Unit - I

INTRODUCTION

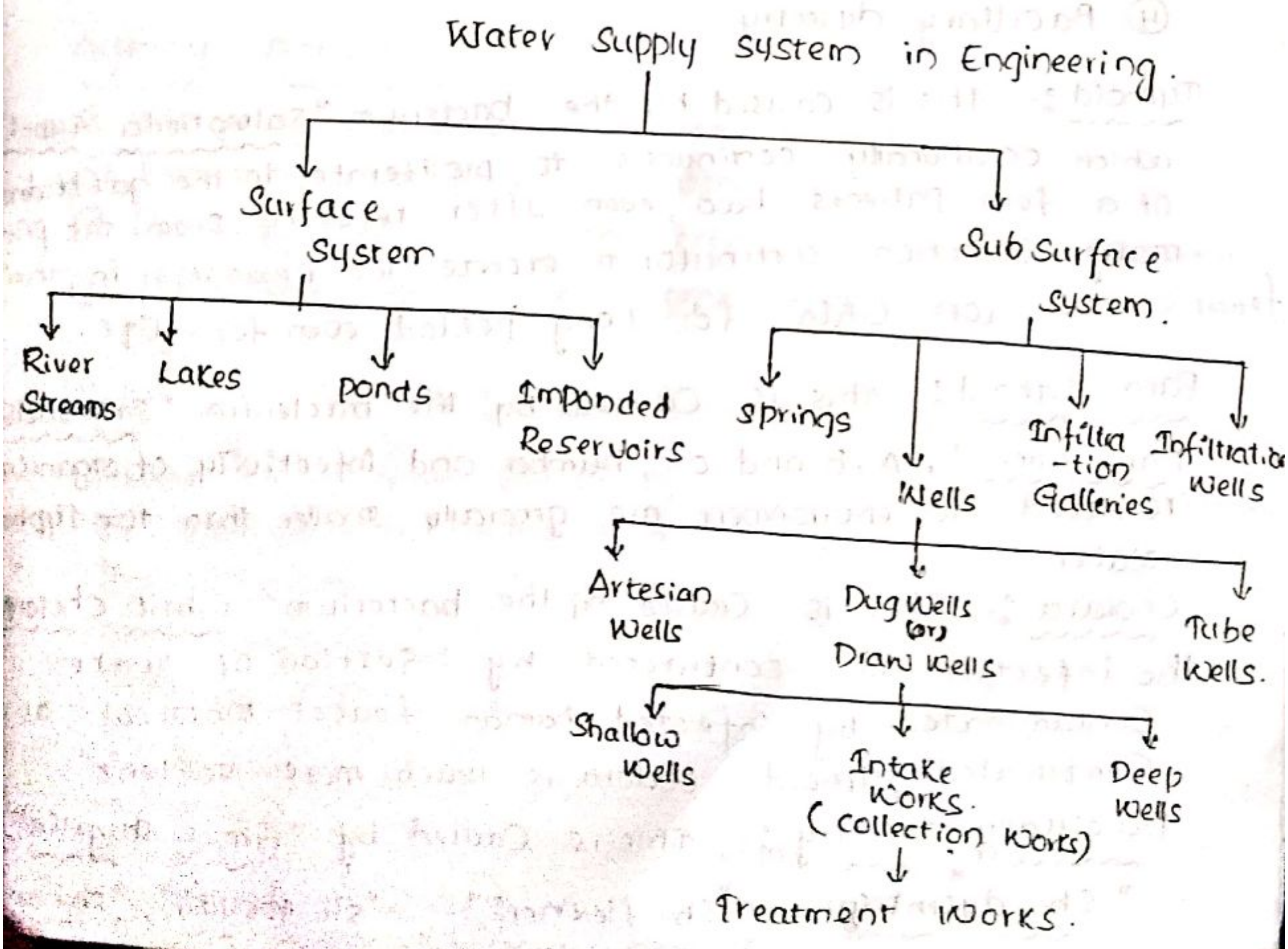
"Best of all things is water"

Importance and necessity of water supply system :-

Water is used for various purposes like irrigation, drinking, domestical uses . bathing and washings of clothes.

* For heating and air conditioning system.
* For growing of crops .
* Street Washing
* For fire fighting.
* For recreation in Swimming pools, fountains.
* For steam power and Industrial purposes.
* In civil engineering purpose the total knowledge of designing , construction , and maintanence of water supply system , treatment plants as a basic knowledge of environmental engineering.

Flow chart of public water supply system :-



(Continue) Treatment works

↓ Plain Sedimentation | ↓ Sedimentation with coagulation | ↓ Filtration | ↓ Disinfection | ↓ Miscellaneous treatments

↓

Distribution systems

↓ Gravity System | ↓ Pumping System | ↓ Dual System

↓

District Water Mains

↓

Branches and service pipes

↓

Consumers

↓

Waste Water.

Water borne diseases :-

① Bacterial Diseases ② Protozoal Diseases

③ Virus Diseases ④ Helminthic

① **Bacterial Diseases :-** four types

① Typhoid ② Para-typhoid ③ Cholara

④ Bacillary dysentry

Tyhoid :- This is caused by the bacterium "Salmonella Typhi" which occationally continuous to proliferate in the gall bladder of a few patients two, even after recovery from the primary infection continuity to excrete the organism's in their feacal spieces, (or) Urin, for long period, even for life.

Para-Typhoid :- This is Caused by the bacterium "Salmonella Para typhi". A, B and C, number and infectivity of organism released to environment are generally smaller than the Typhoid water

Cholara :- This is Caused by the bacterium "Vibrio Cholerae" the infection is contracted by ingestion of water Contaminated by infected human feacal material as Comparated typhoid, cholora is much more Voilent.

