| | 20 | E | II |

Rathnavali Balika Vidyalaya - Gampaha

| Second Term Test – 2022 | Grade 12 |

| Information and Communication Technology - II | 3 Hours |

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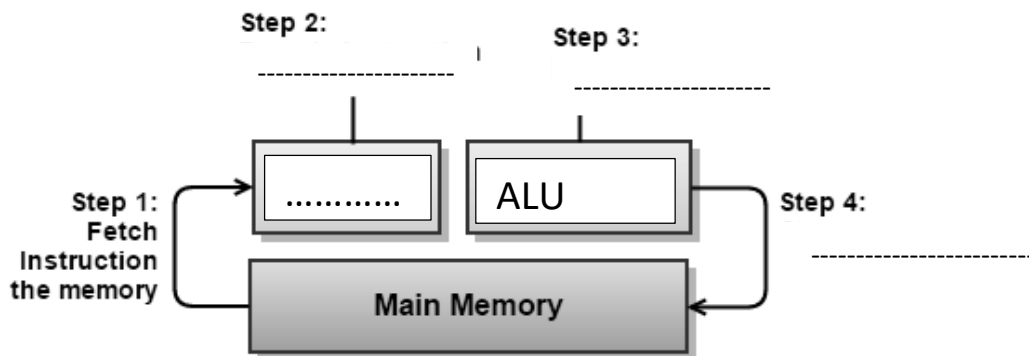
Part A – Structured Essay

*Answer **all four** questions on this **paper itself.***

(1).

a. Fill in the blanks of the diagram given below which shows the functions of the relevant steps of fetch execute cycle.   (2 marks)

b. Give two advantages of using multi core processors in present computers.   (2 marks)

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……………………………………………………………………………………………………

c. Mention 2 major technological differences between the first and fourth generations in the evolution of computers.   (2 marks)

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d. Mention the computer era to which the following techniques belong.   (2 marks)

Computer	Era
Abacus	
Pascaline	
Automatic Sequence Controller	
ENIAC	

e. In comparing computer generations, write 2 characteristics that are increasing and 2 characteristics that are decreasing from the first computer generation to the fifth computer generation. (2 marks)

characteristics that are increasing

……

characteristics that are decreasing

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2. When a key is pressed on the keyboard, the computer stores the ASCII representation of the character typed into main memory.

The ASCII representation for A is 65, for B is 66 ... etc.

There are two letters stored in the following memory locations.

Location 1 | **A** |

Location 2 | **J** |

a. (i) Show the contents of location 1 and location 2 as binary. (2 marks)

Location 1 ……………………………………………………………………………………………………..

Location 2 ……………………………………………………………………………………………………..

(ii) Show the contents of location 1 and location 2 as hexadecimal. (2 marks)

Location 1 ……………………………………………………………………………………………………..

Location 2 ……………………………………………………………………………………………………..

b. The following machine code instruction is stored in a location of main memory.

| 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 |

Convert this binary pattern into hexadecimal. (2 marks)

……..

…………………………………………………………………………………………………..

c. Explain why a programmer would prefer to read the instructions displayed as hexadecimals rather than binary? (2 marks)
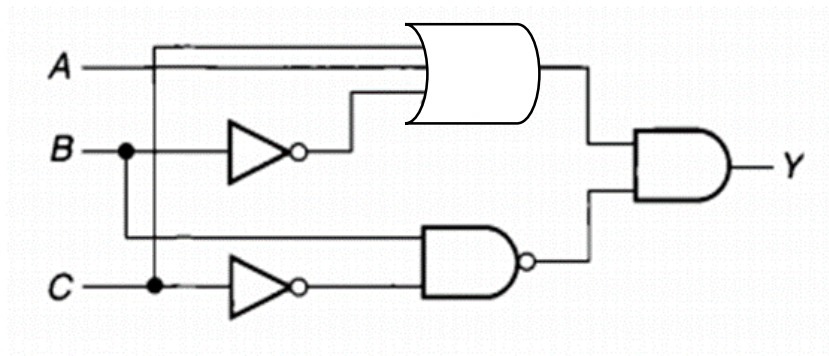
……….

