

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

**Course Code: CE405**  
**Course Name: ENVIRONMENTAL ENGINEERING- I**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any two full questions, each carries 15 marks.*

- |   |  | Marks |
|---|--|-------|
| 1 | a) What is fire demand? How will you calculate fire demand?  | (5)   |
|   | b) Explain in brief different methods used for prediction of future population of a city.          | (10)  |
| 2 | a) What are the various factors affecting "per capita demand"?                                     | (5)   |
|   | b) Explain Logistic curve method of population forecasting.  | (10)  |
| 3 | a) List out the different factors to be considered while selecting the location of an intake well. | (5)   |
|   | b) Describe the different methods for bacteriological analysis of water.                           | (10)  |

**PART B**

*Answer any two full questions, each carries 15 marks.*

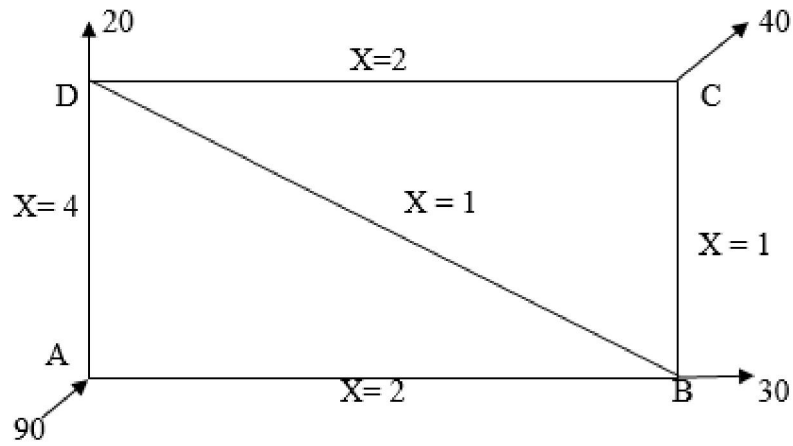
- |   |  |      |
|---|--|------|
| 4 | a) Differentiate between Type I and Type II settling.  | (4)  |
|   | b) Compare alum and iron salts as coagulants.  | (4)  |
|   | c) Illustrate with a sketch, the different functional zones of a rectangular sedimentation tank.       | (7)  |
| 5 | a) Explain the procedure for determination of Optimum Coagulant Dosage by Jar Test with a neat sketch. | (7)  |
|   | b) Explain the theory of sedimentation.  | (8)  |
| 6 | Design a rapid sand filter for a total demand of 6 MLD of water with all its principal components.     | (15) |

**PART C**

*Answer any two full questions, each carries 20 marks.*

- |   |   |      |
|---|---|------|
| 7 | a) Explain the various methods of disinfection of water.                  | (8)  |
|   | b) Explain breakpoint chlorination and super chlorination.                | (8)  |
|   | c) What is meant by fluoridation?   | (4)  |
| 8 | a) Explain the desalination process by electro-dialysis with neat sketch. | (5)  |
|   | b) Explain the types of aerators with suitable figures.                   | (10) |

- c) Give an account on Adsorption. (5)
- 9 a) The following pipe network consists of 5 pipes. The head loss in a pipe is given by  $hf = X.Q^2$ . The values of X for different pipes and the flows at nodes are given in figure. Calculate the discharge in each pipe of the network. (20)



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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

**Course Code: CE405**

**Course Name: ENVIRONMENTAL ENGINEERING- I**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) What are the various sources of water available on the Earth? (5)  
 b) What do you understand by the term 'Design Period'? (5)  
 c) Write a note on variation in rate of demand. (5)
- 2 a) Explain Graphical comparison method of population forecasting. (5)  
 b) The following is the population data of a city available from past census records. (10)  
 Determine the population of the city in 2021 by (a) arithmetical increase method  
 (b) geometrical increase method (c) incremental increase method.