Bacillary dysentry :- This is Caused by "Genus Shigella", "Sh. dysenteriae", "Sh. flexneri", "Sh. boydii", "Sh. sonnei"

② Protozoal Diseases :- This is caused by " Protozoon entamoeba histolitica". They live in the human large intestine forming Schist which are excreated in the bowl discharge infected person and which will lives for long period.

③ Virus Diseases :-

① Coxsakie viruses ② Echo viruses

③ Polio viruses ④ The viruses of infectius

⑤ Hepatities ⑥ Adino viruses ⑦ Reo viruses.

⑧ The Common diseases Schistosomiasis and swimmer itch.

Role of environmental Engineer :-

The environmental engineers designing construction and maintanence of diff water supply systems (or) Schemes. They have Some Knowledge of above particulars.

* An environmental engineer is to make public aware about the environmental degradation and also to impart training in such a way so that people participate in the programmes of keeping environmental clean.

* They also protect natural resources from the effect of disposal of hazardous waste.

Agency Activities :-

① designing waste water treatment plant's.
② monitoring air pollution & operating control equipment.
③ Developing pollution Control technologies for diff Industries.
④ Predicting moment of contaminents in air water and Soil.

Types of Demands :- While designing the water supply Scheme for a town (or) City, it is necessary to determine the Quantity of water recquire for various purposes by the City. There are diff types of demands. for determining water demand of a town (or) City by using the formules of empherical formule and thumb rules.

→ Domestic Water Demand
→ Commercial & Industrial demand.
→ fire demand
→ Demand for public use
→ Compensate losses of demand's.

Public use - 25 Litre / day / capita.
Business (or) Trade - 150 Litre / day / Capita.
Losses and wastage - 55 Litre / capita / day.

Total / capital / day	270 Litres.

design period :- The No of years per which the designs of the water work have been done is known as "design period" following factors should be kept in view while fixing the design period.

(a) Funds available for completion of project. If more funds are available the design period shall be less.
(b) Life of the pipe and other structural materials used in the water supply scheme.
(c) The design period should be equal to the material used in the water supply works.
(d) Rate of interest on the loans take into complete the project. If the rate of interest is less, it will be good to keep design period is more
(e) Anticipated expansion rate of the town.

Population Fore Casting :- The future developments of town depends on trade expansion, development of Industries and Surrounding countries etc.
The following are the standard methods by which the fore-casting of population is done.

* Arthemetrical increase method.
* Geometrical increase method.
* Incrimental increase method.
* Decreasing rate method.
* Simple graphical method.
* Comparative graphical method
* Master plan method. / zoning method.
* Logistic curve method.
* The apportionment method / Graphical method.

Arthemetrical increase method :-

$$\therefore P_n = P + nI$$

Where P = Present population.
P_n = population at the end of n_{es} where n = no of decade years

Problems:- I = average increase per year. (population)

(*) The following data have been noted from the census development.

Year	1940	1950	1960	1970
population	8000	12000	17000	22500

Calculate probable population in the years 1980, 1990, 2000?

Sol:-

Here n = 1 decade

S.NO	years	population
1	1940	8000
2	1950	12,000
3	1960	17000
4	1970	22,500

} 8000 - 12000 = 4000

} = 5000

} = 5500

14500

∴ Average total = $\frac{14500}{3}$ = 4833.3

Arthematic Increase method :-

We know that $P_n = P + nI$

1980 = 22500 + (1 × 4833.3)

Incr. population in → 1980 = 27333

$P_n = P + nI$

1990 = 27333 + (1 × 4833.3)

∴ 1990 = 32166

Increase population in 2000 = 32166 + (1 × 4833)

∴ 2000 = 36999

(*) The present population of city is 100000 the pass population to the last three decades were as follows. Compute the expected population after one, two and three decades by arthematical increase method?

Sol:- present population = 1,00000

One decade before = 95,000

Two decade before = 90,500

Three Decade before = 86,500

Sol:-

S.No	No of Decades	Population	Difference	Average
1	present year	1,00,000		
2	one decade	95 000	5000	13500 / 3
3	two decades	90,500	4500	= 4500
4	three decades	86500	4000	

Arthematic Increase method:-

W.K. that $P_n = P + nI$

∴ One decade = 100000 + 1 × 4500
= 104500

∴ Two decades = 1,04500 + 1 × 4500
= 109000

∴ Three decades = 109000 + 1 × 4500
= 113500

⊛ Estimate the population of the year 2011 for the town whose census data are given below by applying the Arthematic increasing method.

Year	1931	1941	1951	1961	1971	1981
Popula-tion	187440	210890	245450	291120	347900	415790

Sol:-

S.No	No of years	Population	Difference (population)	population Average (n)
1	1931	187440		
			23450	
2	1941	210890		
			34560	Avg = 45670
3	1951	245450		
			45670	
4	1961	291120		
			56780	
5	1971	347900		
			64890	
6	1981	415790		

Arthematic increase method:-

W.K. that $P_n = P + nI$

2011 population = 415790 + 3 * 45670

Increased population in 2011 → 552800

Geometrical Increase method:-

It is calculated by

$$P_n = P\left[1 + \frac{I_G}{100}\right]^n$$

where P_n = Increased population at the end of yr.

I_G = Avg. % growth

P = present population

(*) The following data have been noted from the census development. Calculate population in 1980, 1990, 2000?

year	1940	1950	1960	1970
population	8000	12000	17000	22500

by using Geometrical Increase method?

Sol:-

Year	population	Increase in population	Percentage increase in population
1940	8000		
1950	12000	4000	$\frac{4000}{8000} * 100 = 50\%$
1960	17000	5000	$\frac{5000}{12000} * 100 = 41.6\%$
1970	22500	5500	$\frac{5500}{17000} * 100 = 32.3\%$

Avg = 4833.33   Avg:- 41.3%.

