M.E. BIO-PROCESS ENGINEERING FIRST YEAR SECOND SEMESTER - 2018
ENVIRONMENTAL BIOTECHNOLOGY   **Full Marks :100**

Answer any four questions

1. Write down the microbial factors and environmental factors which can affect the biodegradation. Write down the mechanism of biodegradation of benzene/phenol. Briefly describe phytoremediation and its advantages   **7+8+10**

2. Design a conventional activated sludge plant to treat 20000 kl/d of settled solid of BOD is 200 mg/l. The effluent BOD is 30 mg/l. F/M ratio is 0.22, MLSS is 3000 mg/l. Adopt diffusion aeration system SVI = 90. Air required is 100 m^3/d/kg of BOD removed. Standard diffusion plates of 0.3 m x 0.3 m x 25 mm and pore size is 0.3 mm.
   Define F/M ratio and sludge volume index   **15+ 5+5**

3. Assuming suitable criteria, design a facultative waste stabilization pond to treat 4 MLD flow of sewage having 300 mg/L BOD_5. Desired effluent BOD_5 is 30 mg/L. Assume BOD removal rate constant as 0.1 d^{-1} at 20 ^{0}C. The ponds are to operate at an altitude of 1000 m and 30^0 latitude in India. The wastewater temperature is 15 ^{0}C. Individual pond area and depth should not be more than 3 hectares and 1.5 m respectively. Organic loading rate is 182 kg BOD/ha/d. Hydraullic retention time 60 days on the basis of summer and winter conditions. Determine pond area, volume of pond, pond surface area and number of ponds.   **25**

4. Write down the difference between aerobic and anaerobic process.
   1st stage of BOD of a sample is 50 ppm. 5 day BOD at 20C is 41 ppm. What will be the reaction rate constant if the sample temperature is at 30C?
   Briefly describe activated sludge process and its application   **4+12+9**

5. Determine the values of bio-kinetic constant using the data given in table derived from the laboratory experiments carried out on the CFSTR model of an activated sludge process without recycle.   **25**

Table:

Sl No	Influent substrate conc, (mg/L)	Reactor substrate concentration, (mg/L)	Detention time, Days	Reactor biomass concentration (mg/L)
1	350	12	3.8	132
2	350	20	2.6	130
3	350	34	1.8	132
4	350	60	1.3	123
5	350	70	1.2	119