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By-Jaspal Sir

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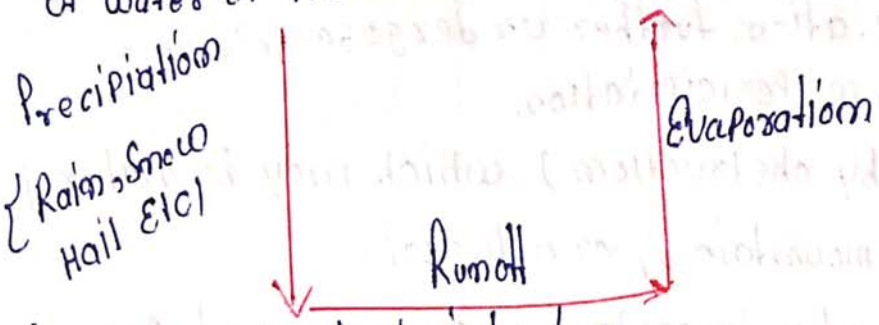
HYDROLOGY It is the Science of water

— It deals with occurance, circulation and distribution of water of the Earth and atmosphere



It is farther Classified into two

(a) Scientific Hydrology : it is the Study of water Concerned with Academic Aspects i.e Records of Past data

(b) Engineering Hydrology OR Applyied Hydrology :
Study of water Concerned with Engineering application of Sources of water, water Process i.e Precipitation, Evaporation, transpiration, infiltration etc.

— In order to understand occurance circulation and storage of water, Hydrological cycle or water cycle Can be analysed

— The Precipitation and Evaporation Continuous forever hence a balance is maintained blw the two, which Can be understood from water cycle

→ Since it is the Continuous Process it is no starting Point, End Point or, Point at which it Paused

— water in oceans vapourises upwards and forms clouds, which under condensation

and forms Precipitation that again falls over the ocean Predominantly

Some Clouds moves over land due to wind and Precipitate these

- Cont - This Precipitation further undergose following

(i) Evaporation from Precipitation

(ii) intercepted by obstruction) which may be natural (Plants or trees mountains) or artificial

(iii) Certain Portion of interception vapourises and Remaing falls over the surface

(iv) During Photosynthesis Plant utilises water from soil and transpirs certain Portion into atmosphere

(v) Reaches the surface which further undergoes

(a) Evaporation

(b) fills the depression over the ground (Depression storage)

(c) flows under gravity from surface into the soil through voids termed as infiltration

(d) flow over the surface (surface runoff) and meets the stream after which it is termed as stream runoff

Note Certain Portion of infiltration flows under head diff Horizontally and vertically ['Prompt (fast) interflow'] and meets the stream termed as seepage

▷ flow of water through voids of the soil under gravity from unsaturated to saturated soil mass is termed

As Percolation

— if this Percolation flows through voids cracks, fissures of impermeable strata it is termed as Deep Percolation

— Certain Portion of the ground water also meets the stream over the Period of time and is termed as Base flow or (Prolonged interflow

— There are Several Paths of watercycle each of which has one or more following aspect.

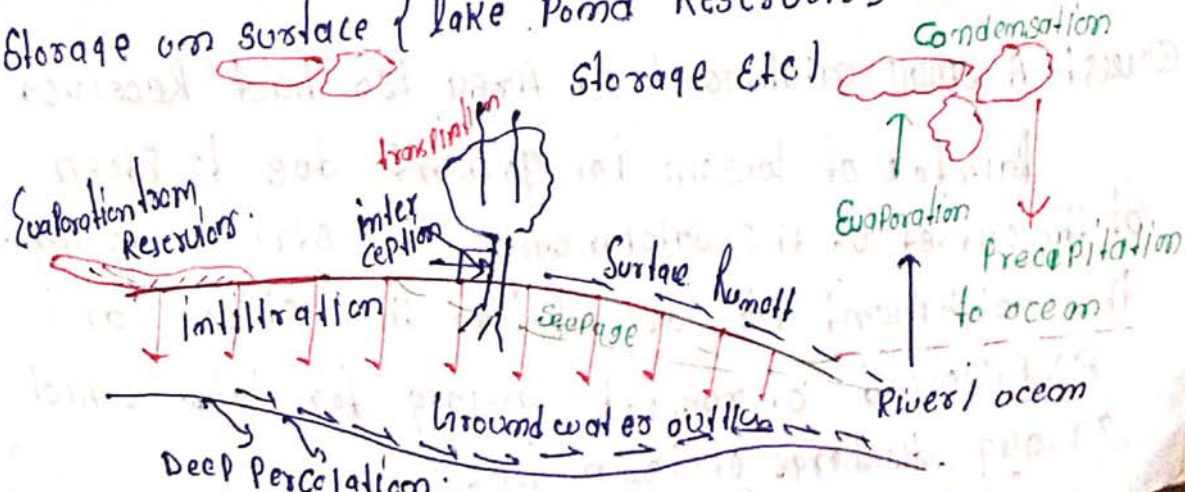
(I) Transportation of water
(II) Temporary Storage
(III) Change of Phase / stage

