

Department of Civil Engineering-I.I.T. Delhi
CVL723 Wastewater Engineering (Dr.Arun Kumar, arunku@civil.iitd.ac.in)
March 16th, 2021, Minor Exam (4pm-5pm; 50 marks)

Declaration (must to be submitted along with answers)

Name of student:ASHISH SAINI.....

By appearing in this exam and submitting my answer script /online response, I agree that,

1. I will not give or receive any form of aid in examinations or assignments, which is against the spirit of the examination;
2. I would take part in the examination/assignment honestly, abiding by all the rules of the examination/assignment.
3. I will do my share and take an active part in seeing to it that others, as well as myself, uphold the spirit and letter of the Honour Code of IIT Delhi.

I submit that at the time of admission to IIT Delhi, I signed the Honour Code and I realize that any violation of that could invite disciplinary action.

ASHISH SAINI

Signature

Instructions

Kindly finish this paper by 5pm and send the answer sheet by 5:10pm. After this marks will be deducted. (<5min delay=5% deduction of maximum marks (50); then 10% deduction/ minute delay)

Notes: Answer all the questions; Assume any missing data and mention; Attempt every question with a new page.

Q1. AA community produces 1MLD wastewater. Using PST effluent characteristics (5-dBOD=160mg/L), design an aeration basis on solids retention time (desired effluent BOD₅=20 mg/L). Wastewater sample is collected from the biological reactor and is found to contain a suspended solids concentration of 4,300 mg/L. The suspended solids concentration in the secondary sludge is 15,000 mg/L. Biomass related characteristics: $Y=0.55$, $k_0=0.1/\text{day}$; $k_d=0.05/\text{day}$, $K_s=10 \text{ mg/L BOD}_5$. The mean cell retention time of the solids is 4 days and sludge is processed on the belt filter press every 5 days. Calculate oxygen required for achieving the treatment goal? [15 points]

Q2. Write a mass balance reaction for biomass for the contact-stabilisation process. [10 points]

Q3. Identify electron donor and electron acceptor for nitrification in an MBBR(media=AquaCell; BOD₅ removal ability of media=0.67 mg nitrogen/m²/d; internal media specific surface area=466m²/m³)(wastewater flow rate =0.1 MLD). For 80% extent of nitrification of 100mg/L ammonia-N, calculate amount of biomass produced and amount of AquaCell media required for sustaining bacterial community in the MBBR[5+5+5=15 points].

Q4. Write “Yes” or “No” (100% negative marking)(10points)

- 1) Chemoautotrophs derive energy from oxidation of organic compounds. _____
- 2) Lower F/M ratio indicates higher BOD removal in the plant. _____
- 3) Increasing order of ability to act as electron donor: Oxygen > nitrate ion > carbon dioxide _____
- 4) Suspended solids test for biomass quantification differentiates between biological solids and organic particles in the wastewater. _____
- 5) Anaerobic process has greater Y value as compared to aerobic process. _____