Year	1941	1951	1961	1971	1981	1991	2001
Population	12500	17000	27000	42000	58000	68000	74000

- 3 a) Prepare a standard chart giving the drinking water quality standards for any 10 (5)  
 parameters as per BIS.  
 b) With the help of neat sketches, describe any two types of intakes? (5)  
 c) Explain any five chemical characteristics of water. (5)

**PART B**

*Answer any two full questions, each carries 15 marks.*

- 4 a) What is meant by coagulation? Enumerate the different coagulants used. (5)  
 b) Design a continuous flow rectangular sedimentation tank for a population of (10)  
 20,000 persons with an average per capita demand of 120 litres per day. Assume  
 detention period of 6 hours.
- 5 a) Design a clariflocculator for treating 3 MLD of water. Make suitable (15)  
 assumptions. Prepare a neat sketch.
- 6 a) Explain the theory of filtration. (4)  
 b) With a neat sketch, explain the working of a slow sand filter. (6)  
 c) Compare slow sand and rapid sand filters. (5)

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) What are the requirements of a good disinfectant. (4)  
b) Explain the theory of chlorination. (6)  
c) Explain different types of chlorination. (10)
- 8 a) Give an account on Ion Exchange Process. Explain its advantages also. (10)  
b) How can you remove permanent hardness by Lime Soda Process? (10)
- 9 a) What are the requirements of a good distribution system? (5)  
b) Write short note on the different layout of distribution networks. (10)  
c) Explain the equivalent pipe method with neat sketch. (5)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

**Course Code: CE405**

**Course Name: ENVIRONMENTAL ENGINEERING- I**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) Discuss the method of arriving at the quantity of water to be supplied to a community. (7)
- b) Compare the different sources of water for selecting them as a source for a water supply project. (5)
- c) Define MPN . Explain the significance of determining the same. (3)
- 2 a) Enlist any eight important chemical characteristics of raw water. Mention the method of analysis and its acceptable value as per drinking water quality standards of any three of them. (6)
- b) The population of a city in three consecutive years i.e. 1991, 2001 and 2011 is 80,000; 250,000 and 480,000, respectively. Determine (a) The saturation population, (b) The equation of logistic curve, (c) The expected population in 2021. (9)
- 3 a) Define intake as referred in a water supply system and distinguish between Dry intake and wet intake. Also list the important factors governing the selection of site for the selection of an intake (8)
- b) What are the points which needs consideration while selecting location for a pumping station? Compute the cost of electric energy in a month for a pump which is operated 8 hours daily for 30 days, The pump lifts 93600 litres of water per hour against a total head of 25 m. Pump has an efficiency of 75% and the electric motor have an efficiency of 80% .The cost of electric energy is Rs 15 per unit. (7)

**PART B**

*Answer any two full questions, each carries 15 marks.*

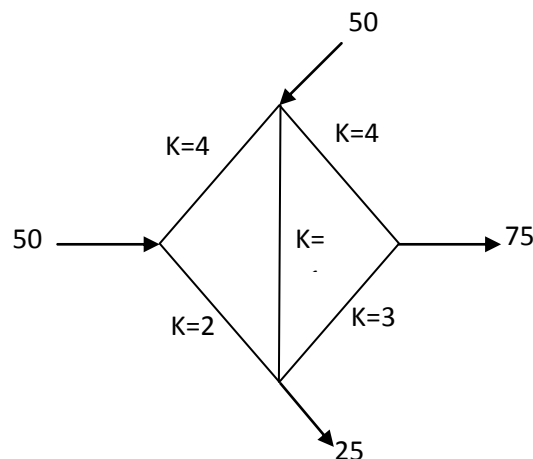
- 4 a) Distinguish between Type I and Type II settling of suspended particles. (4)
- b) Describe any two mixing devices of coagulants with figure. (6)

