Roll No.													

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST –1

Winter Semester: 2021 - 22
Course Code: CIV 222
Course Name: Water infrastructure systems
Program & Sem: B.Tech, VI Semester

Date: 26th April 2022
Time: 10:00 AM to 11:00 AM
Max Marks: 30
Weightage: 15

Instructions:

(i) Read the question properly and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and Non-programmable calculators are permitted.

Part A [Memory Recall Questions]

Answer both the Questions. Each question carries FOUR marks. (2Qx4M=8M)

1. Define per capita water demand and list the factors affecting per capita water demand. (C.O.1) [Knowledge]

2. Write a note on any two types of water demand. (C.O.1) [Knowledge]

Part B [Thought Provoking Questions]

Answer both the Questions. Each question carries SIX marks. (2Qx6M=12M)

3. Duty of an engineer in designing a water supply scheme for a particular section of community is to evaluate the amount of water available and amount of water demanded by the public and to design a water supply. Discuss the objectives of the community water supply system. (C.O.1) [Comprehensive]

4. This method is a modification of arithmetical increase method and it is suitable for an average size town under normal condition where the growth rate is found to be in increasing order. The population of 5 decades from 1970 to 2010 are given below. Find out the population after 2 and 3 decades beyond the last known decade.

Year	1970	1980	1990	2000	2010
Population	25000	28000	34000	42000	47000

(C.O.1) [Comprehensive]

Part C [Problem Solving Questions]

Answer the Question. Question carries TEN marks. (1Qx10M=10M)

5. A water supply scheme has to be designed for a city having a population of 100,000. Estimate the important kinds of draft which may be required to be recorded for an average water consumption of 250 lpcd. Also record the required capacities of the major components of the proposed water works system for the city using a river as the source of supply. (C.O.1) [Application]

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF Engineering

Extract of Question Distribution [outcome wise & level wise]

Winter Semester: 2021 - 22
Course Code: CIV 222
Course Name: Water Infrastructure Systems
Program & Sem: B.tech & VI

Date: 26-04-2022
Time: 10:00 AM to 11:00 AM
Max Marks: 30
Weightage: 15%

Q.NO	C.O.NO (%age of CO)	Unit/Module Number/Unit /Module Title	Memory recall type [Marks allotted] Bloom's Levels	Thought provoking type [Marks allotted] Bloom's Levels	Problem Solving type [Marks allotted]	Total Marks
			K	C	A	
1	1	Module 1	4			4
2	1	Module 1	4			4
3	1	Module 1	4			4
4	1	Module 1		5		5
5	1	Module 1		5		5
6	1	Module 1			8	8
	Total Marks		12	10	8	30

K =Knowledge Level C = Comprehension Level, A = Application Level

Note: While setting all types of questions the general guideline is that about 60%

Of the questions must be such that even a below average students must be able to attempt, About **20% of the questions must be such that above average students** must be able to attempt and finally **20% of the questions must be such that only the bright students** must be able to attempt.

I hereby certify that all the questions are set as per the above guidelines.

Mr. Santhosh M B

Reviewer’s Comments:

Annexure- II: Format of Answer Scheme

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

SOLUTION

Winter Semester: 2021 - 22
Course Code: CIV 222
Course Name: Water Infrastructure Systems
Program & Sem: B.tech & VI

Date: 26-04-2022
Time: 10:00 AM to 11:00 AM
Max Marks: 30
Weightage: 15%

Part A (3Q x4 M =12 Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
1	**Per capita water demand** It is an average amount of water demanded by an average individual live in a community. Or Per capita water demand = Volume/(population X 365) It will be expresses in terms of lpcd. factors affecting per capita water demand are a) Size of the city b) Living standards of people c) Climatic conditions d) Quality of water e) System of Supplies f) Cost of water g) Intensity of industrial and commercial activities	Definition: **1M** 6 Factors affecting per capita demand **3M**	5 Minutes
2	a) **Total demand:** Greater of following 1) Maximum daily demand + fire demand 2) Maximum hourly demand Called as total draft b) **Coincident demand:** Maximum daily demand + fire demand.	**2 X 2 = 4M**	5 Minutes

	Called as coincident draft		
3	Factors governing the selection of a particular source of water ➢ Quantity of water ➢ Quality of water ➢ Distance between source and supply ➢ Topography between source and supply ➢ Elevation between source and supply	4 factors **4 X 1 = 4 M**	5 Minutes