Geometrical increase method:-

$$P_n = P\left[1 + \frac{I_G}{100}\right]^n$$

$\therefore P_{1980} = 22500\left[1 + \frac{41.3}{100}\right] = 31794.7$.

$\therefore P_{1990} = 31794.7\left[1 + \frac{41.3}{100}\right]^1 = 44925.48$

$\therefore P_{2000} = 44925.48\left[1 + \frac{41.3}{100}\right]^1 = 63479.5$

(*) Incremental increase method:-

It is calculated by

$$P_n = P + n\left[I_a + I_c\right]$$

Where I_a = Avg Arthemetic increase.

I_c = Average incremental increase.

* The population figures of a town as per the census records are given below for the years 1911 to 1971. assuming that the scheme of water supply will be commence to function from 1976. It is required to estimate the population after 30 years. i.e; in 2006 and also intermidiate population, i.e, 15 years after 1976.

Year	1911	1921	1931	1941	1951	1961	1971
population	40185	44522	60395	75614	98886	124230	158800

Sol:-

Year	population	Increase in population (I_a)	Incremental (I_c) Increase
1911	40185		
		4335	(15873 - 4335)
1921	44522		11536
		15873	
1931	60395		655
		15218	
1941	75614		8054
		23272	
1951	98886		2072
		25344	
1961	124230		9226
		34570	
1971	158800		
		I_a = 19769	I_c = 6046.6

Incremental Increase Method:-

We know that

$$P_n = P + n[I_a + I_c]$$

$$P_n = 158800 + 0.5[19769 + 6046.6]$$

$$P_{1976} = 171707.8$$

for 30 years

$$P_{2006} = 171707.8 + 3[19769 + 6046.6]$$

$$P_{2006} = 249154.6$$

Intermidiate after

1971 + 15 years $P_{1991} = 249154.6 + 1.5[19769 + 6046.6]$

$$P_{1991} = 287878$$

Decreasing rate method :-

* The population of 5 decades from 1940 to 1980 as given. find out the population 1990, 2000 and 2010. by using decreasing rate of growth method ?

Year	1940	1950	1960	1970	1980
population	25000	28000	32500	40,000	45000

Sol:-

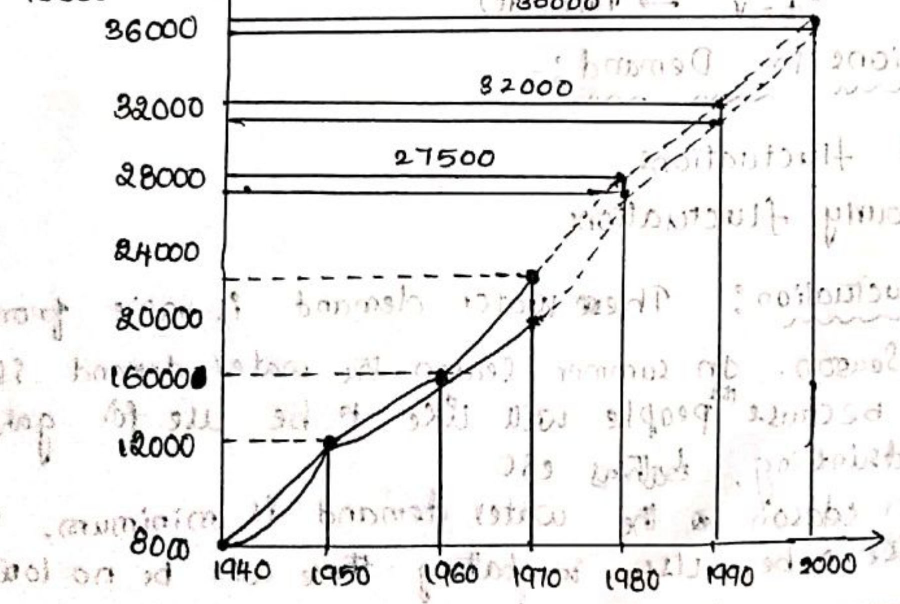
Year	population	Increase in population	% increase in population	decreasing in pop
1940	25000			
		3000	12 %	-4.1%
1950	28000			
		4500	16.07%	-7.1%
1960	32500			
		7500	23.07%	+10.6%
1970	40,000			
		5000	12.5 %	
1980	45,000			
Total	20,000	← 63.7%	63.7%	-0.6%
Avg	5,000	16%	16%	-0.2%

for calculating 1980, 1990, 2000 we know

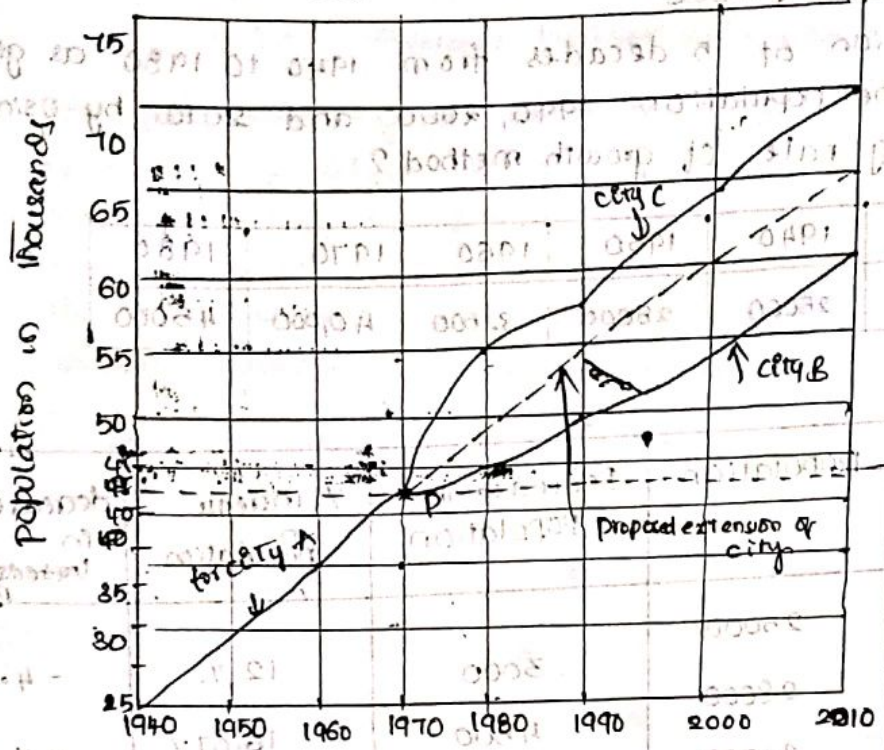
Year	Net % of population	population
1990	12.5 - (-0.2%) = 12.7%	$45000 + \frac{12.7}{100} \times 45000$ = 50715
2000	12.7 - (-0.2%) = 12.9%	$50715 + \frac{12.9}{100} \times 50715$ = 101430.12
2010	12.9 - (-0.2%) = 13.1%	$101430.12 + \frac{13.1}{100} \times 101430$ = 114717.46

