# P P SAVANI UNIVERSITY

**Fourth Semester of B. Tech. Examination**

**May 2019**

**SECH2091 Biochemical Engineering**

**28.05.2019, Tuesday** **Time: 09:00 a.m. to 11:30 a.m.** **Maximum Marks: 60**

***Instructions:***

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

## SECTION – I

**Q - 1** **Answer the following: (Any Five)** **[05]**

**(i)** Define: Enzymes.

**(ii)** Discuss the effect of temperature on microbial growth.

**(iii)** List the phases of cell growth.

**(iv)** What do you mean cell inhibition?

**(v)** State the classification of enzymes.

**(vi)** A higher Ks value of Monod's equation means
(A) greater affinities to substrate (B) lower affinities to substrate (C) unaffected with the substrate bonding (D) lower dissociation constant value

**(vii)** State Michaelis-Menten Equation.

**Q - 2 (a)** Explain the role of biochemical engineering in modern world. **[05]**

**Q - 2 (b)** Explain the growth of a typical microbial culture in batch conditions. **[05]**

**OR**

**Q - 2 (a)** State the factors affecting microbial cell growth. **[05]**

**Q - 2 (b)** List out various unit operations used in bioprocessing. **[05]**

**Q - 3 (a)** When glucose is converted into fructose by glucose isomerase, the slow product formation step is also reversible as: **[05]**

$$S + E \underset{k_2}{\overset{k_1}{\leftrightarrow}} ES$$

$$ES \underset{k_4}{\overset{k_3}{\leftrightarrow}} P + E$$

Derive the rate equation by employing the Michaelis-Menten approach.

**Q - 3 (b)** Write down Monod equation explaining each term in it. How do you determine the constant parameter of Monod equation? Is there any limitation of this equation? **[05]**

**OR**

**Q - 3 (a)** Explain mechanisms of enzyme action and concept of active site. **[05]**

**Q - 3 (b)** Define Growth Yield and other various Yield Coefficients used in cell culture. **[05]**

**Q - 4** **Attempt any one.** **[05]**

**(i)** What is a degree of reduction of substrate and biomass?

**(ii)** Explain Lock and Key model with diagram for enzymatic reactions.

## SECTION – II

**Q - 1** **Answer the following: (Any Five)** **[05]**

**(i)** Single cell protein (SCP) is the production of?
(A) extracellular proteins
(B) fermentation of waste products
(C) intracellular proteins extraction
(D) metabolites

**(ii)** Secondary metabolites are produced during _____ phase
(A) Lag phase
(B) Log Phase
(C) Stationary Phase
(D) all the above

**(iii)** Which of the following is an upstream process?
(A) Product recovery
(B) product purification
(C) media formulation
(D) Cell lysis

**(v)** What do you mean by spent medium?
(A) Medium With High Nutritional Content
(B) Hydrated
(C) Dehydrated
(D) Non Toxic

**(vi)** Fermentor should be filled with medium up to
(A) 65-70%
(B) 70-75%
(C) 75-80%
(D) 80-85%

**(vii)** The heated medium passes through a holding section, which is usually maintained in
(A) isothermal conditions
(B) isotropic conditions
(C) adiabatic conditions
(D) isobaric conditions

**Q - 2 (a)** List the different techniques used for purification process and explain any one in brief. **[05]**

**Q - 2 (b)** Define cell disruption. Explain methods of cell disruption. **[05]**

**OR**

**Q - 2 (a)** Explain briefly the principle of scale-up in bioprocess operation. **[05]**

**Q - 2 (b)** Discuss in detail the types of reactors used in bioprocess. **[05]**

**Q - 3 (a)** State the functions of each part of a fermenter with the help of a schematic diagram. **[05]**

**Q - 3 (b)** Enlist the different types of spargers used for aeration in fermenter. **[05]**

**OR**

**Q - 3 (a)** Discuss the working of Plug valve, Butterfly valve and Ball valves with diagram. **[05]**

**Q - 3 (b)** Discuss various types of steam traps used in fermentation vessel. **[05]**

**Q - 4** **Attempt any one.** **[05]**

**(i)** Discuss the production of single cell protein with a diagram. State the use of single cell protein.

**(ii)** Discuss the production of industrial alcohol with a diagram. State the use of single cell protein.

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