## UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
### End Semester Examination, December 2022

Course: Green Biotechnology and Pollution Abetment      Semester   : III
Program: B.Tech (Biotechnology)                         Duration   : 3 Hours
Course Code: HSBT 2005                                  Max. Marks : 100
**Instructions: Read all questions carefully. All questions are compulsory.**

| S.No. | Section A (20Qx1.5M= 30 Marks) Short answer questions/ MCQ/T&F | Marks | COs |
|---|---|---|---|
| | **Expand the terms** | | |
| Q1 | BGA…………………………………………………………………….. | 1.5 | CO1 |
| Q2 | IPM………………………………………………………………………... | 1.5 | CO1 |
| Q3 | PIPs…………………………………………………………………….. | 1.5 | CO1 |
| Q4 | UASB……………………………………………………………….. | 1.5 | CO1 |
| Q5 | RBC…………………………………………………………………….. | 1.5 | CO1 |
| Q6 | PAOs……………………………………………………………… | 1.5 | CO1 |
| | **Fill in the blanks** | | |
| Q7 | …………is a fungicide effective against soil borne diseases such as root rot. | 1.5 | CO1 |
| Q8 | Major gases in landfills are………………and ……………………….... | 1.5 | CO1 |
| Q9 | …………...is common biopesticides which is effective against the lepidopterous pest of cotton, rice and vegetables. | 1.5 | CO1 |
| Q10 | Members of the genus …………(soil microorganism) are the most predominant microorganisms that degrade xenobiotic. | 1.5 | CO1 |
| | **State True or False** | | |
| Q11 | Pesticides, herbicides, plastics are Xenobiotics. | 1.5 | CO1 |
| Q12 | Nitrogen fixing bacteria turns atmospheric nitrogen gas into plant available amines and ammonium via a specific and unique enzyme they possess called nitrogenase. | 1.5 | CO1 |
| Q13 | Many strains of Azotobacter also exhibit fungicidal properties against certain species of bacteria. | 1.5 | CO1 |
| | **Short answer questions** | | |
| Q14 | Name the rhizobium which is known as a fast growing rhizobia. | 1.5 | CO1 |
| Q15 | Define term biopesticides. | 1.5 | CO1 |
| Q16 | State the advantages of Rhizofiltration. | 1.5 | CO1 |
| Q17 | State the pros of genetically modified organisms. | 1.5 | CO1 |
| Q18 | Name three anaerobic microorganism which helps in bioremediation process. | 1.5 | CO1 |
| Q19 | Name three diagnostic enzymes used for the diagnosis of various human disease. | 1.5 | CO1 |
| Q20 | List three merits of biocatalyst. | 1.5 | CO1 |
| | **Section B (4Qx5M=20 Marks)** | | |

| Q 1 | Explain the area method of landfilling with the help of well labelled diagram. | **05** | **CO2** |
| Q2 | Discuss different uses of biocatalyst. | **05** | **CO2** |
| Q3 | Differentiate between phytotransformation and phytostimulation. | **05** | **CO3** |
| Q4 | Distinguish between Bio stimulation and Bio augmentation. | **05** | **CO3** |

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**Section C**
**(2Qx15M=30 Marks)**

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| **Q1** | **Case Study-I**<br>Global population growth poses a threat to food security in an era of increased ecosystem degradation, climate change, soil erosion, and biodiversity loss. In this context, harnessing naturally-occurring processes such as those provided by soil and plant-associated microorganisms presents a promising strategy to reduce dependency on agrochemicals. Biofertilizers are living microbes that enhance plant nutrition by either by mobilizing or increasing nutrient availability in soils. Various microbial taxa including beneficial bacteria and fungi are currently used as biofertilizers, as they successfully colonize the rhizosphere, rhizoplane or root interior. Despite their great potential to improve soil fertility, biofertilizers have yet to replace conventional chemical fertilizers in commercial agriculture<br>(**Source:** Mitter, E. K., Tosi, M., Obregón, D., Dunfield, K. E., & Germida, J. J. (2021). Rethinking crop nutrition in times of modern microbiology: innovative biofertilizer technologies. *Frontiers in Sustainable Food Systems*, *5*, 606815)<br><br>**Based on the above case study, please answer below mentioned questions**<br>    a)  State advantages of biofertilizers.<br>    b)  Illustrate the process of nitrogen fixation with the help of symbiotic bacteria. | <br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>**05**<br>**10** | <br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>**CO1**<br>**CO3** |
| **Q2** | **Case Study-II**<br>Srikakulam city has been a developing place due to the steady increase in city population, which in turn resulted in the increase of domestic sewage generated, but still there is no sewage treatment plant. So it is required to construct a sewage treatment plant with sufficient capacity to treat the generated sewage. Sewage water treatment has challenges to treat the excess sludge and disposal of sludge. Sewage/wastewater treatment operations are done by various methods in order to reduce, its water and organic content, and the ultimate goal of wastewater management is the protection of the environment in a manner commensurate with public health and socioeconomic concerns. In one day the total sewage generated was estimated 22.2 MLD considering the projected population of Srikakulam town for the next 30 years. The various components of sewage treatment plant are screening, grit chamber, primary sedimentation tank, biological reactor, secondary clarifier, activated sludge tank, drying beds. | | |

| | (Source: Puspalatha P, Kalpana P. Design Approach for Sewage Treatment Plant: A Case Study of Srikakulam Greater Municipality, India. Environ Sci Ind J. 2016;12(9):112) | | |
|---|---|---|---|
| | **Based on the above case study, please answer below mentioned questions**<br>   a)  Define term wastewater. | **05** | **CO1** |
| |    b)  Identify the type of secondary wastewater treatment process was involved in Srikakulam sewage treatment plant. Explain it. | **10** | **CO3** |
| **Section D**<br>**(2Qx10M=20 Marks)** | | |
| **Q 1** | With the help of well labelled diagram, discuss the working mechanism of VAM. | **10** | **CO2** |
| **Q2** | Briefly discuss the process bioethanol production with the help of well labelled process diagram. | **10** | **CO2** |