BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE & ENGINEERING

DEPARTMENT: BIOLOGICAL SCIENCES

PROGRAMME: HBScBioTec

COURSE CODES:	**BTEC213**	**NARRATION:**	**BIOPROCESS ENGINEERING**
DURATION:	**2 HOURS**	**TOTAL MARKS:**	**100**

APR 2025

INSTRUCTIONS

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

1. (a) Explain bioprocess engineering, and how it relates to biotechnology. [10]

   (b) A pharmaceutical company is producing an enzyme in a batch fermentation process. The company has observed that the enzyme production rate declines after 24 hours of fermentation. Identify the possible reasons for this, and steps that can be taken to resolve the issue. [10]

   (c) Explain the DEO as it is used in bioprocess engineering. [5]

SECTION B

2. Describe any **FOUR** (4) methods used in the recovery and purification of bioproducts.

3. (a) Discuss the effect of rheological properties on mixing, [10]
   (b) Describe the advantages of using an outer-loop airlift reactor in commercial production process. [15]

4. With the aid of a well labelled diagram, describe the Fring's acetator vinegar production process.

5. State the equations of the following conditions and explain their roles in bioprocess production:
   (a) Oxygen transfer rate [15]
   (b) Monod model of cell growth [10]

6. Explain the concept of mass transfer in a bioreactor and elaborate on the improvement of oxygen transfer efficiency in large-scale fermentation.

END OF PAPER