BACHELOR OF ENGINEERING (CIVIL ENGINEERING) EXAMINATION 2023 ( SUPPL)
III RD YEAR, 2ND Semester Supplementary Examination 2023

SUBJECT:   WATER SUPPLY ENGINEERING

Full Marks 30/100

Time:   ~~Two hours~~/Three hours/~~Four hours/ Six hours~~

Use a separate Answer-Script for each part

| No. of Questions | Part I (Marks: 50) | Marks |
|---|---|---|
| | **PL. ANSWER ANY THREE ( 3) QUESTIONS**<br>**Two ( 2) marks are reserved for neatness and to the point answer.**<br>**Assume any relevant data if necessary.**<br><br>Q 1.<br>a) What do you understand by impurities of raw water? Why they are harmful?  ( 3+3= 6 )<br><br>b ) Draw a neat flow diagram showing different units for rendering fit for drinking purpose considering river is the source of water. Raw water shows presence of organics and dissolved gases.<br>Justify the purpose of providing the each unit.                                    ( 10)<br><br>Q2.<br>a) Distinguish between plain and chemical settling process. Under what circumstances they are adopted?                                          ( 3+2=5)<br><br>b)  Examine the validity of Stokes Law and settling velocity of a spherical silica particle of specific gravity 2.65, in water at $23^0$ C , if the diameter of the particles is 0.01 cm. Assume $v = 0.92$ centistokes                               ( 5)<br>c) What do you understand by Ideal settling basin? Prove that for an ideal settling tank overflow rate is a velocity term with same dimension.                    (6)<br><br>Q 3.<br>a) What are colloids? Why they are stable?                          ( 2+3 )<br>b) Explain the colloid stability in water with double layer  ionic theory    ( 5)<br>c) A Coagulation –sedimentation plant clarifies to supply27 MLD of water. The raw water contains an alkalinity equivalent of 12mg/l  $CaCO_3$. The filter alum requires a dose of 40mg/l. Determine the filter alum quantity and the quick lime ( containing 80% CaO) to be required per day for treating the water considering 3% loss of water in the plant. The plant operates 18 hrs including 30 minutes backwashing time.  Take Al=27, Ca=40, S=32. C=12.    ( 6)<br><br>Q 4.<br>a) What do you understand by filtration of water? What are the different mechanisms of filtration of water through granular bed media?                       ( 2+4) | |

b)With the help of a neat sketch explain the operation principle of rapid gravity sand filter. Show different valves for operation of the filter.                                      (  6)

c ) Compare rapid sand and slow sand filter process with different points of criterion. ( 4 )

Ref No. –EX/CE/ 5/T/305/2023 (S )

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## PART II (50 Marks)

**Group A:   Answer any two questions**        2x15

1.   Determine the future population for the year 2031 from the following data for a town; estimate by Geometrical increase and Incremental increase method.

| Year | Population |
|------|-----------|
| 1971 | 72,000 |
| 1981 | 80,000 |
| 1991 | 1,20,000 |
| 2001 | 1,70,000 |
| 2011 | 2,25,000 |

2.   A pipe network with two loops is shown in Fig. Determine the flow in each pipe for an inflow of 5 units at the junction A and outflows of 2.0 units and 3.0 units at junctions *D* and *C* respectively. The resistances R for different pipes are shown in the figure.
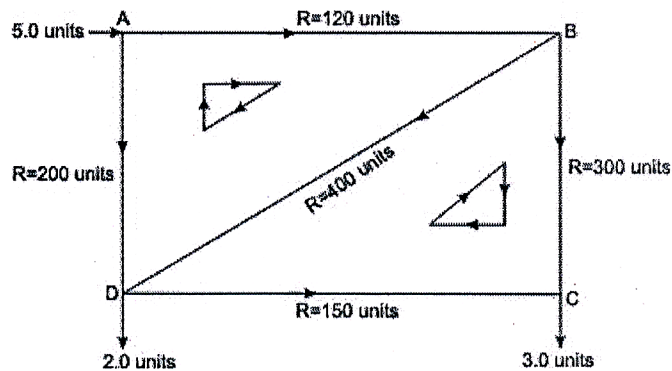


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3. The estimated hourly consumptions of water for a town for one day are given in the table. Determine the capacity of the distribution reservoir if the pump installed can supply the water in the reservoir at a uniform rate of 1.45 cu. m/sec.

| Time in hr | Consump. in Million litre /hr |
|---|---|
| 1 | 2.45 |
| 2 | 2.25 |
| 3 | 2.14 |
| 4 | 2.30 |
| 5 | 2.55 |
| 6 | 2.60 |
| 7 | 3.50 |
| 8 | 5.25 |
| 9 | 6.10 |
| 10 | 6.55 |
| 11 | 7.25 |
| 12 | 7.35 |
| 13 | 7.55 |
| 14 | 6.35 |
| 15 | 5.95 |
| 16 | 5.75 |
| 17 | 5.65 |
| 18 | 7.45 |
| 19 | 7.30 |
| 20 | 7.25 |
| 21 | 5.65 |
| 22 | 4.50 |
| 23 | 3.70 |
| 24 | 2.85 |

**Group B:  Answer any four questions**                                                                 4x5

4.Calculate the hydraulic gradient for a concrete pipe of diameter 2.5 m carrying a flow 3.0cumecby Modified Hazen William's formula.  Assume   CR for concrete pipe =1.0

5. Discuss the Bacteriological quality guideline for water in distribution system.

6. What is annual average daily demand?

If annual average daily demand of a town is 'q'    then

        i) what will be the maximum daily demand?

        ii) what will be the maximum hourly demand?

        iii) What will be the maximum hourly demand of the maximum day?

7.What are the factors affecting losses and wastes of water in a municipal water distribution system

8.  Draw the   Radial system, Ring system and the Dead end system of water supply network and discuss the merits of each system.