FACULTY	AGRICULTURE, ENGINEERING, AND NATURAL SCIENCES		
SCHOOL	AGRICULTURE AND FISHERIES SCIENCES		
DEPARTMENT	FOOD SCIENCE AND SYSTEMS		
SUBJECT	FOOD BIOTECHNOLOGY		
SUBJECT CODE	F3701SB		
DATE	JUNE 2025		
DURATION	2 HOURS	**MARKS**	100

SECOND OPPORTUNITY EXAMINATION

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This question paper consists of **two (2)** pages excluding this front page.

Instructions:

- **Answer any five (5) out of six (6) questions.**

QUESTION 1

a) Compare and contrast traditional and modern food biotechnology activities. **[6]**
b) Outline four (4) examples of food biotechnology practices. **[8]**
c) Outline the functions of proteases and amylases in food processing. **[6]**

QUESTION 2

Briefly discuss the following terms encountered in recombinant DNA technology:

a) Restriction endonucleases. **[8]**
b) Isoschisomers. **[4]**
c) Expression vector. **[4]**
d) Expression host. **[4]**

QUESTION 3

a) Define bacterial plasmids and briefly discuss the characteristics that make them suitable for DNA cloning vectors. **[10]**
b) Sketch and discuss the map of pBR322 showing the position of two (2) selective markers, the origin of replication, and the restriction sites for HindIII and BamHIII. **[10]**

QUESTION 4

a) Outline three (3) problems associated with cloning DNA larger than 10 kb in plasmids. **[6]**
b) Define pUC18/19 and describe the markers used to screen for transformants carrying a recombinant plasmid. **[8]**
c) Outline the differences in the genetic material of bacteriophage lambda (λ) and M13 bacteriophages, and explain how each is utilized as a cloning vector in recombinant DNA technology. **[6]**

QUESTION 5

a) State four (4) advantages of using immobilized enzymes compared to soluble enzymes. **[4]**
b) Discuss the following techniques used in enzyme immobilization:
i) Encapsulation. **[2]**
ii) Entrapment. **[2]**
iii) Cross-linking. **[2]**

c) Briefly discuss the five (5) stages employed in downstream processing. **[5]**
d) Briefly discuss the following techniques used in downstream processing, mentioning the specific stage where the method is applied.
i. Ion exchange chromatography. **[3]**
ii. Freeze drying. **[2]**

QUESTION 6

a) Sketch and clearly describe the key steps involved in Western blotting used to detect specific proteins in a sample. **[10]**

b) Describe how qRT-PCR is used to estimate gene expression through the quantification of mRNA transcripts. **[10]**

END OF EXAMINATION