

Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, May 2021

Course: Environmental Engineering II

Semester: VI

Program: B.Tech (Civil Engineering)

Time 3 hrs.

Course Code: HSFS 3021

Max. Marks: 100

Instructions: All questions are compulsory to attempt.

SECTION A (30 Marks)

S. No.	Question	Marks	CO
Q 1.	The various physical characteristics of wastewater are _____, _____, _____ and _____.	5	CO1
Q 2.	Enlist the different loading rates of an activated sludge plant.	5	CO4
Q 3.	Define the terms: Chemical Oxygen Demand and First Stage Biochemical Oxygen Demand.	5	CO1
Q 4.	Define the terms: Sewerage system and Design period.	5	CO3
Q 5.	The various additions and subtractions carried out from water supply for estimation of sewage discharge are _____, _____, _____ and _____.	5	CO3
Q 6.	The various natural forces of purification which can affect the self-purification process of natural streams are _____, _____, _____, _____ and _____.	5	CO2

SECTION B (50 Marks)

Q 7.	Design an oxidation pond for wastewater treatment from a hot residential colony with 7000 persons contributing wastewater at the rate of 140 l/h/d. The BOD ₅ of the wastewater is 225 mg/L.	10	CO4
Q 8.	A high rate trickling filter has to be installed for the treatment of sewage flow of 4.5 Mld. The BOD of raw sewage is 220 mg/l and final effluent BOD concentration desired is 35 mg/l. The BOD removal in the primary sedimentation tank is 25% and recirculation ratio for the filter is 1.1. Calculate the dimensions of the high rate trickling filter required for the above purpose.	10	CO4
Q 9.	The BOD of a sewage sample incubated for 5 days at 20°C was found to be 200 mg/l. Determine the value of 8 day BOD at 28°C for the sewage sample.	10	CO1
Q 10.	Explain the laying procedure of sewer pipes in real field conditions.	10	CO3
Q 11.	Construction of a conventional activated sludge plant (ASP) with diffused aeration system has to be carried out for treatment of domestic sewage from a town with population of 40,000. The average sewage flow is 170 lpcd and BOD of raw sewage	10	CO4

	is 200 mg/l. Before the treatment in ASP, the BOD removal in primary treatment is found to be 23% and overall BOD reduction desired is 86%. Take F/M ratio as 0.32 and MLSS concentration as 1900 mg/l. Calculate the efficiency required in activated sludge plant and the volume of the aeration tank required for the above treatment.		
SECTION-C (20 Marks)			
Q12.	<p>A city discharges 1200 liters per second of sewage into a stream whose minimum rate of flow is 5000 liters per second. The temperature of the sewage as well as water is 20°C. The BOD₅ at 20°C for sewage is 175 mg/l and that of river water is 0.8 mg/l. The D.O. content of sewage is zero and that of the stream is 92% of the saturation value. If the minimum D.O. to be maintained in the stream is 4.5 mg/l, find out the degree of sewage treatment required (Assume $K_D = 0.1$ and $K_R = 0.3$). Take value of saturation D.O. at 20°C as 9.2 mg/l.</p> <p style="text-align: center;">OR</p> <p>Design a sludge digestion tank for the primary sludge with an average sewage flow of 19 Mld. The total suspended solids concentration in raw sewage is 270 mg/l and the moisture content of digested sludge is 88%. Assume any other suitable data and figures according to design guidelines.</p>	20	CO2
		20	