Simple Graphical method :-

Graph :-

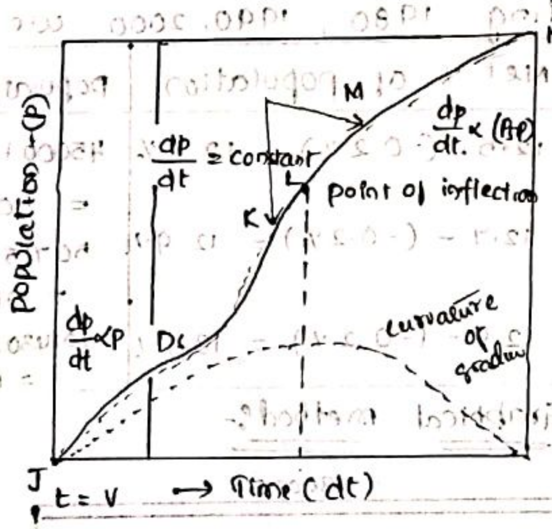


Comparitive graphical method :-



The simple Grabhical method is used for population forecasting to plot the Suitable Scale graph with respect to indecate

LOGISTIC Method :-



fluctuvations in Demand :-

① Seasonal fluctuations

② Daily/hourly fluctuations

Seasonal Fluctuation :- The water demand is varie from Season to Season. In summer season the water demand is maximum. because the people will like to be use for gardening washing, drinking, bathing etc

* In winter season the water demand is minimum. the people like to be use in bathing there will be no looming.

Daily / fluctuation (or) hourly fluctuation :-

Max. Daily (or) hourly fluctuations = 1.5 * Avg hourly consumption of the max. day

* In sunday's and other holyday's the peak hours about early due to late awakening where as it may be 6am - 10am

Factors effecting of water demand :-

① climatic conditions ② size of community
③ Living standards of people ④ Industrial & commercial activities
⑤ Pressure in the distribution system
⑥ System of Sanitation ⑦ Cost of water.

LOGISTIC CURVE :-

The point of fluctuation is "L"

$$\log_e\left(\frac{P_s - P}{P}\right) - \log_e\left[\frac{(P_s - P_o)}{P_o}\right] = -K \cdot P_s \cdot t$$

Where

P_s = Saturation population.
P_o = The population of the town at point "j"
K = Constant
T = population at the time from the origin

(*)

Year	1960	1970	1980
population	35000 (P_o)	78000 (P_1)	115000 (P_2)

Sol:- Given data is

$t_0 = 0$, $t_1 = 10$ and $t_2 = 20$

$$P_s = \frac{2P_0 \times P_1 \times P_2 - P_1^2 (P_0 + P_2)}{P_0 * P_2 - P_1^2}$$

$$P_s = \frac{2 * 35000 * 115000 - (78000)^2 (35000 + 115000)}{(35000 * 115000) - (78000)^2}$$

$\therefore P_s = 138271.0053$

$$m = \frac{138271.005 - 35000}{35000} = 2.95$$

$$n = \frac{2.3}{t_1} \log_{10}\left[\frac{P_0 (P_s - P_1)}{P (P_s - P_0)}\right]$$

$$n = \left[\frac{35000\,(138271.0053 - 78000)}{78000\,(138271.0053 - 35000)}\right] \frac{2.3}{t_1} \log_{10}$$

$$n = 0.23 \log_{10} (0.2619)$$

$$\boxed{n = 0.42}$$

$$P = \frac{P_s}{1 + m \log_e^{-1} (n \cdot t)}$$

SOURCES OF WATER

Sources of water can be divided into 2 types

① Surface Sources of water

② Sub Surfaces Sources.

Surface Sources :- These are classified into streams, lakes, ponds, rivers and impounded reservoirs, stored rain water, cisterns.

Sub Surfaces Sources :- Wells, springs, infiltration galleries pourus pipe galires.

Streams :- In mountaines region streams are formed by runoff, The discharging stream's is much in rainy season than other season. those streams which dry up in summer and contain water only during rainfall are known as "Raining streams". All the suspended impurities can be removed in settling tanks upto certain extent. but the disolved impurites required special treatment.

Lakes :- In mountains at some places natural basins are formed with impermiable beds.

