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Printed Page:-4 **Subject Code:- BBT0513**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
B.Tech
SEM: V - THEORY EXAMINATION (2025 - 2026)
Subject: Bioenergy Technologies and Systems

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. Biobased fuels have not reached the potential commercial market because of _____ (CO1, K1) 1

(a) Low cost
(b) High cost
(c) Seasonal variation in the cost
(d) Variations in different batch productions

1-b. Biomass refers to (CO1, K1) 1

(a) Plants
(b) Animals
(c) Microbes
(d) All of the above

1-c. Yeast is used in the production of (CO2, K1) 1

(a) Ethyl alcohol
(b) Acetic acid
(c) Cheese
(d) Curd

1-d. Production of bioethanol is through fermentation of _____ and starch components (CO2, K1) 1

(a) Alcohol
(b) Sugar
(c) Milk
(d) Acid

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1-e. What does the term valorization mean in the context of biorefineries? (CO3, K1) 1

(a) The process of degrading biomass into simpler compounds

(b) The process of extracting the maximum value from biomass by producing high-value products

(c) The process of minimizing waste generation in a biorefinery

(d) The process of optimizing energy efficiency in a biorefinery

1-f. Which of the following is a key challenge in improving the overall performance of biorefineries? (CO3, K1) 1

(a) Technological advancements

(b) Lack of renewable feedstock

(c) Regulatory restrictions

(d) Reducing production cost

1-g. Scrubbers are used to remove which type of contaminants from gas streams? (CO4, K1) 1

(a) Particulate matter

(b) Oxygen

(c) Nitrogen

(d) Gases such as SO2 or H2S

1-h. Energy resources obtained from natural organic materials are called _____ (CO4, K1) 1

(a) geothermal energy

(b) Fossil fuels

(c) biomass

(d) none of the above

1-i. TEA analysis involves three components which are _____ (CO5, K1) 1

(a) input

(b) development

(c) assessment

(d) all of the above

1-j. SuperPro Designer is a valuable tool for engineers and scientists in _____ (CO5, K1) 1

(a) process development

(b) process engineering

(c) manufacturing

(d) All of the above

2. Attempt all parts:-

2.a. What are drop in fuels? (CO1, K1) 2

2.b. What do you understand by farm waste? (CO2, K1) 2

2.c. List few agricultural residues which can be employed as feedstock. (CO3, K1) 2

2.d. What do you mean by anaerobic digestion? (CO4, K1) 2

2.e. What do you mean by Genetic algorithm? (CO5, K1) 2

SECTION-B 30

3. Attempt all parts:-

3.a. Answer any one of the following:-

3.a.(i)	Describe the US-EIA guidelines for classification of biofuels. (CO1, K2)	6
3.a.(ii)	Differentiate between bioheat and biopower. How these can be correlated with each other? (CO1, K2)	6

3.b. Answer any one of the following:-

3.b.(i)	Which method is used to analyze forest waste? Write in detail the concept of that particular method. (CO2, K2)	6
3.b.(ii)	What are the advantages and shortcomings of residual feedstock as biomass related biofuels? (CO2, K2)	6

3.c. Answer any one of the following:-

3.c.(i)	Diagrammatically represent the carbon assimilation in integrated refineries (CO3, K2)	6
3.c.(ii)	Explain the production of biopolymers. Give few examples of biopolymers. (CO3, K2)	6

3.d. Answer any one of the following:-

3.d.(i)	Describe the concept of gasification.(CO4, K2)	6
3.d.(ii)	Express the production of ethanol from starchy biomass with the help of flow diagram. (CO4, K2)	6

3.e. Answer any one of the following:-

3.e.(i)	Differentiate between Plackett-Burman and Response surface methodology. (CO5, K2)	6
3.e.(ii)	Discuss the application of machine learning in optimizing a process. (CO5, K2)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Diagrammatically represent the production of aviation fuels from wood as a feedstock. (CO1, K3)	10
4-b.	How carbon neutral biofuel production is beneficial in creating the ecofriendly environment? Discuss three methods for biomass generation. (CO1, K3)	10

5. Answer any one of the following:-

5-a.	Explain the concept of agricultural waste, its various kinds and how it can impact human health adversely. (CO2, K3)	10
5-b.	How can you differentiate between different types of biofuels? Explain the advantages and disadvantages associated with them. (CO2, K3)	10

6. Answer any one of the following:-

6-a.	What do you understand by life cycle assessment? Explain with the help of flow diagram. (CO3, K3)	10
6-b.	Explain with flow diagram the generation of value added products from the wastes produced from food industry. (CO3, K3)	10

7. Answer any one of the following:-

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7-a.	What do you understand by the concept of thermochemical conversion? Discuss combustion, gasification and pyrolysis aspects w.r.t. thermochemical conversion. (CO4, K3)	10
7-b.	State combustion, gasification and pyrolysis. How these methods contribute in biofuel production. (CO4, K3)	10

8. Answer any one of the following:-

8-a.	Explain genetic algorithms, gradient descent and exhaustive search approach for optimization strategy. (CO5, K3)	10
8-b.	How simulators are boon to the society? Explain its usage for ethanol production using SuperPro software. (CO5, K3)	10