JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

Comprehensive Examination - 2025

Ph.D (CSE//ECE/CE/BT/BI/PMS/MATHS/HSS)

COURSE CODE (CREDITS):17P1WCE131 MAX. MARKS: 100

COURSE NAME: Comprehensive Test

COURSE INSTRUCTORS: Ashish Kumar MAX. TIME: 3 Hours

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(c) Use of calculator is allowed

Sec A

Q.No	Question	Marks
1	Describe various physical, chemical, and biological pretreatment methods for lignocellulosic biomass. How do these methods enhance biodegradability and methane production in anaerobic digestion processes?	12
2	Explain the process of biochar and ash formation during thermal conversion of biomass. How do process parameters such as temperature, residence time, and feedstock type affect the yield and quality of biochar and ash?	12
3	Discuss the principle of co-digestion in anaerobic systems. How can co-digestion improve biogas yield, nutrient balance, and process stability?	10

Sec B

Q.No	Question	Marks
4	How can you carry out IPR inclusions to maintain effective IPR management for a smart biogas generator and distribution system designed for urban households? Design a methodology from the idea stage to the product development stage by including IPR considerations at every phase for its value addition. What is the role of an ethical model in ensuring fair assessment, responsible innovation, and sustainable release of this IP-protected smart biogas generator into the market? Which form of intellectual property would help in generating maximum revenue for this product, and why?	10
5	Explain the biochemical stages involved in biogas production. Discuss how environmental factors such as temperature, pH, retention time, and C/N ratio influence the rate and quality of biogas generation.	12
6	Explain briefly various treatment methods of treatment of waste water from different sources.	11

Sec C

Q.No	Question	Marks
7	Evaluate the biogeochemical consequences of nitrogen fixation and its release in a forest ecosystem with the help of a suitable diagram. Enlist the various microbes involved in nitrification and denitrification processes.	11
8	How does the methanogenic and methanotrophic microorganisms play important role in regulating methane fluxes at marine methane seeps. Compare the mechanisms of methane production and methane oxidation in methanogenic and methanotrophic archaea.	11
9	Analyze, how nutrient loading and pollution affect biodiversity and ecosystem function in marine and freshwater systems. Explain the role of restoration and bioremediation strategies in mitigating damage.	11