

<b>Name:</b>	
<b>Enrolment No:</b>	

**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**  
**End Semester Examination, December 2018**

<b>Course: Environmental Engineering II (CEEG 352)</b>	<b>Semester: VII<sup>th</sup></b>
<b>Programme: B.Tech (Civil Engineering)</b>	
<b>Time: 03 hrs.</b>	<b>Max. Marks: 100</b>
<b>Instructions: All questions are compulsory to attempt</b>	<b>PAPER I</b>

**SECTION A**

S. No.	Question	Marks	CO
Q 1	What do you understand by self-cleansing velocity in sewer and also explain its relevance.	04	CO1
Q 2	Analyze the term “Relative Stability” and “Population Equivalent” in sewage characterization.	04	CO2
Q 3.	Plastic and stone media both can be used as a filtering media in filters, out of these two which will have high hydraulic loading rate and why	04	CO3
Q 4.	Explain briefly the two distinct temperature zones which can be found during sludge digestion process.	04	CO4
Q 5	What do you understand by term “Dilution Factor” in sewage disposal and also state its importance.	04	CO4

**SECTION B**

Q 1	The BOD <sub>5</sub> of a waste has been measured as 400 mg/l. If $k = 0.23$ per day, determine the ultimate BOD of the waste. Also find what proportion of the ultimate BOD would remain unoxidised after 18 days.	10	CO2
Q 2	Design a circular sedimentation tank for treating the sewage from a city with an average daily water demand of 9 Mld. Assume suitable data and figures where needed in accordance with design guidelines	10	CO3
Q 3	Explain in detail the entire treatment processes adopted for sewage treatment along with their critical points.  OR What do you understand by sewer appurtenances and explain the importance of Manhole and Drop Manhole as a sewer appurtenance.	10	CO3  CO1
Q 4	Design a septic tank for a small colony of 250 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.	10	CO3

**SECTION-C**

Q 1	A high rate trickling filter has to be installed for the treatment of sewage flow of 5 Mld. The BOD of raw sewage is 230 mg/l and final effluent BOD concentration desired is 40 mg/l. The BOD removal in the primary sedimentation tank is 22% and recirculation ratio for the filter is 1.2. Determine the dimensions of the high rate	13	CO3
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**PAPER II**

**SECTION A**

S. No.		Marks	CO
Q 1	Enumerate the different additions and subtractions from the water works to be done for determining the precise quantity of sewage production from a city.	04	CO1
Q 2	Explain the reason for incubating BOD bottles in dark conditions during the experiment and also write the expression used for BOD calculation.	04	CO2
Q 3.	Mention the essential functional difference between the Grit chamber and Sedimentation chamber for sewage treatment.	04	CO3
Q 4.	Explain briefly the factors affecting sludge digestion process in a digestion tank.	04	CO4
Q 5	What do you understand by Oxygen Deficit of a polluted river stream and also explain its relevance.	04	CO4

**SECTION B**

Q 1	A sample of sewage is estimated to have a 5 days 20°C BOD of 210 mg/l. If the test temperature be 25°C, in how many days will the same value of BOD will be obtained. The k value is known to be 0.23 per day at 20°C.	10	CO2
Q 2	Design a rectangular sedimentation tank for treating the sewage from a city with an average daily water demand of 10 Mld. Assume suitable data and figures where needed in accordance with design guidelines	10	CO3
Q 3	Explain the functional difference between Grit chamber and Primary clarifier in sewage treatment. Also mention the most essential point to be considered during designing of the Grit chamber. <p style="text-align: center;">OR</p> Explain in detail the importance of Lamp holes and Street Inlets as a sewer appurtenance.	10	CO3 CO1
Q 4	Design an Oxidation pond for a residential colony of 4000 persons and maximum water demand of 130 liters per capita per day. The sewage generated by the colony is found to have the BOD content of 250 mg/l.	10	CO3

**SECTION-C**

Q 1.	A city discharges 1400 liters per second of sewage into a stream whose minimum rate of flow is 5800 liters per second. The temperature of the sewage as well as water is 20°C. The BOD <sub>5</sub> at 20°C for sewage is 195 mg/l and that of river water is 0.85 mg/l. The D.O. content of sewage is zero and that of the stream is 90% of the saturation value. If the minimum D.O. to be maintained in the stream is 4.5 mg/l, find out the	20	CO4
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	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 9.17 mg/l.		
Q 2.	<p>Design suitable dimensions of a circular trickling filter treating sewage having flow of 10Mld and BOD content=220 mg/l. Also design the central column for rotary distributor system of the filter. Assume suitable data and figures where needed in accordance with design guidelines.</p> <p style="text-align: center;">OR</p> <p>A conventional activated sludge plant (ASP) with diffused aeration system has to construct for treatment of domestic sewage from a town with population of 42,000. The average sewage flow is 185 lpcd and BOD of raw sewage is 230 mg/l. Before the treatment in ASP, the BOD removal in primary treatment is found to be 28% and overall BOD reduction desired is 88%. Take F/M ratio as 0.34 and MLSS concentration as 2200 mg/l. Determine the efficiency required in activated sludge plant and the volume of the aeration tank required for the above treatment. Also check for the hydraulic retention time and volumetric loading for the plant.</p>	20	CO3
		20	CO3