

**FEDERAL UNIVERSITY OF TECHNOLOGY MINNA, NIGERIA**  
**SCHOOL OF ENGINEERING AND ENGINEERING TECHNOLOGY**  
**DEPARTMENT OF MECHATRONICS ENGINEERING**  
**SECOND SEMESTER 2016/2017 B.Eng. DEGREE EXAMINATION**  
**COURSE : MCE 220 FUNDAMENTALS OF MECHATRONICS**  
**INSTRUCTION: Answer Question One and any 3 Questions**  
**TIME ALLOWED: 2:30 Hours**

**Question One (Compulsory)**

- a.) In clear terms, justify the synergistic integration in mechatronics as it applies in the development of products and services. (10 Marks)
- b.) Discuss, in brief the advantages of Mechatronics based systems over non- mechatronics based systems. (10 Marks)
- c.) Explain the operational concept of the two AI tools outlined below
  - a. Artificial Neural Networks (5 Marks)
  - b. Genetic Algorithm (5 Marks)

**Question Two**

- a) Briefly discuss the key Elements and Disciplines involved in Mechatronics. (8 Marks)
- b) Identify and describe the basic classes of Mechatronics products stating at least one example in each instance. (6 Marks)
- c) Identify any three areas of application of mechatronics systems in Agriculture. (6 Marks)

**Question Three**

- a.) Briefly explain the following as it relates to control systems:

- i. Controlled Variable (2 Marks)
- ii. Manipulated Variable (2 Marks)
- iii. A System (2 Marks)

- b.) Compare and Contrast the Open Loop Control system and Closed Loop Control Systems (6 Marks)
- c.) With the aid of a diagram identify the transient response; steady state response and steady state error of a basic control system. (8 Marks)

**Question Four**

- a.) Explain in brief what is Artificial Intelligence (7 Marks)
- b.) List and briefly explain the two types of Artificial Intelligence (7 Marks)
- c.) Identify five practical areas of application of mechatronics engineering and state two products or services in each area. (6 Marks)

**Question Five**

- a.) What is a hangar used for? (6 Marks)
- b.) Sketch a hangar and its major content (7 Marks)
- c.) Using a recent definition of mechatronics, verify its application to any hangar project (7 Marks)