- c) Find the diameter of the particles with specific gravity 1.2 removed in a tank having a surface area of  $250 \text{ m}^2$ , treating 10 MLd of water at  $21^\circ\text{C}$ . (5)
- 5 a) Design a slow sand filter from following data. (5)
- |                         |   |                   |
|-------------------------|---|-------------------|
| Population to be served | = | 50,000 persons    |
| Per capita demand       | = | 150 Lpcd          |
| Rate of filtration      | = | 180 L/hr./sq.m    |
| Length of each bed      | = | Twice the breadth |
- Assume maximum demand as 1.8 times the average daily demand. Also assume that one out of six will be kept as stand by.
- b) Design a clariflocculator to treat 6 MLd of water. Assume suitable data wherever necessary. (10)
- 6 a) Name any four commonly used coagulant in water treatment. What are the factors which affect coagulant dosage. (5)
- b) With the help of a neat sketch explain the construction, working and back washing of a rapid sand filter. (10)

### PART C

*Answer any two full questions, each carries 20 marks.*

- 7 a) Define disinfection. Enlist various methods of disinfection and mention where they are suitable. (6)
- b) Explain various types of chlorination in water treatment? (8)
- c) Explain analysis of a water distribution system using Hardy Cross method. (6)
- 8 a) Discuss the purpose and methods of aeration in water treatment. (8)
- b) Explain any three common methods employed in desalination of water. (6)
- c) Explain equivalent pipe method in water distribution network design. (6)
- 9 a) Name the various types of water distribution systems. (4)
- b) Determine the distribution of flow in the pipe network shown in figure. The head loss  $h_L$ , may be assumed as  $KQ^2$ . The flow is turbulent and pipes are rough. The value of  $k$  for each pipe is indicated in the figure. Use Hardy-Cross method. (16)



**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Seventh semester B.Tech examinations (S), September 2020

**Course Code: CE405****Course Name: ENVIRONMENTAL ENGINEERING-I**

Max. Marks: 100

Duration: 3 Hours

**PART A***Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) With the help of neat sketches, explain Infiltration gallery and Infiltration well? (4)
- b) Enlist any four type of pumps usually used in water supply systems and the main factors which are to be considered while selecting a suitable pump. (5)
- c) Explain logistic curve method of population forecasting? (6)
- The present population of a city is 3,00,000 which was 1,70,000 twenty years ago and it was 30,000 forty years ago. Determine the population after next 20 years by logistic curve method?
- 2 a) Define per capita water demand? List any four major factors affecting the rate of demand of water and explain the concept of fluctuations in water demand? (6)
- b) The population statistics pertaining to a town are given below. Estimate the population expected in the year 2020 by Geometrical and incremental increase method? (6)

Year	1960	1970	1980	1990	2000
Population	70,000	1,00,000	1,50,000	2,10,000	2,50,000

- c) Explain the significance of indicator organisms like *E.coli* in bacteriological analysis of water? List various methods of enumerating them. (3)
- 3 a) Explain the significance and analysis of any four important physical characteristics and any six chemical characteristics of drinking water. (10)
- b) Define intake works in a water supply scheme? With the help of a neat figure, explain any one type of intake structure? (5)

**PART B***Answer any two full questions, each carries 15 marks.*

- 4 a) Distinguish between slow sand and rapid gravity filters? (5)
- b) A water treatment plant treating 50 MLD of water requires 20 mg/l of filtered alum? If this water has 5 mg/l of alkalinity as  $\text{CaCO}_3$ , determine the quantity of alum and quick lime required per day? (5)
- c) Distinguish between discrete particle settling and flocculent settling. Derive an expression for settling velocity of a discrete particle in water. (5)
- 5 a) Design a mechanical rapid mix unit for treating water at the rate of  $6000\text{m}^3 / \text{day}$ . Assume a detention period of 30 seconds and velocity gradient of  $600\text{ s}^{-1}$  (8)

- b) A circular sedimentation tank (bottom slope of 1V:12H) fitted with standard sludge removal equipment is to handle 3.6 MLD of water? If the detention period of the tank is 5 hours and the depth of the tank is 3m, what should be the diameter of the tank? (4)
- c) Write a note on any three operation troubles in filters. (3)
- 6 a) Design the principal components of a Rapid sand filter including manifold and under drainage system for treating 4 MLD of water? (12)
- b) Compare alum and iron salts as coagulant. (3)

