



2024 SECOND SEMESTER FINAL EXAMINATIONS

Faculty : Engineering and the Environment
Department : Metallurgical Engineering
Paper Code/Title : EMG 2203/Computer Applications in Metallurgical Engineering
Duration :3 Hours
Examiner :P. Garanowako

INSTRUCTIONS

1. This paper contains **one** section with **six** questions.
2. Answer any **four** questions.
3. Where the question contains subdivisions, the mark of each subdivision is shown in brackets.
4. Each question carries **25 marks**.
5. Start each question on a new page.

NB: DO NOT TURN OVER THE QUESTION PAPER OR COMMENCE WRITING UNTIL INSTRUCTED TO DO SO.

Question 1

- a. Discuss the applications of modeling and simulation techniques in metallurgical engineering. **[15 marks]**
- b. Discuss the advantages and limitations associated with these techniques. **[10 marks]**

Question 2

- a. What are the objectives of process control? **[10 marks]**
- b. Discuss the 3 types of controllers used in process control, highlighting their respective advantages and disadvantages. Explain the benefits and limitations associated with each controller type. **[15 marks]**

Question 3

- a. What are the advantages of using computer-aided quality control and how does it contribute to overall product quality? **[15marks]**
- b. What are the challenges or limitations associated with implementing computer-aided quality control systems? **[10 marks]**

Question 4

- a. Discuss the role of sensors and actuators in process control and automation, and provide examples of commonly used sensors and actuators in industrial applications **[10 marks]**
- b. Explain the concept of supervisory control and data acquisition (SCADA) systems and their role in monitoring and controlling industrial processes. Provide examples of SCADA applications. **[15 marks]**

Question 5

- a. Explain the concept of computer-aided material selection and design and discuss its significance in the field of metallurgical engineering **[10 marks]**
- b. Describe the steps involved in the computer-aided material selection process and discuss how it can help in optimizing material choices for specific engineering applications. **[15 marks]**

Question 6

- a. Discuss two key differences between autonomous systems and AI and how they interact **[5 marks]**
- b. Discuss the potential advantages of integrating AI technology in metallurgical engineering **[10 marks]**
- c. What are the potential limitations of integrating AI technology in the field of metallurgical engineering in Zimbabwe? **[10 marks]**

END OF EXAMINATION PAPER