UNIVERSITY OF COLOMBO, SRI LANKA

University of Colombo School of Computing

UCSC

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

Second Year Examination – Semester II – 2021/2022

SCS2213 – Electronics and Physical Computing (Part B)

TWO (2) HOURS (for both parts A and B)

To be completed by the candidate

Examination Index No: .....

Important Instructions to candidates:

1. The medium of instruction and question is **English**.
2. Write your answers in **English**.
3. If a page or a part of this question paper is not printed, please inform the supervisor immediately.
4. Note that questions appear on both sides of the paper. If a page is not printed, please inform the supervisor immediately.
5. Write your index number on each and every page of the answer paper.
6. This paper has **2** questions in **07** pages.
7. Answer **ALL** questions. All questions carry equal marks (**25** marks).
8. **This paper consists of two parts, Part A (Question No 1 and Question No 2) and Part B (Question No 3 and Question No 4) and submit separately.**
9. Any electronic device capable of storing and retrieving text including electronic dictionaries and mobile phones are not allowed.
10. Calculators are **not allowed**.

For Examiner's use only	
Question No	**Marks**
1	
2	
3	
4	
Total	

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Part B

Question 3

(a) Briefly explain the terms "Sensor" and "Actuator".

[2 marks]

Answer:

(b) Briefly explain the **main differences** between a microprocessor and a microcontroller.

[2 marks]

Answer:

(c) A student wants to turn on/ off the air-conditioner (A/C) in a room automatically based on the presence/ absence of humans in the room.
PIR sensors can be used to detect human movements and IR led can be used to transmit the control commands to the IR receiver of the A/C.
(Assume that the IR data transmitting code and the circuit are already implemented.)

(i) Mention an Arduino pin and the function that can be used to read PIR sensor data.

[2 marks]

Answer:

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(ii) Complete the loop function to implement the functionality mentioned above in question 3. (c). (Assume the "IRSender()" function can be used to transmit the control commands to the IR receiver as "on" to turn on the A/C and "off" to turn off the A/C. Mention the global variables outside the loop function, if any)

[8 marks]

Answer:
void loop(){
}

(iii) Now, the student wants to sense the ambient light outside the room and adjust the room light intensity accordingly while performing the functionality mentioned above in question 3. (c). Briefly explain the approach towards the solution and mention the required main Arduino functions.

[5 marks]

Answer:

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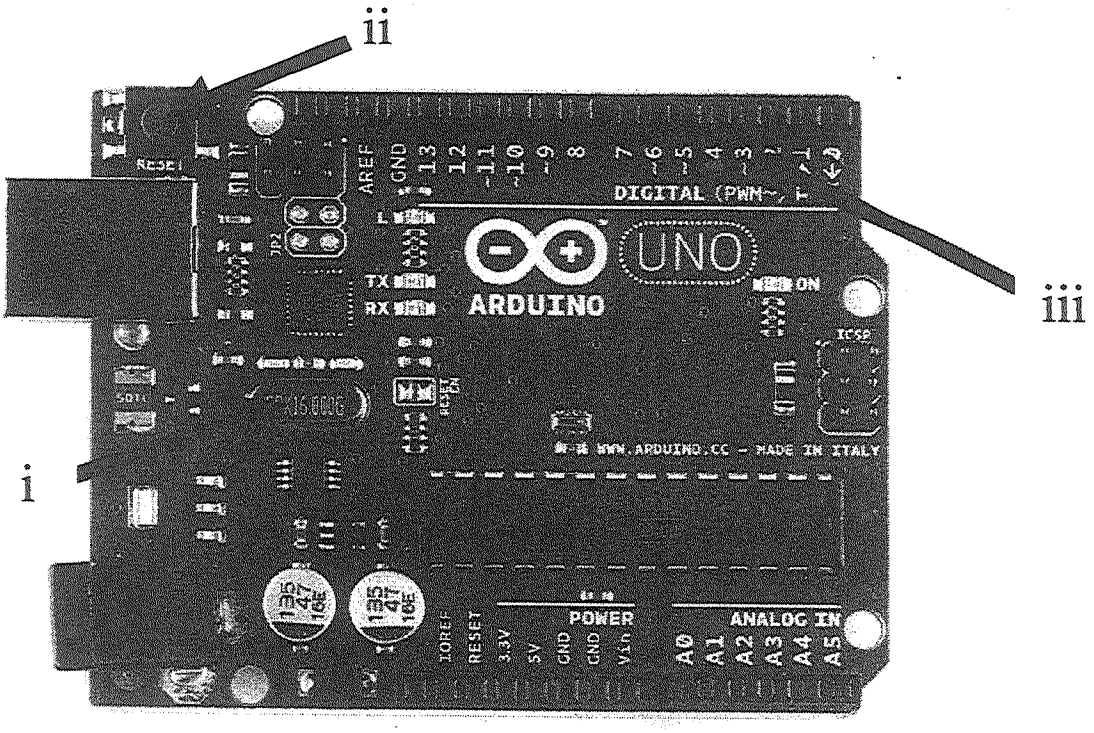
(d) Name the following components (i to iii) of an Arduino UNO board and briefly explain the functionality of each component.

[6 marks]



Answer:

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Question 4

(a) What are the **main differences** between serial and parallel transmission?

[4 marks]

Answer:

(b) Write down the main usage and a limitation of parity bits in data communication.

[4 marks]

Answer:

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(c) UART (Universal Asynchronous Receiver/Transmitter) data transmission protocol is categorized as a full-duplex asynchronous data transmission protocol.
Explain how it provides full-duplex communication by using necessary diagrams.

[8 marks]

Answer:

(d) Briefly explain the "**Virtual Ring Topology**" that can be found in SPI (Serial Peripheral Interface) protocol.

[5 marks]

Answer:

(e) A student wants to implement a high-speed data communication channel that transmits weather-related sensor data to a data centre located 500m away from the location in a cost-effective manner. Select the most suitable protocol out of the following three options.

- SPI (Serial Peripheral Interface)
- I2C (Inter-Integrated Circuit)
- UART (Universal Asynchronous Receiver/Transmitter)

Explain the reasons for the selection briefly.

[4 marks]

Answer:

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