الجامعة الإسلامية العالمية ماليزيا
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA
يونيورسيتي إسلام انتارابغسا ملايسيا

KULLIYYAH OF ENGINEERING

MID-OF-SEMESTER EXAMINATION
SEMESTER 2, 2022/2023 SESSION

Programme	:	**Mechatronics Engineering**	Level of Study	:	**UG 3**
Time	:	**3:30pm - 6:00pm**	Date	:	**3 Jan 2023**
Duration	:	**2h 30m**			
Course Code	:	**MCTA3203**	Section(s)	:	**1**
Course Title	:	**Mechatronics System Integration**			

This Question Paper Consists of **Three (3)** Printed Pages (Including Cover Page) with **ONE (1)** Question only.

INSTRUCTION(S) TO CANDIDATES

- Total mark of this examination is **50 marks.**
- This lab examination is worth **25%** of the total course assessment.
- This is an open book, open notes examination and also access to the internet. Answer **ALL QUESTIONS**
- Marks assigned to each question are listed in the margin.

DECLARATION

By answering this final examination, I hereby declare that:

- The whole answer of this final examination is my own work.
- I do not receive any help from any other parties in answering on any part of this examination.
- I do not give any clue, hint or work to other students in answering on any part of this final examination.
- I understand that any form of cheating or attempt to cheat is a serious offence which may lead to dismissal.

Name: **Matric No:**

Name: **Matric No:**

QUESTION 1 (50 marks)

Instructions:

1. Form groups of two students.
2. You have 2 hours and 30 minutes to complete the tasks.
3. Ensure proper documentation, code comments and email to zzulkifli@iium.edu.my
4. Demonstrate effective collaboration within your team.

Task 1: Arduino Integration

1. Arduino Connection Setup (10 minutes)
   - Integrate two Arduino boards into a single system.
   - Establish communication between the Arduinos.

2. Sensor Integration (20 minutes)
   - Connect at least three different input sensors to each Arduino (e.g., temperature sensor, ultrasonic sensor, potentiometer and etc.).
   - Implement code to read data from these sensors.

3. Actuator Integration (20 minutes)
   - Connect at least three different output actuators to each Arduino (e.g., servo motor, DC motor, Linear Actuator, Lights, Relay Module and etc.).
   - Implement code to control these actuators based on sensor inputs.

Task 2: Computer Interface

4. Serial Communication (20 minutes)
   - Set up a serial communication link between one Arduino and the computer.
   - Transfer sensor data from the Arduino to the computer.

5. Data Visualization (20 minutes)
   - Develop a simple computer interface (using a programming language of your choice) to visualize real-time sensor data.
   - Ensure the interface clearly displays information from both Arduinos.

Task 3: System Integration

6. Synchronization (20 minutes)
   - Implement synchronization mechanisms to ensure coordinated operation between the two Arduinos.

7. User Input Control (20 minutes)
   - Allow user input from the computer interface to control actuators on both Arduinos.

Task 4: Final Testing

8. Testing and Troubleshooting (20 minutes)
   - Conduct comprehensive testing of the integrated system.
   - Identify and troubleshoot any issues that arise during testing.

Grading Criteria

Functionality (25%)

1. Task 1: Arduino Integration
    a) Sensor Integration **(5)**
    b) Actuator Integration **(5)**
2. Task 2: Computer Interface
    a) Serial Communication **(5)**
    b) Data Visualization **(5)**
3. Task 3: System Integration
    a) User Input Control **(5)**

Documentation and Comments (10%)

1. Clearly documented code. **(5)**
2. Comments explaining the purpose and functionality of each code section. **(5)**

Collaboration (7%)

1. Evidence of effective teamwork. **(5)**
2. Fair distribution of tasks within the group. **(2)**

Creativity and Problem-Solving (8%)

1. Innovative solutions to challenges. **(5)**
2. Efficient troubleshooting during testing. **(3)**

Result:

END OF PAPER