



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

ICS 2104: COMPUTER ORGANIZATION AND ARCHITECTURE

DATE: 20th NOVEMBER, 2019

TIME: 2 Hours

INSTRUCTIONS:

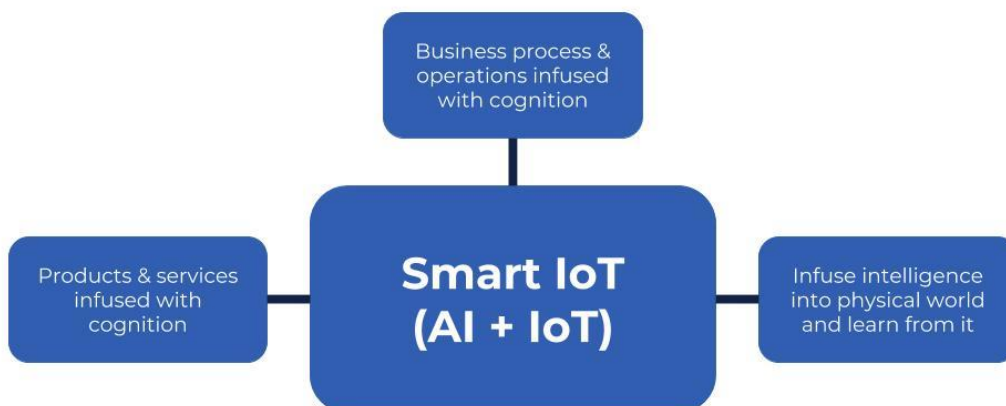
- i. This paper contains **FIVE** questions.
 - ii. You are required to answer **THREE** questions, that is, **QUESTION ONE** which is **COMPULSORY** and any other **TWO** questions.
 - iii. All questions carry equal marks i.e. **20 MARKS** each.
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QUESTION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

The Potential Use Cases Where Combination of AI & IoT can be Applied

Smart cities and smart homes are probably the hottest ideas on board which can only be made possible when AI and IoT work hand in hand. IoT is still applied to connect various home devices but blending AI with it will give rise to more automation. Such intelligent devices will learn from our preferences and will create a more pleasant and automatic user experience. An ideal Smart Home is a multi-layer system which should not need any management from humans and should make intelligent decisions based on past behaviors of humans.

In addition to this, a reliable, safe and intelligent driverless transportation is another concept which can be achieved with IoT and AI.



- a) With reference to the above case, briefly discuss whether the author is right in his statement. (4 marks)
- b) List and describe any four types of sensors that can be used in computer science according to the above case. (4 marks)

- c) Based on the above case develop a proposal on an IoT microcontroller based idea which the computer scientists can embrace in the current technology era. Your proposal should relate to computer organization and architecture. (8 marks)
- d) If the proposal in c) is to be implemented using four sensors, explain with a truth table, a Boolean expression and Arduino IDE based program how the implementation is to be done. (4 marks)

QUESTION TWO (20 MARKS)

- a) Based on the hardware concept, explain how a microcontroller is built starting from raw materials. (8 marks)
- b) Describe the feature trends in relation to power indicating their importance in relation to computer organization. (6 marks)
- c) Write an Arduino based program to implement single bit division. (6 marks)

QUESTION THREE (20 MARKS)

- a) Implement and explain the operation of an NOT gate using the Arduino IDE. Also list any two of its real life applications. (4 marks)
- b) With the aid of a diagram explain the concept that is associated with multiprocessor or multicore operation. (6 marks)
- c) With an illustration, identify the components of a computer storage that facilitate its management and briefly describe them including their software implementations. (10 Marks)

QUESTION FOUR (20 MARKS)

- a) List and briefly describe the sections of a laser printer indicating the reason why it is necessary for a computer science student to understand their operation. (8 marks)
- b) Identify the device that is used to store data temporary in the computer and explain its organization. (6 marks)
- c) Taking the microcontroller of an optical mouse, describe its possible input devices and explain how they can be implemented in software based on the Arduino IDE. (6 marks)

QUESTION FIVE (20 MARKS)

- a) Briefly describe the CPU organization clearly explaining the operation of each constituent part in relation COA. (10 Marks)
- b)
 - i. AMD 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.
 - ii. Based on machine and register transfer languages examples, describe how the method can be used to control the parts of the CPU in a) above. (8 marks)
- c) List and describe any two methods that the computer uses to place and retrieve data from registers. (2 Marks)