



**FACULTY OF INFORMATION TECHNOLOGY
BACHELOR OF COMPUTER SCIENCE
END OF SEMESTER EXAMINATION**

ICS 2104: COMPUTER ORGANIZATION AND ARCHITECTURE

DATE: 26th JULY, 2018

TIME: 2 Hours

INSTRUCTIONS:

- i. This paper contains **FIVE** questions.
 - ii. You are required to answer **THREE** questions, that is, **QUESTION ONE** which is **COMPULSORY** and any other **TWO** questions.
 - iii. All questions carry equal marks i.e. **20 MARKS** each.
-

QUESTION ONE COMPULSORY (20 MARKS)

- a) Based on the hardware concept, explain how a computer is built starting from raw materials. (8 marks)
- b) With appropriate diagrams, describe the approximate market share for the most commonly used processor type. (4 marks)
- c) Write an Arduino based program to implement single bit subtraction hence perform the following subtraction using the direct subtraction algorithm.
 $0.01111 - 0.01001$ (8 marks)

QUESTION TWO (20 MARKS)

- a) Describe the feature trend in relation to power dissipation indicating its importance in relation to computer organization. (6 marks)
- b) With the aid of a diagram explain the concept of pipelining in relation processor operation indicating the necessary condition for it to be achieved. Use a six stage with eight instruction pipeline. (10 marks)
- c) With an illustration explain the algorithm to convert a number from binary to gray code. (4 marks)

QUESTION THREE (20 MARKS)

- a) With an illustration, identify the components of a computer memory that facilitate its management and briefly describe them. (10 Marks)
- b) With the aid of diagrams describe a microcontroller as a digital system. (10 marks)

QUESTION FOUR (20 MARKS)

- a) Implement and explain the operation of an AND gate using switches and implement it in Arduino IDE. (4 marks)
- b) Identify the Boolean law represented as then using the truth table, show that the relation is correct indicating where the law is applied. (6 marks)
- c) Using the Boolean laws and rules simplify the expression and implement the minimized expression using logic gates: $F = A'BC + A'BC'$ (4 marks)
- d) From basic principles design a half adder and implement it using an Arduino IDE program. (6 marks)

QUESTION FIVE (20 MARKS)

- a) Based on machine and register transfer languages describe a simple control word. (6 Marks)
- b) Describe the processor device that is used to select memory. (4 Marks)
- c) Intel are planning to design a simple microcontroller to be used in teaching ICS students, describe the best design method they could use to develop its control unit indicating the reasons for your opinion. (6 marks)
- d) List and describe any four types of addressing modes. (4 Marks)