Environmental Biotechnology (BBL341)

Minor II Examination

Full Marks 20 **Time 1 hr**

1. a) Define and mention significance of BOD and BOD/COD
   b) List the factors responsible for promoting antimicrobial resistance proliferation
   c) Derive the relation between θ and θc in Activated Sludge Reactor

[4+2+6]

2. Design a STP having completely mixed activated sludge system for a city of 850000 residents. Per capita water requirement in the city is 120 l/d. θ=3 h, θc = 5 d, effluent BODu = 1.46 BOD_5, 25 % of influent BOD_5 and TKN reductions happen in PST, Yield coefficient Y = 0.5; Decay constant K_d = 0.08 d^{-1}; Specific substrate utilization rate = (0.05 mg/l)$^{-1}$ (h)$^{-1}$ at ambient temperature, oxygen required for nitrification = 5 kg/d TKN oxidized, MLSS = 3850 mg/l, in the effluent, 85% SS are VSS, 80 % VSS are biodegradable, suspended solids concentration of return flow is 1.2%, specific gravity of sludge =1.2, BODu of waste sludge = 1.35 BOD_5, efficiency of blower used for aeration is 65% and blower requires 1kwh to supply 1 kg oxygen.

The STP influent and effluent characteristics are given below:

Parameters	Influent	Effluent
BOD_5	25 g/person-day	25 mg/l
COD	48 g/person-day	250 mg/l
TKN	10 g/person-day	0 mg/l
NO_3	0 g/person-day	Not measured

Estimate F/M ratio (kg BOD_5 per kg MLSS per day) in aeration tank, recycle ratio used to return sludge from settler to the aeration tank, flow rate of recycle stream (m^3/d), amount of liquid sludge to be removed (m^3/d), total oxygen required, energy required for aeration. [8]