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d.Why is Unicode important?   (2 marks)

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………

3.(a) Answer the following questions with reference to the logic circuit below.

i. Prepare a truth table for the above circuit and derive an SOP expression from it.   (2 marks)

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ii. Simplify the expression obtained in (i) above using Boolean rules.   (2 marks)

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(b) i. Convert the Boolean expression **AB' + AC + BC'** to a standard Boolean expression. (2 marks)

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ii. Convert the standardized Boolean expression in part (i) above to POS.   (2 marks)

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iii. Solve the K-map below   (1 mark)

X \ YZ	00	01	11	10
0	0	1	1	0
1	1	0	0	1

………..

iv. Simplify the Boolean expression represented by the K-map above using Boolean rules. (1 mark)

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………..

4.

A. If the clauses about the operating system below are true, put the right mark and if not, put the wrong mark.

(5Marks)

i.The operating system provides a platform for application software	
ii. Multi-threaded operating systems allow for parallel processing	
iii. Contiguous allocation is suitable for storing files on a CD.	
iv. The number of pages in virtual memory is always equal to the number of frames in physical memory	
v.Program counter holds the next instruction to be executed in the program	

B. The diagram below shows how A, B file data is stored in Blocks on the computer hard disk. Note that all used blocks contain complete data. And the capacity of one block is 4KB. Find where file A starts and answer the following questions.

Directory entry	Block
0	-1
1	
2	10
3	9
4	7
5	
6	3	← **File B starts here**
7	2
8	-1
9	0
10	8

(1*5 Marks)

i. Number of categories used for file A?

....

ii. The Capacity of file A is …………….

iii. Number of categories used for file B?

…………………………………………

iv. The capacity of file B is ……………….

v. Write the sequence of steps by which file B is read.

....

5

Part B – Essay

*Answer any **four** questions only.*

1.

1) Draw the diagram related to the abstract model of information creation.

2) Briefly explain three verification methods given below and give one example for each.
   a. Type check
   b. Presence check
   c. Range check

3) Compare and contrast open source software and proprietary software.

4) Two memory access methods are given below. Name the memory access method related to the diagram of spaces A and B. Write one storage strategy using the same memory access method in C and D spaces.

A. ....

B. ....

1 2 3 4 5 6 7 8

1 3 7 2 8 6 4 5

C. ....

D. ....
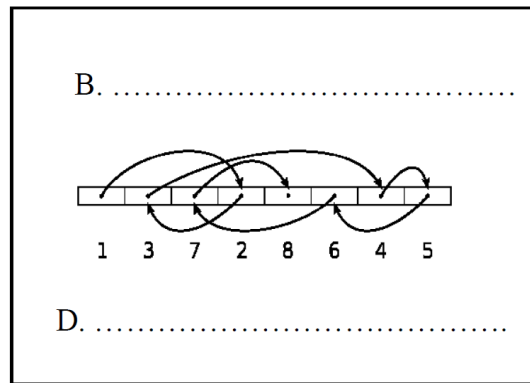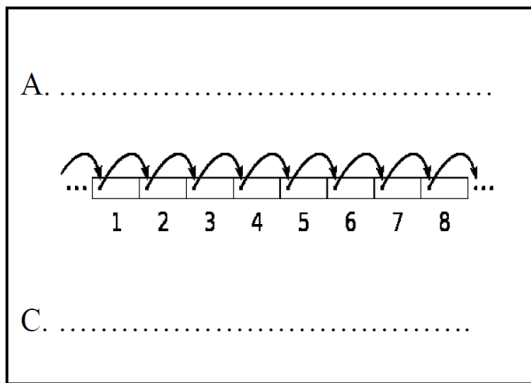
5) A comparison between two types of Random Access Memory is given below. Select the correct answer according to the given criteria.

