ACMP 102

CHUKA



UNIVERSITY

UNIVERSITY SUPPLEMENTARY/SPECIAL EXAMINATIONS.

FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF APPLIED COMPUTER SCIENCE

ACMP 102: COMPUTER SYSTEMS

STREAMS: BS.c

TIME: 2 HOURS

DAY/DATE: WEDNESDAY 7 /6/2017

2.30 P.M - 4.30 P.M.

CANDIDATE'S INSTRUCTIONS

• Answer Question ONE in section A and any other TWO questions from section B.

SECTION A COMPULSORY QUESTION ONE (COMPULSORY) [30 MARKS]

- a) With the use of a well labeled diagram, explain the basic hardware components of a computer system. [5 Marks]
- b) Add 23₁₀ and -13₁₀ using One's complementarithmetic. Use 8 bits to represent the binary numbers. [3 Marks]
- c) Find the sum of 15₁₀ and -7₁₀ in binary using the two's complement arithmetic. Use 8 bits to represent the binary numbers. [4 Marks]
- d) Explain what interrupts are and identify any two types of interrupts. [3 Marks]
- e) Explain the difference between write-through and write-back cache write policies.

[5 Marks]

- f) Construct a truth table for the following Boolean Expressions. (Hint: Need one truth table with the expected outputs for the two expressions) [6 Marks]
 - (i) $AB\overline{C} + A\overline{B}\overline{C} + \overline{A}B\overline{C}$
 - (ii) $A(B\overline{C} + B\overline{C})$

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g) Draw the combinational circuit that implements the following Boolean function.

[4 Marks]

$$F(x,y,z) = (xy \text{ XOR } (\overline{y+z})) + \overline{x}z$$

SECTION B (ANSWER ANY TWO QUESTIONS FROM THIS SECTION) QUESTION TWO [20 MARKS]

Given the function $F(x, y, z) = XY\overline{Z} + X\overline{Y}\overline{Z} + XYZ$

- (i) Construct the truth table for *F*.
- (ii) Draw the logic diagram using the original Boolean expression. [7 Marks]
- (iii) Simplify the expression using Boolean algebra identities.
- (iv) Draw the logic diagram for the simplified expression in part (iii) above. [4 Marks]

QUESTION THREE [20 MARKS]

- (a) A three-input digital circuit gives a TRUE output when a majority (i.e. 2 or more) of the inputs is TRUE. Develop a truth table for the output and then draw the logic diagram for the circuit implementation using AND, OR and NOT gates. [10 Marks]
- (b) Discuss computer Memory hierarchy.

QUESTION FOUR [20 MARKS]

(a) Write a simplified expression for the Boolean function defined in the Kmap below.

[7 Marks]

[10 Marks]

[4 Marks]

[5 Marks]

∖yz				
wx 🔪	00	01	11	10
00	1	1	1	1
01			1	1
11	1	1	1	1
10	1			1

(b) Create the Kmap and then simplify for the following function.

[6 Marks]

 $F(x, y, z) = \overline{x}\overline{y}\overline{z} + \overline{x}y\overline{z} + x\overline{y}\overline{z} + xy\overline{z}$

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(c) Find the truth table that describes the following circuit and write the simplified Boolean function for the logic diagram: [7 Marks]



QUESTION FIVE [20 MARKS]

(a) Discuss the CPU instruction cycle. Use an appropriate diagram to illustrate your answer.

[10 Marks]

- (b) On the instruction cycle, show how the cycle is affected when interrupts are enabled. Use an appropriate diagram to illustrate your answer. [4 Marks]
- (c) Perform the following number conversions:

i)	243.25_{10} to binary (base 2)	[3 Marks]
ii)	8FEA2_{16} to binary (base 2)	[3 Marks]
