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Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: V - THEORY EXAMINATION (2024 - 2025)

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.

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SECTION-A 20

1. Attempt all parts:-

1-a. Enzymes break cellulose to _____ (CO1, K1) 1

(a) Carboxylic acid

(b) Alcohol

(c) Sugar

(d) None of the above

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

(a) Biodimethoxy ethane

(b) Biodimethyl ethane

(c) Bio dimethyl ether

(d) Biodimethoxy ether

1-c. Which is the yeast strain normally employed for ethanol production from carbohydrates? (CO2, K1) 1

(a) *E. coli*

(b) *Saccharomyces cerevisiae*

(c) *Enterobacter aerogenes*

(d) *Pichia pastoris*

1-d. Lignocellulosic biomass have been used to produce biofuels known as _____ (CO2, K1) 1

(a) First generation biofuels

(b) Second generation biofuels
(c) Third generation biofuels
(d) None of the above

1-e. What is the main benefit of integrating biorefineries with agriculture and forestry operations? (CO3, K1) 1

(a) Increased land use for urban development
(b) Enhanced resource availability and sustainability
(c) Decreased demand for renewable feedstock
(d) Reduced need for transportation of biomass feedstock

1-f. By-products generated during the rectification of bioethanol is utilized as (CO3, K1) 1

(a) cow feed
(b) sheep feed
(c) dog feed
(d) pig feed

1-g. What types of forest materials are used for biomass? (CO4, K1) 1

(a) Manure
(b) Logging residues
(c) Fish oil
(d) Tallow

1-h. In trans-esterification, what is reacted with triglycerides to produce biodiesel? (CO4, K1) 1

(a) Alcohols (e.g., methanol or ethanol)
(b) Hydrogen gas
(c) Acids (e.g., sulfuric acid)
(d) Water

1-i. In factorial designs, the number of times a condition is noted is called (CO5, K1) 1

(a) Randomization
(b) Factorization
(c) Replication
(d) None of these

1-j. In ANOVA, a factor is defined as the: (CO5, K1) 1

(a) Dependent variable
(b) Independent variable
(c) Both
(d) None of these

2. Attempt all parts:-

2.a. How biofuels are different from commercial fossil fuels? (CO1, K2) 2

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2.b.	Define biochar, biooil and syngas. (CO2, K1)	2
2.c.	Write four examples of biopigments. (CO3, K1)	2
2.d.	Define pyrolysis? (CO4, K1)	2
2.e.	Define algorithm. (CO5, K1)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Differentiate between bioheat and biopower. How these can be correlated with each other? (CO1, K2)	6
3-b.	Explain various types of Advanced liquid fuels. (CO1, K2)	6
3-c.	Discuss in detail the impact caused by agricultural solid waste on human health and ecology. (CO2, K2)	6
3-d.	Describe the concept of third generation biofuels in detail. (CO2, K2)	6
3.e.	How biopolymers can be differentiated from conventional polymers? Explain the process of producing biopolymers. (CO3, K2)	6
3.f.	Illustrate various aspects of enzymatic hydrolysis in detail. (CO4, K2)	6
3.g.	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.	How biofuels can be produced to create ecofriendly environment? Categorize various biofuels as per the regulations of US-EIA. (CO1, K2)	10
4-b.	Explain different kinds of advanced liquid fuels and how these can be distinguished from one another. (CO1, K2)	10

5. Answer any one of the following:-

5-a.	How can you differentiate between various types of biofuels? Explain the advantages and shortcomings associated with them. (CO2, K2)	10
5-b.	Discuss in detail the concepts of 3Rs to assimilate hazardous waste. Apply the concept of 3Rs in cleanup the environment. (CO2, K3)	10

6. Answer any one of the following:-

6-a.	How integrated refineries can be distinguished from other fundamental refineries? Comment on the carbon assimilation that can be achieved in integrated refineries. (CO3, K3)	10
6-b.	How food products and the wastes produced from food industry can be transformed to value added products. Explain with the help of flowchart. (CO3, K3)	10

7. Answer any one of the following:-

7-a.	Discuss the concept of thermochemical conversion. How gasification and pyrolysis contributes in thermochemical conversion? (CO4, K2)	10
7-b.	Briefly descrbe the modes of fermentation. How these can be employed for biofuel generation. (CO4, K2)	10

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8. Answer any <u>one</u> of the following:-

8-a.	Which software is used for modelling bioenergy pathway? Explain with flowchart. (CO5, K2)	10
8-b.	How the rate constant dependency on temperature can be elaborated with Arrhenius law? Find out the activation energy of a reaction, given that the rate constant of the reaction at 600K is 8.0×10^{3} s^{-1} and the rate constant at 300K is 4.0×10^{2} s^{-1}. (CO5, K2)	10

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