## CHUKA



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 <br> QUESTION ONE (COMPULSORY) [30 MARKS]

a) With the use of a well labeled diagram, explain the basic hardware components of a computer system.
b) Add $23_{10}$ and $-13_{10}$ using One's complementarithmetic. Use 8 bits to represent the binary numbers.
c) Find the sum of $15_{10}$ and $-7_{10}$ in binary using the two's complement arithmetic. Use 8 bits to represent the binary numbers.
d) Explain what interrupts are and identify any two types of interrupts.
e) Explain the difference between write-through and write-back cache write policies.
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) $\mathrm{AB} \overline{\mathrm{C}}+\mathrm{A} \overline{\mathrm{B}} \overline{\mathrm{C}}+\overline{\mathrm{A} B} \overline{\mathrm{C}}$
(ii) $\mathrm{A}(\mathrm{B} \overline{\mathrm{C}}+\mathrm{B} \overline{\mathrm{C}})$
g) Draw the combinational circuit that implements the following Boolean function.

$$
F(x, y, z)=(x y \operatorname{XOR}(\overline{y+\bar{z}}))+\bar{x} z
$$

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

Given the function $F(x, y, z)=X Y \bar{Z}+X \bar{Y} \bar{Z}+X Y Z$
(i) Construct the truth table for $F$.
[4 Marks]
(ii) Draw the logic diagram using the original Boolean expression.
[7 Marks]
(iii) Simplify the expression using Boolean algebra identities.
[5 Marks]
(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.
(b) Discuss computer Memory hierarchy.
[10 Marks]

QUESTION FOUR [20 MARKS]
(a) Write a simplified expression for the Boolean function defined in the Kmap below.
[7 Marks]

| $w x$ | 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.

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

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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 theCPU 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.
(c) Perform the following number conversions:
i) $\quad 243.25_{10}$ to binary (base 2)
[3 Marks]
ii) $8 \mathrm{FEA} 2_{16}$ to binary (base 2)

