

**University of Ruhuna- Faculty of Technology**  
**Bachelor of Biosystems Technology Honours Degree**  
**Level 3 (Semester I) Examination, June 2023**  
**Academic year 2021/2022**

**Course Unit: BST 3133 Industrial Microbiology (Theory)      Duration: 2 hours**



- Answer **ONLY FOUR (04)** questions.
  - Use a separate book for answering the questions.
  - Each question should be started with new page.
- 1) Microbiology is the technological and scientific field that has been used from ancient times both to improve living conditions and to increase survival opportunities by transforming risks into challenges.
- a) Itemize the key roles of an industrial microbiologist in an industry which engaging to develop commercially important microbial products. [20 marks]
  - b) Briefly discuss differences between industrially important microbial primary metabolites and secondary metabolites. [30 marks]
  - c) Briefly discuss the issues associated with industrial microbial processes. [50 marks]
- 2) The use of a good, adequate, and industrially usable medium is as important as the deployment of a suitable microorganism in industrial microbiology.
- a) List the important factors that consider in formulating the medium for large scale production. [20 marks]
  - b) Briefly discuss the main components of microbial medium. [30 marks]
  - c) You are hired by the company ABC which is leading in developing new fermentation products. You have been assigned to develop the medium. Discuss the key factors you will consider in selecting the raw materials for the medium. [50 marks]
- 3) The growing demand for biotechnological products against limited metabolic capacity of industrially used microorganisms has led to an increased interest on strain-improvement over the last several decades.
- a) State the main characteristic features of industrial microbes. [20 marks]
  - b) Briefly discuss the natural gene transfer method in strain improvement. [30 marks]

- c) Bacteriophage attack is one of the most important challenges in dairy fermentation and *Lactococcus lactis* strain A is commonly used in the fermentation process. You are requested to develop bacteriophage resistant *Lactococcus lactis* strain using genetic engineering knowledge. Mutated YjaE gene was found in bacteriophage resistant strain B and strain B is not efficient in dairy fermentation process. Explain the process to improve bacteriophage resistant character in Strain A. [50 marks]
- 4) A bioreactor is a vessel in which raw materials under controlled conditions are converted into products by activity of living organism or by cellular components such as enzymes.
- a) List the factors affecting the fermentation process. [20 marks]
  - b) Discuss the controlling parameters of stirred tank bioreactor. [30 marks]
  - c) Briefly discuss continuous culture operating mode of fermentation process. [50 marks]
- 5) Downstream processing refers to the recovery and purification of biosynthetic products, pharmaceuticals, from natural sources such as animal tissue, plant tissue, or fermentation broth, as well as the recycling of salvageable components and the proper disposal of waste.
- a) What are the factors that are considered in deciding the recovery process of fermented products. [20 marks]
  - b) Briefly explain the recovery process of cephamycin C from fermented broth. [40 marks]
  - c) Contamination of industrial microbial processes is caused to lose the quality and yield of the product. Discuss the sterilization techniques that are used in industrial microbial processes. [40 marks]

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