UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2019

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

Instructions: All questions are compulsory to attempt   **SET A**

SECTION A

S. No.		Marks	CO
Q 1	Explain how comparative graphical method can be used for population forecasting.	04	CO1
Q 2	What do you understand by threshold number for a water sample. Also explain its relevance.	04	CO2
Q 3	Enlist the various forms of applying chlorine to the water for treatment purpose.	04	CO4
Q 4	Differentiate between the terms "Flocculation" and "Coagulation". Also enumerate the different units of a clariflocculator.	04	CO3
Q 5	Which turbidimeter is used for measuring low turbidity water samples and also state the working principle of the same (only key points)	04	CO2
	SECTION B		
Q 1	a. Explain the starch iodide test used for determination of residual chlorine.	06	
	b. While performing orthotolodine test, yellow colour of a water sample after 5 seconds resembles 2.2 mg/l standard of chlorine and after 5 minutes it resembles 2.8 mg/l standard. Determine the total residual, combined residual and free residual chlorine concentration in water sample.	04	CO4
Q 2	Explain briefly the different forms of nitrogen present in raw water and laboratory methods used for their determination. OR What is the measure adopted to determine pathogenic bacteria concentration in raw water sample. Also explain the membrane filter test performed for their determination	10	CO2
Q 3	A circular sedimentation tank fitted with standard mechanical sludge remover equipment is to handle 5 million liters per day of raw water. If the detention period of the tank is 4.5 hours and the depth of the tank is 3.2 m, what should be the diameter of the tank	10	CO3
Q 4	Explain the basic function of an intake structure. Also discuss the twin well type of river intake structure with its critical points.	10	CO1
	SECTION-C		
Q 1	A city is having a population of 110000 and daily water demand of 110 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	20	CO3

	suitable data and figures wherever needed according to design guidelines.		
Q 2	During sedimentation process in a continuous flow settling tank 3.5m deep and 55m long, what flow velocity of water would you recommend for effective removal of 0.02 mm particles at 25° C. The specific gravity of particles is 2.64 and kinematic viscosity for water may be taken as $0.01 cm^2$/sec.	**20**	**CO3**
	OR A rectangular sedimentation tank following coagulation-flocculation is to treat a flow of $2500 m^3$/day with a detention time of 5 hrs. The suspended solids concentration of the water reduced from 260 mg/l to 6 mg/l by coagulation flocculation. The alum dose used for the purpose is 1.5 kg/day. The settled sludge has a moisture content of 83% and specific gravity of 1.20. Calculate the volume of sludge produced per day from the tank.	**20**	**CO3**

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SECTION A

S. No.		Marks	CO
Q 1	Discuss the method generally used for population forecasting in well planned cities.	**04**	**CO1**
Q 2	Enlist and explain briefly the various forms of nitrogen which may be present in water.	**04**	**CO2**
Q 3	Which turbidimeter cannot be used for measuring low turbidity water samples and also state the working principle of the same (only key points).	**04**	**CO2**
Q 4	Why the use of inclined screens is preferred during the screening process in water treatment.	**04**	**CO3**
Q 5	Explain the process for determining the optimum dose of chlorine for a given water sample	**04**	**CO4**

SECTION B

Q 1	What do you understand by an intake structure. Also explain the dry and wet intake towers with their critical points.	**10**	**CO1**
Q 2	Discuss the different physical quality parameters of water along with their critical points and prescribed permissible limits. OR Discuss the different methods generally performed for determining coliform bacteria concentration in raw water sample.	**10**	**CO2**
Q 3	Design a coagulation-cum-sedimentation tank with continuous flow for a population of 90,000 persons with a daily per capita water allowance of 125 litres. Assume suitable data wherever necessary in accordance with design guidelines	**10**	**CO3**
Q 4	Explain in detail the Break Point Chlorination process with graphical aspect used for disinfection purpose	**10**	**CO4**

SECTION-C

Q 1	A rectangular sedimentation tank following coagulation-flocculation is to treat a flow of 2200m^3/day with a detention time of 4 hrs. The suspended solids concentration of the water reduced from 240 mg/l to 7 mg/l by coagulation flocculation. The alum dose used for the purpose is 1 kg/day. The settled sludge has a moisture content of 80% and specific gravity of 1.23. Determine the volume of sludge produced per day from the tank. OR	**20**	**CO3**

	In a continuous flow settling tank 3m deep and 60m long, what flow velocity of water would you recommend for effective removal of 0.025 mm particles at 25° C. The specific gravity of particles is 2.65 and kinematic viscosity for water may be taken as 0.01cm^2/sec.	**20**	**CO3**
Q 2	A town is having a population of 130000 and daily water demand of 120 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 wherever needed according to design guidelines	**20**	**CO3**