Part B (2Q x 5 M = 10 Marks)

Q No	**Solution**	**Scheme of Marking**	**Max. Time required for each Question**
4	**Solution** Year | Population | Increment | Geometrical increase Rate of growth 1961 | 858545 | - | 1971 | 1015672 | 157127 | (157127/858545) = 0.18 1981 | 1201553 | 185881 | (185881/1015672) = 0.18 1991 | 1691538 | 489985 | (489985/1201553) = 0.40 2001 | 2077820 | 386282 | (386282/1691538) = 0.23 2011 | 2585862 | 508042 | (508042/2077820) = 0.24 Geometric mean $I_G = (0.18 \times 0.18 \times 0.40 \times 0.23 \times 0.24)^{1/5}$ $= 0.235$ i.e., 23.5% Population in year 2021 is, $P_{2021} = 2585862 \times (1+0.235)^1 = 3193540$ Similarly for year 2031 and 2041 can be calculated by, $P_{2031} = 2585862 \times (1+0.235)^2 = 3944021$ $P_{2041} = 2585862 \times (1+0.235)^3 = 4870866$	Tabular column with all details 1M Geometric mean method formula 1M Population for the year 2021, 2031, and 2041 (1 X 3) = 3M	15 Minutes
5	$Q = 4637\sqrt{P}\,(1 - 0.01\sqrt{P}\,)$ P = 100 Q = 41733 lpm Total volume of water required to extinguish fire = Q X duration of fire fighting = 41733 X 5 X 60 = 12.52 X 10^6 litres Fire demand in lpcd = 12.52 X 10^6 litres/(100000 X 30) = 4.173 lpcd	Formula 2 M Fire demand in liters 2 M Fire Demand in lpcd = 1M	15 Minutes

Part C (1Q x 8 M = 8 Marks)

Q No	**Solution**	**Scheme of Marking**	**Max. Time required for each Question**
6	Average daily demand = 250 X 100000 Q_{avg} = 25 MLD Maximum daily demand = 1.8 Q_{avg} $Q_{Max.daily}$ = 45 MLD Maximum hourly demand = 2.7 Q_{avg} $Q_{Max.hourly}$ = 67.5 MLD Fire demand ($Q_{fire\ demand}$) = 60 MLD (Given) Where P is population in thousands $Q_{fire\ demand}$ in liters/minute Coincident draft = Maximum daily demand + Fire demand = 105 MLD Design capacity of distribution pipes = Total demand Greater of following 1) Maximum daily demand + fire demand 2) Maximum hourly demand Called as total draft Therefore Design capacity of distribution pipes = 105 MLD 1) Storage reservoir = $Q_{Max.daily}$ = 45 MLD 2) Intake structure = $Q_{Max.daily}$ = 45 MLD 3) Distribution/Service reservoir = $Q_{Max.hourly}$ = 67.5 MLD 4) Distribution pipes (system) = Total demand = 105 MLD	Q_{avg} = 25 MLD 1M $Q_{Max.daily}$ = 45 MLD 1M $Q_{Max.hourly}$ = 67.5 MLD 1M Coincident draft = 105 MLD 1M Storage reservoir capacity 1M Intake structure capacity 1M Distribution/Service reservoir capacity 1M Distribution pipes (system) 1M	15 Minutes

Roll No.													

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST –2

Winter Semester: 2021 - 2022
Course Code: CIV 222
Course Name: Water infrastructure systems
Program & Sem: B.Tech, 6th Semester

Date: 1st June 2022
Time: 10:00 AM to 11:00 AM
Max Marks: 30
Weightage: 15%

Instructions:

(i) Read the question properly and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and Non-programmable calculators are permitted.

Part A [Memory Recall Questions]

Answer both the Questions. Each question carries four marks. (2Qx4M=8M)

1. Coagulation is a process used to remove turbidity, color, and some bacteria from water. In relation to this what are Primary coagulants and Coagulant aid.

[4M](C.O.2) [Knowledge]

2. Sedimentation is a process of removal of settable solids (Suspended or colloidal particles) present in raw water. Write a short note on types of settling in theory of sedimentation.

