Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018

Course: Environmental Engineering I (CEEG 351) **Semester: VIth**
Program: B.Tech (Civil Engineering)
Time: 03 hrs. **Max. Marks: 100**

Instructions: All questions are compulsory to attempt.

SECTION A

S. No.		Marks	CO
Q1.	Explain how ratio method can be used for future population forecasting of a city.	**05**	**CO1**
Q2.	The population of a town in three consecutive years are 5000, 7000 and 8400 respectively. What will be the population of the town in the fourth consecutive year according to: a). Arithmetical increase method b). Geometrical increase method .	**05**	**CO1**
Q3.	Enlist and explain the various forms of nitrogen which may be present in water.	**05**	**CO2**
Q4.	What is the process of determining the optimum dose of chlorine for a given water sample.	**05**	**CO4**

SECTION B

Q1.	a). In a water treatment plant, the pH values of incoming and outgoing waters are 7.2 and 8.4 respectively. Assuming a linear variation of pH with time, determine the average pH value of water. b). Determine the carbonate and non-carbonate hardness of a water sample having 120 mg/l of Ca^{2+} and 60 mg/l of Mg^{2+}. The alkalinity of the sample is recorded as 200 mg/l.	**05** **05**	**CO2**
Q2.	Explain the intake structure generally used for withdrawal of water from the reservoirs (taken as a source). OR Explain the intake structure generally used for withdrawal of water from the rivers (taken as a source).	**10**	**CO1**
Q3.	Explain the orthotolidine test used for determination of residual chlorine. While performing orthotolidine test, yellow colour of a water sample after 5 seconds resembles 3 mg/l standard of chlorine and after 5 minutes it resembles 3.5 mg/l standard. Determine the total residual, combined residual and free residual chlorine concentration in water sample.	**10**	**CO4**

Q4.	Discuss the various types of water demands for an average Indian city. Also explain the factors affecting per capita demand in a city.	**10**	**CO1**
	SECTION-C		
Q1.	Design a coagulation-cum-sedimentation tank with continuous flow for a population of 80,000 persons with a daily per capita water allowance of 120 litres. Assume suitable data wherever necessary in accordance with design guidelines. OR A rectangular sedimentation tank is to handle 10 MLD of raw water. A detention tank of width to length ratio of 1/3 is proposed to trap all particles larger than 0.04 mm in size. Assuming a relative density of 2.65 for the particles and 20^0C as the average temperature, compute the tank dimensions. If the depth of the tank is 3.5 m, determine the detention time.	**20**	**CO3**
Q2.	A town is having a population of 100000 and daily water demand of 100 lpcd. Design a rapid sand filter unit for the above town requirement with details of under drainage system and back water washing including wash water gutter arrangement. Assume suitable data and figures where needed in accordance with design guidelines.	**20**	**CO3**

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SECTION A

S. No.		Marks	CO
Q1.	Explain the multiple tube fermentation technique used for determination of pathogenic bacteria in a water sample.	**05**	**CO2**
Q2.	Explain how master plan method can be used for future population forecasting of a city	**05**	**CO1**
Q3.	The population of a town in three consecutive years are 8000, 10000 and 14000 respectively. What will be the population of the town in the fourth consecutive year according to both Arithmetical increase method and Incremental increase method	**05**	**CO1**
Q4.	Enlist the various forms of applying chlorine to the water for treatment purpose.	**05**	**CO4**

SECTION B

Q1.	Explain the breakup of various types of water demands for an average Indian city. Also explain the factors affecting per capita demand in a city.	**10**	**CO1**
Q2.	a). Explain about the disinfecting action of chlorine in a water sample. b). During an orthotolidine test, yellow colour of a water sample after 5 seconds resembles 3.5 mg/l standard of chlorine and after 5 minutes it resembles 4.5 mg/l standard. Determine the total residual, combined residual and free residual chlorine concentration in water sample.	**05** **05**	**CO4**
Q3.	a). A water sample is having 130 mg/l of Ca^{2+}, 80 mg/l of Mg^{2+} and 220 mg/l as alkalinity. Calculate the temporary and permanent hardness of the water sample. b). The pH values of incoming and outgoing waters in a water treatment plant are 7.4 and 8.6 respectively. Assuming a linear variation of pH with time, determine the average pH value of water.	**05** **05**	**CO2**
Q4.	Explain the twin well type of river intake structure with its critical points. OR Explain the dry and wet intake towers with their critical points.	**10**	**CO1**

SECTION-C			
Q1.	A city is having a population of 120000 and daily water demand of 120 lpcd. Design a rapid sand filter unit for the above city requirement with details of under drainage system and back water washing including wash water gutter arrangement. Assume suitable data where needed in accordance with design guidelines.	**20**	**CO3**
Q2.	Design a sedimentation tank for water works with supplies 2 MLD water to the town. The detention period is 6 hrs. The velocity of flow is 0.15 m/min and the depth of water in the tank is to be kept as 3.5 m. Assume an allowance for sludge as 90 cm. Also determine whether particles of diameter 0.07 mm and specific gravity 2.65 will be able to settle down in the tank or not. Take kinematic viscosity of water as 1.01×10^{-2} m /sec. OR A coagulation-cum-sedimentation tank with continuous flow has to be constructed for a population of 1,00,000 persons with a daily per capita water allowance of 130 litres. Design hydraulically the same assuming suitable data wherever necessary in accordance with design guidelines	**20**	**CO3**