Total number of printed pages: 02 **UG/ 8th Semester/UFET811**

2025

Renewable Energy Technology

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

Attempt any <u>five</u> questions from the following 5x20

1. a) What do you understand by biomass 2

   b) Give the Structural description of lignocellulosic biomass in environment. 5

   c) Briefly explain some physicochemical properties of biomass. 3

   d) Describe two aerobic thermochemical conversion process. Explain biochemical conversion process with suitable example. 6+4

2. a) Give the flow chart of stoichiometric conversion of complex organic waste to biogas synthesis. 3

   b) Explain with ideal flow diagram the detailed mechanism of biogas generation with biochemical reactions and involvement of different microorganisms in an anaerobic digester. 10

   c) Discuss the influence of key factors in biomethanation process. 7

3. a) Why lignocellulosic biomass is considered for bioethanol fermentation? Explain with flow diagram of bioethanol production strategy from corn using wet milling process. 3+5

   b) What is molasses? Give the biochemical reactions involved in molasses fermentation for bioethanol production. 1+3

   c) Describe the biohydrogen production by photosynthetic and dark fermentation. 8

4. a) Differentiate between photolysis and biophotolysis? 3

   b) How biological hydrogen is produced by indirect biophotolysis? 5

   c) Explain briefly the integrated technique of biohydrogen production with biochemical conversions by predicting the yield of hydrogen. 9

   d) Differentiate between hydrogen and biohydrogen. 3

5. a) Define biosurfactant. Give two examples of biosurfactant producing microorganisms. 2+2

b) How biosurfactant is classified? How biosurfactant activity is measured? 2+1

c) Explain the isolation and recovery of biosurfactant with flow diagram. How biosurfactant could be employed for oil storage tank cleaning and microbial enhanced oil recovery? 3+3

d) What is biopolymer? How xanthan is produced microbiologically? How xanthan gum could be advantageous in petroleum recovery? 1+3+3

6. a) What is solar panel? State different applications. 1+2

b) Which factors governs the performance characteristics of solar thermal collector? Explain one solar thermal collector with diagram. 2+4

c) Define geothermal energy and mention their resources. Give the diagram of various sections of earth. 2+2

d) Describe nuclear fission reaction. What are the essential components of a nuclear reactor? Explain with flow diagram a nuclear power plant. 2+2+3

7. a) Explain different types of solar photovoltaic systems with suitable diagram. 7

b) Explain salinity gradient solar pond with diagram. 5

c) Describe a wind turbine system with diagram. 5

d) How tidal energy can be calculated? 3

8. a) What is biodiesel? How calorific value of this biofuel is determined? 1+1

b) Give the details methods of biodiesel production including flow diagram with special emphasis on transesterification mechanism. 12

c) Describe the influence of different variables on transesterification reaction. Give one potential application of biodiesel. 5+1