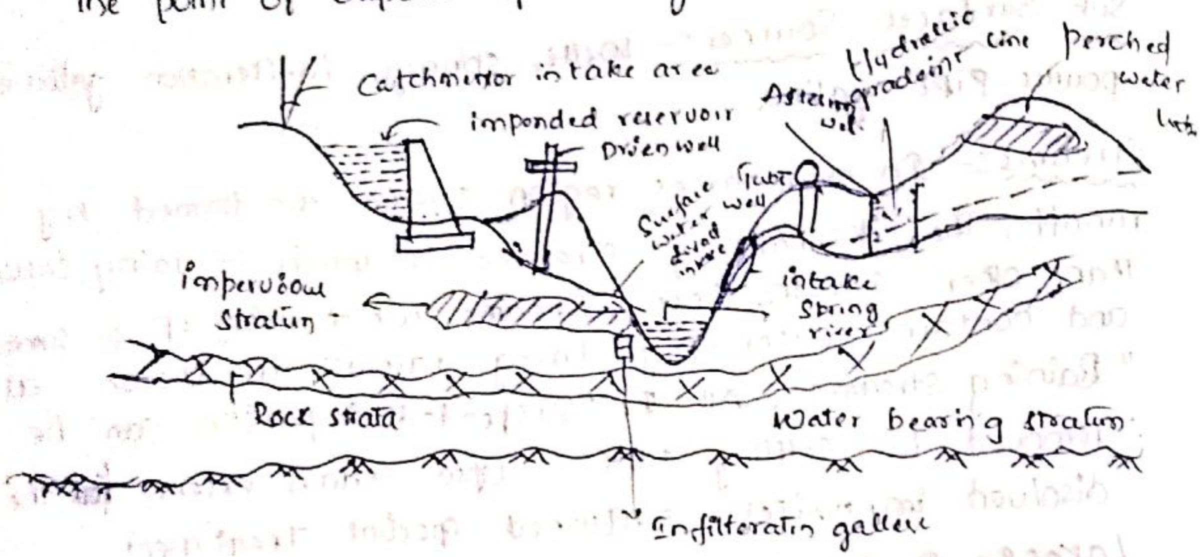
* Water from streams and streams generally flows towards this basin and lakes are formed.
* The Quantity of water in the lakes depends on its basin Capacity, Catch ment area, annual rainfall, porosity of the ground, etc.

Ponds :-

* There are dippresions in planes like lakes of mountains in which the water is collected during rainy season.
* Some times ponds are formed when much excavation is done for constructing Kaccha houses in villages and embankment for roads, railways and manufacturing of bricks
* The water of ponds is used for washing clothes and animal bathing and drinking in some backward villages people also take bathing in dirty water of ponds.
* The water of ponds cannot be used for water supply purposes due to its limited Quantity and large amount of impurities.

Rivers:- Rivers are born in the hills when the discharge of large no of springs and streams combined together.

* Rivers are the only sources of water which have maximum Quantity of water which can be easily taken at the very ancient times the town and cities started developing along the banks of rivers.
* River water has self purification action due to which it automatically becomes clean in some distance travell from the point of disposal of sewage.



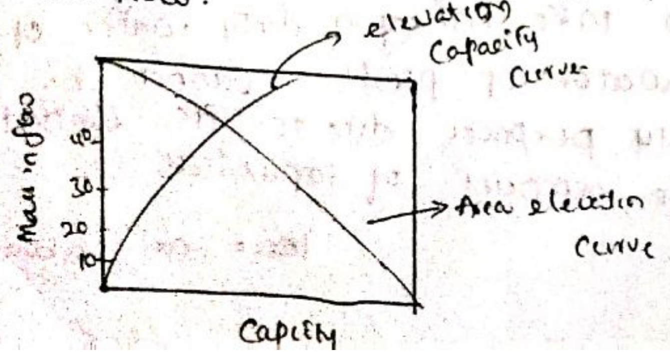
STORAGE RESERVOIR CAPACITY :- The most important physical characteristic of a reservoir is nothing but, it is storage capacity

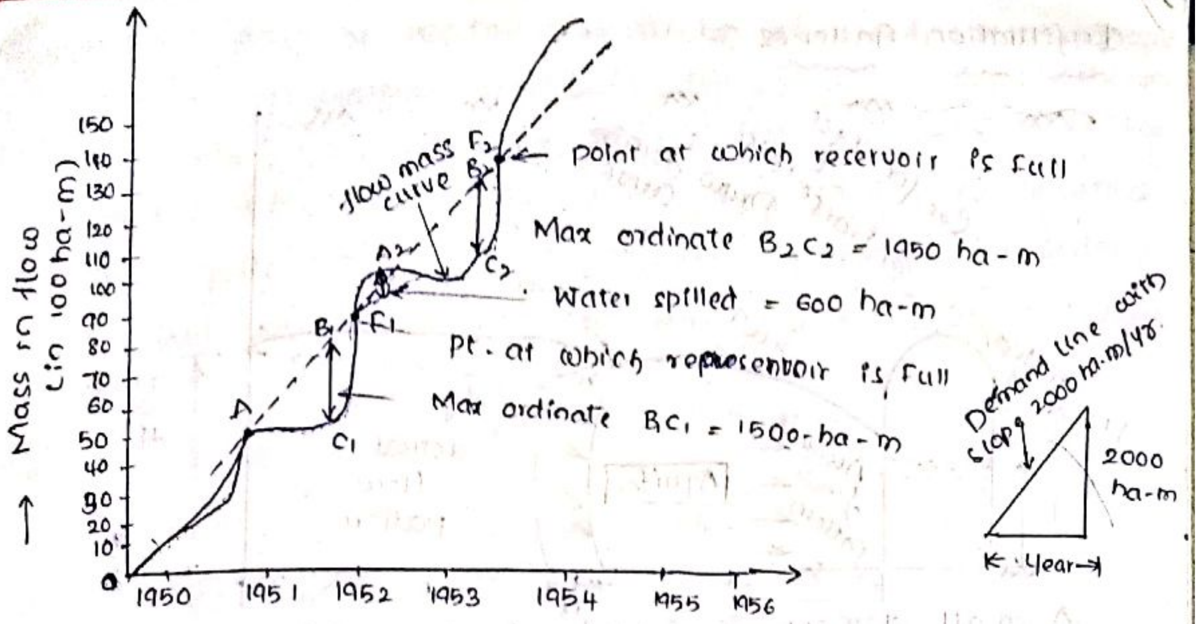
* The capacity computed from these verticle cross sections by the trapezoidal (or) prismoidal formula.