— Transportation Components of water cycle are

(I) Precipitation
(I) Evaporation
(II) Runoff
(IV) Transpiration
(V) Infiltration / seepage / Percolation

— Storage Components of water cycle

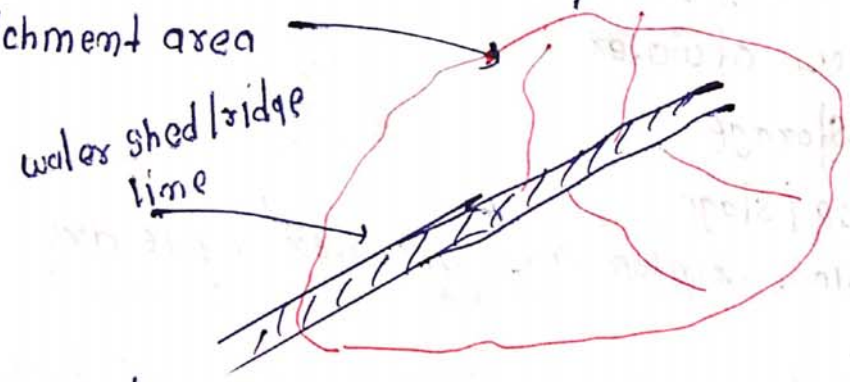
(I) Ground water storage
(II) Soil moisture
(III) Storage on surface (lake Pond Reservoirs depression Storage etc)



WATER BUDGET EQUATION

for a Given Problem Area [catchment Area] in an interval of time Δt, the continuity Equation for water i.e Conservation of mass for water in its various Phases is Applicable

Note The area of land draining into the stream is termed Catchment area



Mass inflow − mass outflow = Change in mass Storage

$$V_i - V_f = \Delta S$$

$$P - R - U - E - T = \Delta S$$

Here $P - R$ = losses (L)

Quest A small catchment of Area 1so had Received a Rainfall of 10.5cm in 90mints due to Storm at the outlet of the catchment, the stream draining the catchment was dry before the storm and Experienced of runoff lasting for 10hr which an avg discharge of 10.5 m^3/sec

The stream was again dry after the runoff Event

Compute ① what is the amount of water that is not available to form runoff

② Coff. of Runoff

losses = P − R

⇒ 150 × 10⁴ × 10·5 × 10⁻² − 1·8 × 10 × 60 × 60

= 10 3500 m³

② $K = \frac{R}{P} = \frac{1.8 \times 10 \times 60 \times 60}{150 \times 10^4 \times 10.5 \times 10^{-2}} = 0.34$

Quest A lake had a water-surface Elevation of 105.2 m above datum at the beginning of a certain month in that month the lake Recieved an average inflow of 6 m³/sec from surface Runoff sources in the same Period outflow from the lake had a value of 6.5 m3/sec further in that month the lake received Rainfall of 145 mm and Evaporation from the lake surface was 6.10 cm

① Mention the water budged Eq for this lake

② Calculate the water surface of lake at the end of the month

The avg surface area of lacke 5000 ha

Ans mass inflow − mass out flow = Change in storage

$(I\Delta t + P.A) - (O.\Delta t + EA) = \Delta S$

$(I - O)\Delta t + A(P - E) = \Delta S$

$(6 - 6.5)\,30 \times 24 \times 60 \times 60 + 5000 \times 10^4 \cdot (140 \times 10^{-3} - 6.10 \times 10^{-2}) = \Delta S$

$\Delta S = 290400\ m^3$ or $\frac{2904000}{5000 \times 104} = 0.058m$

Water Surface Elevation $= 105.2 + 0.058 = 105.258m$

PRECIPITION

⇒ it Represents all forms of water that Reaches the Earth Surface from the Atmosphere

⇒ for Precipitation to form conditions Required are

(A) Presence of moisture in the atm.

(B) Presence of Sufficient nuclei (medium) Particles to help Condensation. $\phi < 0.1mm$

(C) Weather Condition must be optimum for Condensation to takes Place

(d) The Products of Condensation must reach the earth Surface.

— Precipitation occurs in following forms.

(1) Rain: This term is used generally when water droplets are of size 0.5 - 6mm

— The Rain Can be classified on the basis of its intensity As follows

INTENSITY (mm/hr	Type of Rain
< 2.5	Light
2.5 - 7.5	moderate
> 7.5	Heavy