### PART C

*Answer any two full questions, each carries 20 marks.*

- 7 a) Enlist and explain the different layout of distribution networks with their merits and demerits? (6)
- b) Explain Hardy-Cross method of analysis of complex pipe networks? (8)
- c) Differentiate fluoridation and defluoridation process. Give an example for each case. (6)
- 8 a) Explain Equivalent pipe method of water distribution network analysis. (6)
- b) List out common methods of disinfection usually employed in water treatment. Determine the annual requirement of bleaching powder to treat 6MLD of water which requires 0.3ppm of chlorine. The available chlorine in bleaching powder was found to be 25% only. (9)
- c) What are the requirements of a good water distribution system? (5)
- 9 a) Enlist any four factors affecting the efficiency of chlorination. Calculate the dosage of chlorine in mg/l and the chlorine demand of water if chlorine usage in the treatment of  $20,000\text{m}^3$  of water per day is 10 kg/day. A residual chlorine after 10 minutes of contact is to be maintained at 0.2 mg/l. (5)
- b) Enlist various pipe appurtenances in a water distribution network and with neat sketches explain any two of them. (10)
- c) Discuss demineralisation process and electro dialysis in water treatment. 5

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Reg No.: \_\_\_\_\_

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Seventh Semester B.Tech Degree Examination (Regular and Supplementary), December 2020

**Course Code: CE405****Course Name: ENVIRONMENTAL ENGINEERING- I**

Max. Marks: 100

Duration: 3 Hours

**PART A***Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) What are the necessities and components of a planned water supply scheme? (5)
- b) Population of 5 decades from 1970 to 2010 are given below. Find out the population in the year 2026 by incremental increase method. (10)

Year	Population
1970	30000
1980	35000
1990	38000
2000	42000
2010	45000

- 2 a) Explain any 5 physical characteristics of water. (5)
- b) What are the indicator organisms of microbiological quality? Explain MTFT for determination of microbiological quality of water. (10)
- 3 a) Specify the drinking water standards of any five chemical characteristics of water as per IS10500:2012. (5)
- b) Explain logistic curve method for forecasting population. Derive an equation for the logistic curve. (10)

**PART B***Answer any two full questions, each carries 15 marks.*

- 4 a) What is surface over flow rate and its significance in sedimentation? (5)
- b) Design a coagulation-cum-sedimentation tank for treating water to a city with 40000 persons. Assume suitable data required. (10)
- 5 a) Mention the commonly used coagulants for the removal of colloidal solids and explain the mechanism of removal. (8)
- b) Design slow sand filter/s for supplying water to a village having a population of (7)

30000 persons. Assume per capita demand as 140litres/day. Assume suitable data required.

- 6 a) With the help of a neat sketch explain the working of a pressure filter. (8)  
b) Explain the common operational troubles in a rapid sand filter. (7)

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) What is break point chlorination and its significance? (7)  
b) Describe any 2 methods of removing permanent hardness. (7)  
c) Water is supplied to a population of 20000 at a per capita demand of 135 litres per day. Bleaching powder contains 25% available chlorine. Determine how much bleaching powder is required annually if 0.5ppm of chlorine dose is required for disinfection. If residual chlorine is 0.2ppm at the end of contact time of 30 minutes, what is the chlorine demand? (6)
- 8 a) What is defluoridation? Describe any 2 methods of defluoridation. (6)  
b) Explain the process of electro dialysis with a neat sketch. (6)  
c) Describe the methods of distribution of water with advantages and disadvantages. (8)
- 9 a) Explain equivalent pipe method of analysis. (6)  
b) Derive the expression for correction to be applied in assumed flow in Hardy Cross method. (6)  
c) Describe the various types of distribution networks with neat sketches. (8)

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