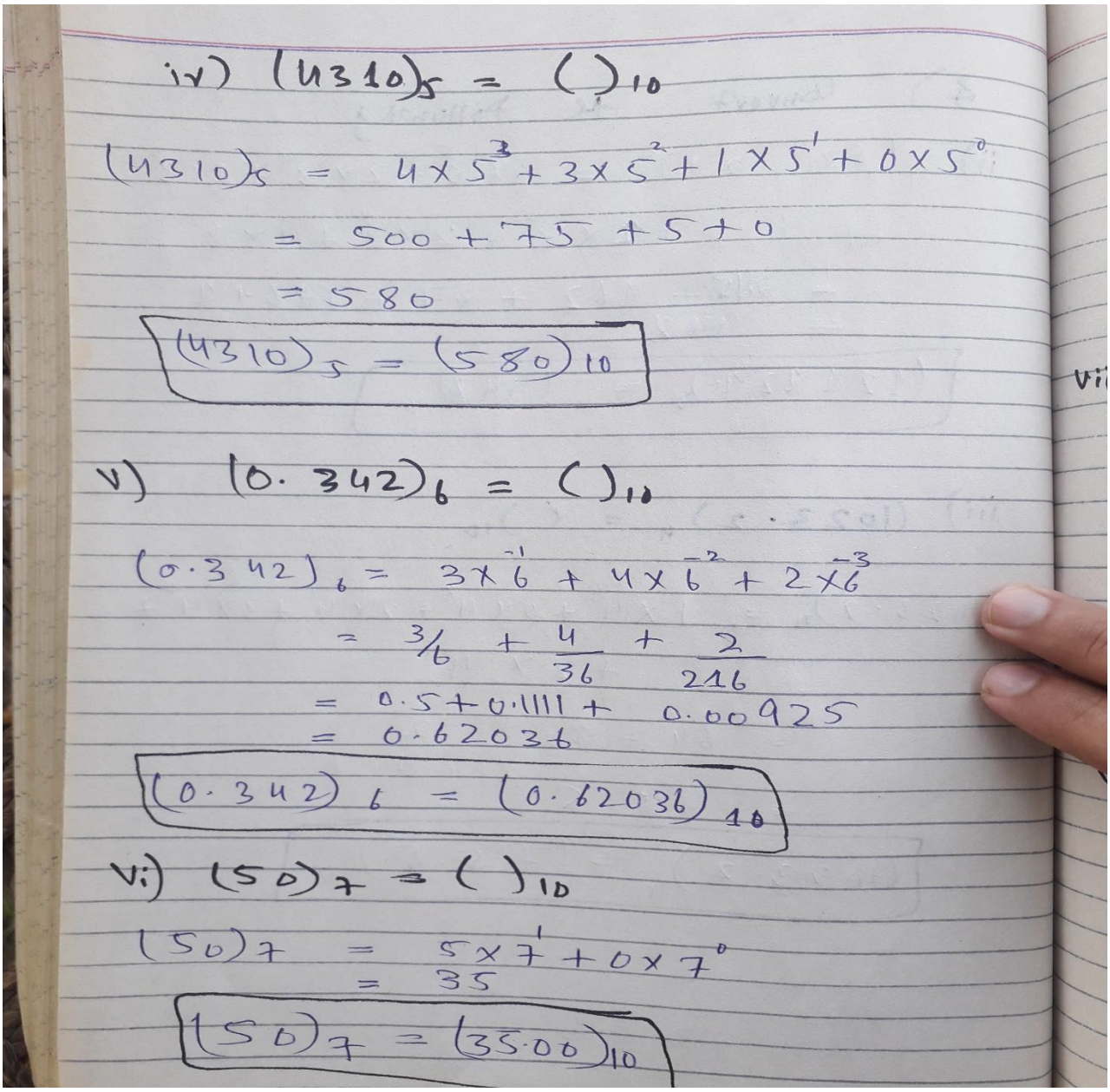
$= 75.5$

$(1023.2)_4 = (75.5)_{10}$

v. (0.342) 6

vi. (50) 7

iv. (4310) 5



vii. (8.3) 9

viii. (198) 12