∴ Volume (V) = $(A_1+A_n) + [4(A_2+A_4+ \ldots) + 2(A_3+A_5+ \ldots)]$

where A_1, A_2, A_3 are the areas enclosed b/w successive elevation lines.

Fixation of Reservoir capacity with the help of mass curve of inflow and out flow.





-: Mass curve Analysis :-

* Assuming the reservoir is to be full at A_1, It is depleted (or) outflow 1950 ha-m - 1500 ha-m = 450 ha-m, at C_1 and is again full at F_1
* The reservoir will be full at F_1 and A_2 In the Quantity of water spilled over spillway. is equal to 1600 ha-m.
* From A to the water starting reduced in the reservoir till it becomes fully empty at C_2.
* The water again starts collecting the reservoir and it is again full at F_2.

GROUND WATER SOURCES :-

Infiltration wells :-

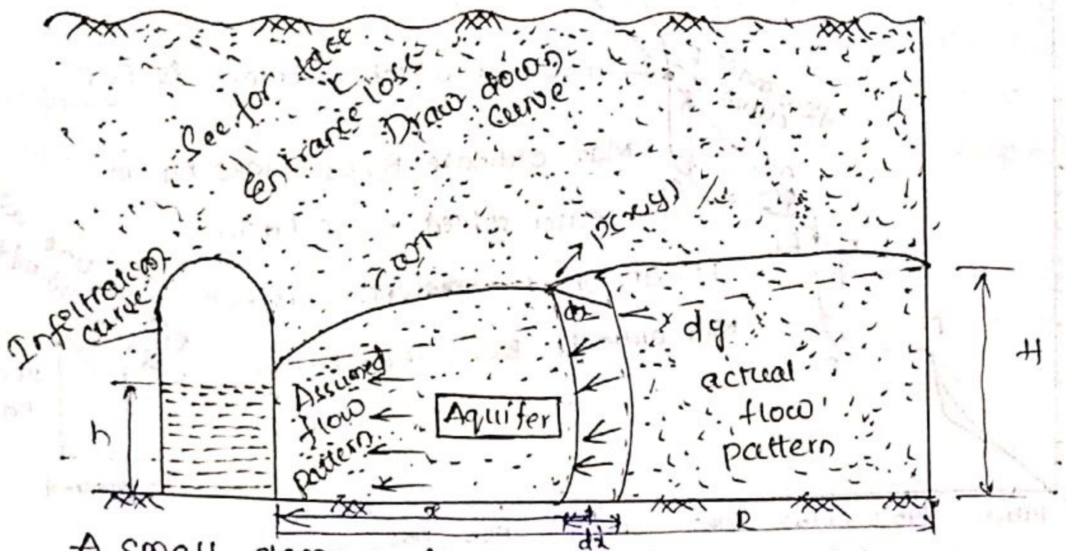
* These are shallow wells constructed under beds of rivers and nallas.
* Deposits of sand exist at least 3m deep in river beds as the water percolater down, impurities are removed Quality of water is better than river water.

Aquifer :- A permeable stratum (or) a geological formation of permeable material which is capable of yeilding appreasiable quantities of Ground water under gravity is known as "Aquifer"

2 Types → ① Unconfined (or) Non Artesian

② Confined (or) Artesian.

Infiltration Galleries :-



A small element is considered of width and the area of soil through which flow will occur is (y × L) it is not visible in above figure

where

Q = discharge , K = co-efficient of permeability

i = head gradient (dy/dx)

A = Area , H = static water level above the bottom of the gallery.

h = depth of water in the gallery on pumping equilibrium

R = Radius of influence

$$Q = KiA$$

$$i = \frac{dy}{dx} \quad \text{and} \quad A = y \times L$$

$$Q = K\left(\frac{dy}{dx}\right)(y \times L)$$

and here

$$Q\,dx = K\,dy\,(y \times L)$$

Apply intigration on both side

$$Q\int dx = K.L\int_{h}^{H} y\,dy$$

$$Q\,[x]_0^R = K.L\left[\frac{H^2-h^2}{2}\right]$$

$$Q\,[R] = K.L\left[\frac{H^2-h^2}{2}\right]$$

$$Q = K.L\left[\frac{H^2-h^2}{2R}\right]$$

(*) 600 m3/day of water is to be obtained from a proposed infiltration gallary which is placed at 6m depth from subsurface water table. The co-efficient permeability of the soil aquifer 100 m/day find the length of the gallery if the drawn down curve in the gallery on pumping is not exceed 4m. The radius of the influence may be assumed to be 100m.

Sol:- Given data is

discharge (Q) = 600 m3/day.

co-efficient of soil aquifer permiability (K) = 100 m/day

Radius of influence (R) = 100 m.

