

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2022

Course: Advanced Environmental Engineering

Program: B.Tech (Civil Engineering)

Course Code: CIVL 3063P

Semester: V

Duration: 3 hrs.

Max. Marks: 100

Instructions: All questions are compulsory to attempt.

SECTION A (20 Marks)

S. No.	Question	Marks	CO
Q 1.	State the various natural forces of self-purification in a river stream along with their critical points.	4	CO2
Q 2.	Enlist the parameters that define the loading rates for an activated sludge plant.	4	CO4
Q 3.	Enumerate the different forms of nitrogen which may be present in wastewater.	4	CO1
Q 4.	State the types of sewerage system along with their critical points.	4	CO3
Q 5.	Analyze the relevance of egg shaped sewer section in sewerage system.	4	CO3

SECTION B (40 Marks)

Q 6.	Design a circular sedimentation tank for treating the sewage from a city with an average daily water demand of 11 Mld (presuming that activated sludge plant is to follow the sedimentation tank). Assume suitable data and figures where needed in accordance with design guidelines.	10	CO4
Q 7.	Analyze the various tests conducted on sewer pipes prior to their operational commencement.	10	CO3
Q 8.	A wastewater sample have a 5 days 20°C BOD of 300 mg/l. If the test temperature be 32°C, in how many days will the same value of BOD will be obtained.	10	CO1
Q 9.	Design a septic tank for a small colony of 320 persons provided with an assured water supply from the municipal load works at a rate of 120 liters per capita per day. Assume suitable data where needed in accordance with design guidelines. <p style="text-align: center;">OR</p> Describe the constructional and operational details of Grit chamber and Skimming tank in a wastewater treatment plant.	10	CO4

SECTION-C (40 Marks)

Q10.	A sludge digestion tank has to be designed for the primary sludge with an average sewage flow of 18 Mld. The total suspended solids concentrations in raw sewage is 280 mg/l and the moisture content of digested sludge comes out to be 80%. Design a sludge digestion tank for the above stated purpose. Assume any other suitable data according to design guidelines.	20	CO2
Q11.	<p>a. Analyze the different ways of expressing loading rates on trickling filter.</p> <p>b. Design suitable dimensions of a conventional circular trickling filter treating sewage having flow of 7.5 Mld and BOD content=255 mg/l. Also design the central column dimensions of rotary distributor for the above flow taking assumptions according to the design considerations.</p> <p style="text-align: center;">OR</p> <p>a. Out of Trickling filter and Activated sludge process which one is the better choice as a secondary treatment of sewage and why. Explain the reason in detail</p> <p>b. A high rate trickling filter has to be installed for the treatment of sewage flow of 3.8 Mld. The BOD of raw sewage is 210 mg/l and final effluent BOD concentration desired is 20 mg/l. The BOD removal in the primary sedimentation tank is 29% and recirculation ratio for the filter is 1.3. Calculate the dimensions of the high rate trickling filter required for the above stated purpose.</p>	07 13 06 14	CO4