BINDURA UNIVERSITY OF SCIENCE EDUCATION
BIOLOGICAL SCIENCES DEPARTMENT
BACHELOR OF SCIENCE HONOURS DEGREE IN BIOTECHNOLOGY
BTEC213 (BIOPROCESS ENGINEERING)

EXAMINATION NOV 2024 **2 HOURS (100 MARKS)**

INSTRUCTIONS TO CANDIDATES

Answer FOUR (4) questions. You MUST answer QUESTION 1 from Section A and any THREE (3) questions from SECTION B. Each question carries 25 marks. Where a question contains subdivisions, the mark value of each part is given in brackets. Illustrate your answer were appropriate with large clearly labelled diagrams. You should not spend more than 30 minutes on each question.

SECTION A (COMPULSORY)

1. (a) Define the term Response Surface Model. (5 marks)

   (b) Explain the relevance of surface response analysis of experimental factors in the production of a fermentation production. (6 marks)

   (c) From Figure 1, identify the labelled parts **A** to **F** that indicate different designs of controllers. (6 marks)

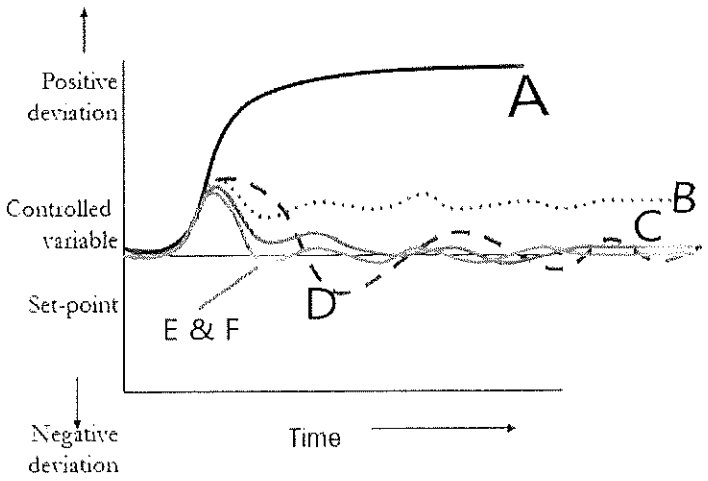

Figure 1: A graph showing responses due to different designs of biocontrollers.

(d) State any FOUR major factors that affect bioethanol production. (4 marks)

(e) Describe the effect of any THREE factors on microbial specific growth rate. (4 marks)

SECTION B

2. Describe any **FOUR** methods used in the recovery and purification of bioproducts.

3. Explain the relevance of process optimization in industrial bioprocesses.

4. Give an account of the yeast industrial production process.

5. With the aid of a diagram, describe the industrial Fring's acetator vinegar production process.

6. State the equations for the following situations and explain their relevance in bioprocess production:
   (a) Oxygen transfer rate. (15 marks)
   (b) Monod model of cell growth. (10 marks)

END OF EXAMINATION QUESTION PAPER