Static water level in gallery (H) = 6m.

pumping should not exceed 4m

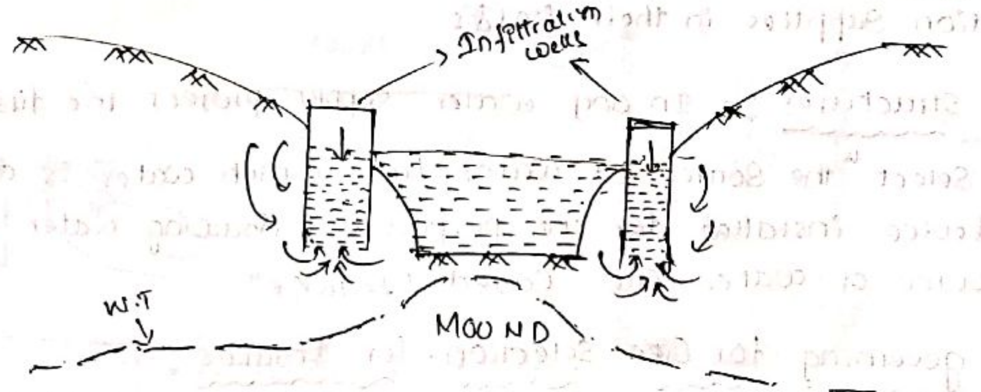
$\therefore h = H - 4m = 6m - 4m = 2m$

$$Q = KL\left[\frac{H^2 - h^2}{2R}\right]$$

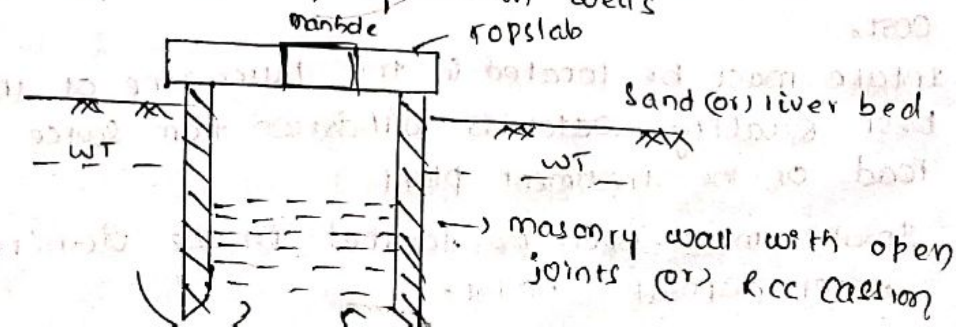
$$600 = 100 \times L\left[\frac{6^2 - 2^2}{2 \times 100}\right]$$

$\therefore L = 37.5m$

INFILTRATION WELLS:-



Location of infiltration wells



Section of infiltration wells.

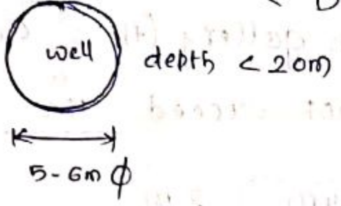
Springs :- The Natural outflow of ground water at the earth Surface is said to form a springs. These are three types

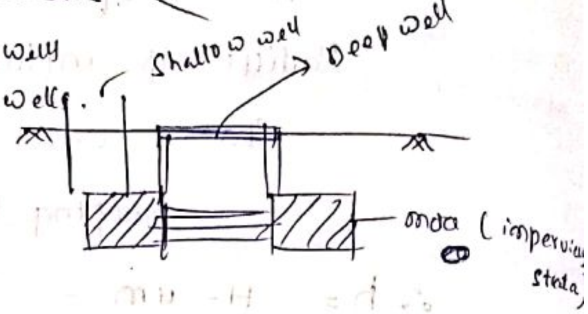
1. Gravity springs
2. Surface Springs
3. Artesian springs, etc.

Wells :- A water well is a hole usually vertical excavated to the earth stratum for lifting ground water through the Surface. These are classified into 2 types.

1. Open wells — Shallow open wells / Deep open wells.
2. Tube wells

Open wells :-





Construction of wells :-

1. Impervious lining (such as masonary lining)
2. pervious Lining (such as brick stone lining)
3. No Lining (i.e kacha wells)

pervious Lining :- The water enters from the sides through the pores in the lining. The flow is radial.

Kacha wells :- These wells are formed by cultivators to supply irrigation supplies in their fields.

Intake Structures :- In any water supply project the first step is to select "the source of water from which water is drawn. The device installed for the purpose of drawing water from the source of water are called "Intake"

Factors governing for site selection for Intakes :-

* Site should be near the treatment plant to reduce conveyance cost.
* Intake must be located in the purer zone of the source so that best Quality water is withdrawn from source to reduce the load on the treatment plant.
* Intake must never be located in the vicinity of waste water disposal point.

Date

UNIT - III

Quality & Analysis of water

Methodology :-

① River - high 0.1 to 1.0 m/Se

② Lakes - Low 0.001 to 0.01 M/Se

wet lands are currently degraded By Natural & anthropogenic activities which is Deteoriated thy quality and push them to the Brink of Extinction in the process of unplanned development, giving rise to the nee for suitable conservation strategies.

The assessment of the chemical creteria of the waterbodies help's in

Evaluated the chemicals that case toxicity to aquatic life.

Studying the log term Effects on the Ecosystem

Conducting the status and Monitoring of wetland resources By studying their physical, chemical & Biological parameters.

Distinigate uses that protect the structure & function of wetlands for protection of fish birds, wild life & recreation.

Analyse the qualitative & quantitative aspect of plankton pollution of the water bodies.

wetlands support a vast diversity of fish, Birds, Mammals Etc. depend directly.

The analysis of water is depends upon the Methodology and quality of water.

Methodology :- i, water is a dynamic Medium quality Varies at the temporarily & permanently body the any water

ii, To characterise the Major components are hydrology, physical, chemical & Biological properties.

Hydrological features :-

There are 4 types of hydrological features

1) Rivers
2) lakes
3) Ground water
4, Reservior.

i, River :- Rivers are Characterised By universal directional current with high average velocity 0.1 to 1 m/sec.

ii, lakes :- It is characterised By a low ash[illegible]
Current with a Velocity of 0.01 to 0.001 M
It is a Multi directional current Mixing with
wet lands.

iii, Ground water :- It is a universal water
supply stored in a ground surface without a
saturation Porosity, void ratio and degree of
It is used for all humanbeings, Birds and
animals etc...

iv, Reservior :- It is the Combination of rivers and
lakes It is also known as Intermediate Mixing
Current to the Both high and low velocity of
current supply.