[4M](C.O.2) [Knowledge]

Part B [Thought Provoking Questions]

Answer both the Questions. Each question carries six marks. (2Qx6M=12M)

3. A flash mixer of 2 m3 with a velocity gradient of mixing mechanism equal to 600 S^{-1} and fluid absolute viscosity 1 x 10^{-3} N – Sec/ m2 is continuously operated . What is the power input per unit volume? [6M](C.O.2) [Comprehension]

4. A rectangular sedimentation tank is designed for a surface overflow rate of 12,000 liters/hr/m2. What percentage of suspended particles of diameter 0.03 mm will be removed in the tank. Take kinematic viscosity (ɣ) = 0.897 mm2/sec and specific gravity of particles 2.65. [6M](C.O.2) [Comprehension]

Part C [Problem Solving Questions]

Answer the Question. The question carries ten marks. (1Qx10M=10M)

5. Water available in various sources contains various types of impurities and cannot be directly used by the public for various purposes, before removing the impurities. For potability water should be free from unpleasant tastes, odours and must have sparkling appearance. The water must be free from disease-spreading germs. The amount and type of treatment process will depend on the quality of raw water and the standards of quality of raw water and the standards of quality to be required. With the help of flow chat explain treatment of surface water.

[10M](C.O.2) [Application]

Roll No												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

END TERM FINAL EXAMINATION

Winter Semester: 2021 - 22
Course Code: CIV 222
Course Name: Water Infrastructure Systems
Program & Sem: B.Tech (CIV) & VI Sem

Date: 29th June 2022
Time: 9:30 AM to 12:30 PM
Max Marks: 100
Weightage: 50%

Instructions:

(iv) Read the all questions carefully and answer accordingly.
(v) Scientific and Non-programmable calculators are permitted.

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries SIX marks. (4Qx 6M= 24M)

1. The amount and type of treatment process will depend on the quality of raw water and the standards of quality of raw water and the standards of quality to be required. Draw the flow chart for surface water treatment. (C.O.No.2) [Knowledge]

2. Water is tested for their quality once before treatment and once after treatment. To know the extent of impurities present in raw water, waters are thoroughly tested based on that degree of treatment, method of treatment and line of treatment is decided. In relation to this list various physical and chemical parameters to be tested. (C.O.No.1) [Knowledge]

3. The distribution pipes are generally laid below the road pavements, and as such their layouts generally follow the layouts of roads. There are general, four different types of pipe networks; any one of which either single or in combinations, can be used for a particular place. Sketch any two layouts of distribution network. (C.O.No.3) [Knowledge]

4. Filtration is a process of passing water through beds of sand or other granular media. What are the mechanisms of the theory of filtration?
(C.O.No.2) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries TEN marks.

(4Qx10M=40M)

5. Wholesome water chemically may not be pure but doesn't contain anything harmful to human being. Discuss the requirements of wholesome water. (C.O.No.1) [Comprehension]

6. Chlorination serves not only for disinfection, but as an oxidant for other substances like iron, manganese, cyanide and for taste and odor control in water. Depict break point chlorination.

   (C.O.No.2) [Comprehension]

7. A water supply pipe of diameter 0.5 m conveying 0.8 m^3/sec of water from a source, where lowest water level is at RL 92.00 m to a reservoir level where it is delivered at RL 108:00 m. The distance between source and supply is 500 m and friction factor of a pipe is 0.03. Find the capacity of pump required, if efficiency of pump and mechanical efficiency are 85% and 80% respectively.

   (C.O.No.3) [Comprehension]

8. Disinfection is a process of killing disease causing pathogens present in water. List any four requirements of ideal disinfectant and explain any two methods of disinfection of water.

   (C.O.No.2) [Comprehension]

Part C [Problem Solving Questions]

Answer all the Questions. Each question carries TWELVE marks.

(3Qx12M=36M)

9. For efficient distribution system adequate water pressure required at various points. Depending upon the level of source, topography of the area and other local conditions, the water may be forced into distribution system. Illustrate the methods of distribution system.

   (C.O.No.3) [Application]

10. A town with population 50000 supplied water at a rate 200 lpcd. A bleaching powder dose of 2 mg/l containing 35% of chlorine added to water to have a residual chlorine of 0.2 mg/l. Find the monthly bleaching powder requirement in kg. Also find chlorine demand in kg/day.

    (C.O.No.2) [Application]

11. Find out the diameter of the conveying main required to handle a flow of 4 MLD from a source to town separated by a distance of 3 km. The elevation difference between source and supply is 8m. Take Hazen William's coefficient CH = 100. (C.O.No.3) [Application]