JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2025

M.Sc. – 3rd Semester (Microbiology)

COURSE CODE (CREDITS): 21MS1MB311 (3) MAX. MARKS: 35

COURSE NAME: ENVIRONMENTAL MICROBIOLOGY

COURSE INSTRUCTORS: AKN MAX. TIME: 2 Hours

Note: *(a) All questions are compulsory.*

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

Q.No	Question	Marks
	Section I	
Q1	a) What role do chelators play in phytoremediation? Name any two plants used in phytoremediation?	1
	b) Justify the role of polyunsaturated fatty acids in pressure adaptation in barophiles.	1
	c) Name one pretreatment method used for lignocellulosic bioethanol production.	1
	d) What property makes radionuclide bioremediation difficult? Name a radionuclide commonly targeted in bioremediation.	1
	e) Give the name of one major by-product of ethanol fermentation?	1
	Section II	
Q 2	What are the major enzymes involved in white rot fungal bioremediation, and how do they differ in function?	3
Q 3	How oligotrophs maintain metabolic activity in extremely low nutrient conditions. Why do oligotrophs often have smaller cell sizes? Briefly explain its adaptive value.	3

Q 4	Evaluate how biofertilizers contribute to sustainable agriculture and soil health. Explain the modes of action of microbial biopesticides, such as *Bacillus thuringiensis* (Bt), against insect pests.	3
Q5	Explain the difference between bioethanol and biodiesel in terms of raw materials and production methods. Propose a bioethanol production flowchart and identify bottlenecks in fermentation and distillation.	3
Q6	Do the biofertilizers offer a robust alternative to synthetic fertilizers in the enhancement of crop yield? Justify your answer.	3
	Section III	
Q 7	Evaluate the environmental risks and benefits of Microbial enhanced oil recovery (MEOR) compared to chemical enhaced oil recovery, considering reservoir ecology, microbial strains, and long-term carbon emissions. List the key physicochemical and microbiological parameters you would monitor during a MEOR operation.	5
Q 8	White rot fungi (WRF) are considered nature's most powerful degraders of lignin. Evaluate how their lignin-degrading mechanisms enable the breakdown of structurally similar environmental pollutants such as PAHs, dyes, and pesticides?	5
Q 9	Explain how bioremediation can be integrated into hazardous waste management? Discuss limitations and situations where biological treatments are not suitable.	5
	Total	**35**