* Sampling features :- There are different types of features Involved in the Sampling to tread and condi[illegible]
The water If there is any suspended feature
dued Impurities In the water. Sampling features
are also known as physical, chemical & Biological
parameters.

Date: 3-1-18

Sampling :-

1. Site Selection
   1. Grab or Catch Sampling
   2. Composite Sampling
   3. Integrated Sampling

Scanned by CamScanner

i, Cation (+)

Ex: Calcium (Ca^{+}), Magnesium (Mg^{2+})

ii. Anion (-)

Ex: Sulfate (NO_3^{2-}), Chloride (Cl^{-})

Physical Characteristics of water:-

These are Mainly, Temparature, colour, turbidity, determaine By the sense water, tast, odour etc.. solids By of colour floating touch & suspendic Site and taste & colour By smell

Temperature:- the Temperature of water affects Some of the Important physical properties are thermal Capacity, density, specific weight, Viscocity of dissolved ganes & etc..

Chemical & Biological reaction rates Increase with Increasing temperature.

Reaction rate Increase in temp 10°c anum streams & rivers

The temp of water in through out the world Varies from 0 to 35°C

5/11

Chemical properties

1. Cations (+)
2. Anions (-)

1. Cations (+)	2. Anions (-)
Calcium (Ca^{2+})	Chloride (Cl^-)
Magnesium (Mg^{2+})	Nitrates (NO_3^-)
Sodium (Na^+)	Sulfates SO_4^{2-}

COD - 4°c 6 days. 2.5 Plastic pipe

BOD - 4°c 7 days Sampling container

Date :

Sampling Container

→ It Should Not react with Sample, we of capacity to the store the Sample & free from Contamination.

Sampling Method :- Take 2.5 liters of Inert plastic container which where distiled & purified in a tank & take water. Befor collecting the sample labilled in Chemical laboratory with the date time & sampling point.

Variations :

The Variations are ManMade or Natural.
Variation Either random. & Cyclic process.

Random Variations :-
unpredictable Events such as oil spills, Sewage
leaks our flows ect are the raddam variations

Cyclic Variations :- It May Be a Result
of regular sesonal changes, Sorter Natural
Process such as rainfall Snow Melt & Seasonal
temperature Changes with the altering of
ago system

Preservation of Sampling :- The Water supply in the
Chemical properties are taken in sertain
Chemicals temperature & times to purity the water
Sample They are Many Cathodes, Anodes,
Cations. & Major Anions taken to the preservation
of sample In Experimentally we can calculate the
heavy Metals & dissolved oxygen ect--

	Exp	Temperature	timing
1.	BOD	cool@4°c	4 hr
2.	COD	cool@4°c	24 hr
3.	Calcium	cool@4°c	7 days

4.	Chlorid	cool at 4°c	7 days
5.	desolved Oxygen	It can calculate in the site	6hr
6.	flowride	Cool at 4°c	7days.
7.	Magnesium	Cool at 4°c	7 days
8.	Nitrate & Nitrite	Cool at 4°c	24 hr
9.	Ph	Acide or Base.	6hr

<u>haivy Metals</u>: heavy metals are in water such as Cadmium, Choromium, Copper, Iron, Lead & Zink or concentrated with the 2ml concentrated Nitric acide for 1liter Sample in 6M:

→ In water the higher concentration of Chemica taken in a 300 calicum tri carbonit ($CaCO_3$)

The Major concentration are

Date

WHC: [1983] - Arghayam

BIS 10500:1991

2010 - living stone

CWC - IS 2296 - 1982

Indian Standard for drinking water BIS specifications (IS 2296 - 1982)

→ This is the presentation of which gives the details of the permissible & desirable limits of various perameters in drinking water as per Indian standard.
the Bureau of Indian

→ Specifications for portable water Arghayam has complied a Breif presentation which gives details of the permissble & desirable limits of various perameter in drinking water as per the Bureau of Indian standard was applyed in the year [1983] & secondly in the year of 1991 Scientist are applied The distribution of water.

→ And it is Most recent revision Back To july 2010

OBjects:-

* TO accees the quality of water resources
* TO check the Effectiveness of water treatment & supplied By the authorities
* they Apply to drinking water supplied By different agencies, department of State

Govt & Central govt.

→ The various parameters covered Include the Colour, Ph, dissolved salts, hardness, alkalinity, Elemental compounds such as iron, Magnesium, Nitrate, Chloride, sulphate, arsenic, Copper, Cynide, lead, Mercury, Zinc..

Consideration of water Supply To follow the Publications

* International standards for drinking water issued By world health organisation [WHO] in 1984.

* Manual of standards of quality for drinking water supplies. Indian Counsil of Medical research in 1971

* Manual of water supply, & treatment, Ministry of urban development in 1989. It is taken as the 3rd version of water Supply publication.

* CWC (Central world ~~commission~~ Commission) as per IS 2296 - 1982, the limits of parameters as specified as per classified use of water depending on various use's of water

The following classifications has been followed in India :-

Class A: drinking water source with out conventional treatment but after the disinfection

Class B: It is used for out door cleaning, Bathing purpose.

Class C:- drinking water source with conventional treatment followed by disinfection.

Class D:- Fish culture, wild life propagation

Class E:- Irrigation, Industrial cooling & waste disposal

Major Ions [Living Stone, 1963]

Chemicals	Concentration Mg/L	Cations Mg/L
Ca^{2+}	15	0.750
Mg^{2+}	4.1	0.342
Na^{+}	6.3	0.274
K^{+}	2.3	0.059
		1.42