	Criteria	SRAM	DRAM
I.	Price	Low/high	Low/high
II.	Data density	Low/high	Low/high
III.	Power consumption	Low/high	Low/high
IV.	Speed	Low/high	Low/high

6) State 2 ways that can be prevented Plagiarism.

2. Following are the conditions where electric lamps are lit in a street automatically.

A - A person(s) walking on the road

B - Moving a vehicle(s) on the road

C - Being after 6.30 pm

The street lamp automatically switches on when a person(s) or vehicle(s) is/are on the road and only if it's after 6.30 pm.

    i. Construct a truth table to represent the operation of the street lamp

    ii. Derive a SOP Boolean expression to represent the truth table you obtained in part (i) above.

    iii. Simplify the Boolean expression you obtained in part (ii) above using a K- map and using Boolean rules.

    iv. Construct a logic circuit using the minimum number of NAND gates for the simplified expression you obtained above.

3. A. Suppose a computer stores an integer using 8-bit two's complement method.

    i.   Show how 71_{10} is represented.

    ii.   Show how – 83 is represented.

    iii.   Show how the computer would evaluate **71_{10} +(- 83_{10})** using the above representations i and ii. You must show all working.

    iv.   Prove that you can get the answer as **-12**

  B. Perform the following calculations. Show your workings.

    i.   Convert 45.125_{10} into binary.

    ii.   Convert 0.4125_{10} into Octal.

  C. What is the advantage of 2's complement over 1's complement in negative number representation in binary number system?

  D. Complete the following table using your knowledge in alternative representation of bit values for positive and negative numbers. (Assume that the computer uses 8-bit register)

Decimal Value	1's Complement Representation	Sign Magnitude Representation
-127		
		10000111
	11111100	

3. (**A**) The length of a computer virtual memory address is 15 bits and the size of a page in this computer is 4KB. When a certain process is running in this computer, the page table is as follows.

Page No	Frame No	Absent/Present bit
0	000	0
1	101	1
2	100	1
3	011	1
4	001	1
5	000	0
6	000	0
7	000	0

- Here the zero page has virtual address 0 to 4095 and the first page has virtual address 4096 to 8191 and so on.
- The absent/ present bit indicates that it is in or not in physical memory.

  i.   How many bits are allocated for the offset in this computer?

  ii. Assume that this program requires 4118 virtual address. What physical address does it transform to? State the page numbers and offset clearly.

  iii. Assume that the operating system needs the virtual reference 101 0000 0000 1111 while running this program.

  - **a.** What is the page number and offset of the above virtual reference?
  - **b.** What does the operating system have to do to get that reference? Explain
  - **c.**   The operating system changes the value of the page 3, absent/present bit 1→ 0 to get that reference.
  - **d.**   What could be the physical memory reference that the above reference could then translate to?

(**B**) Mention an advantage of virtual memory.

(**C**) What is the usage of page table? Explain.

(**D**) Write 02 reasons why a frame that belongs to a process is not in physical memory.

5. Kamal is creating a greeting card using word processing software on a single processor computer. Meanwhile a web browser was opened to download an image.

  i.   At that moment, write separately what is recorded in the following points in the process control block related to the word processing operation and the web browsing operation?
  - State of the process
  - Program counter

ii.   What is the importance of maintaining process control block information?

   A. A certain computer allocates a memory address for each byte and the computer's address bus is 32 bits wide and has 16 GB of main memory installed.

i.   What is the maximum main memory capacity in GB that this computer can use? (Calculate and show with steps.)

ii.   Find wasted memory capacity?

   B. Logic circuits used in computers can be classified into two main types.

i.   What are those types?

ii.   Which circuit is used to store a memory unit in the computer?

iii.   Construct the circuit using NOR gates. Name the inputs and outputs correctly

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