Analytical Method :-

22/10/16

→ Water Budget Equation

→ Conservation of Energy {Energy Budget Equation}

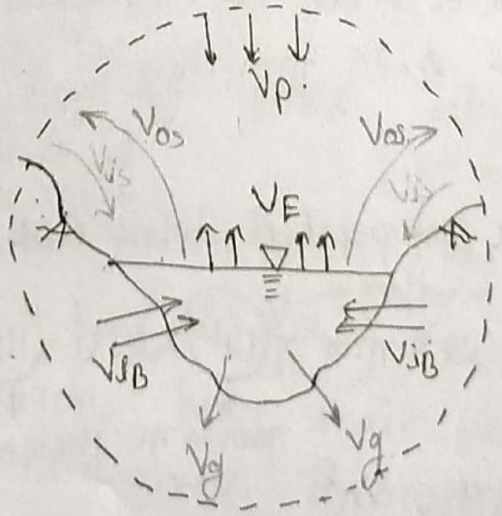
→ Mass Transfer Method {Turbulent mass transfer th which is beyond the 2scope

Geo. – direct
Em. – eqⁿ generate
A. – Research

Water Budget Equation :-

Water budget eqⁿ is based on the application of mass conservation th according to which mass can be distered it only travel from one face to another.

Consider a small Pond catchment as a system under consideration of mass conservation.



where → V_{is} → Volume of Surface inflow
V_{os} → Volume of Surface outflow

V_P → Volume of Precipitation

V_E → Volume of Evoporation

V_{iB} → Volume of (Base inflow) → Sub surface in flow.

V_g ~~V_{oB}~~ → Volume of spee seepage flow

Where transpiration is given then we used in outflow

Note → Since water used by vegetation in transpiration has very small quantity hence it can be ignored.

Applying the hydrological Continuity for System under consideration.

Total inflow − Total out flow = change in storage

$$(V_p + V_{is} + V_{iB}) - (V_E + V_{os} + V_g) = \Delta V_s$$

$$V_E = (V_p + V_{is} + V_{iB}) - (\Delta V_s + V_{os} + V_g)$$

If the area of water surface is A

Then

$$E_L = \frac{1}{A}\left[(V_p + V_{is} + V_{iB}) - (\Delta V_s + V_{os} + V_g)\right]$$

if transpiration ~~Lases~~ Loss is given as V_T

$$E_L = \frac{1}{A}\left[(V_p + V_{is} + V_{iB} - (\Delta V_s + V_{os} + V_g + V_t)\right]$$

<u>Note</u>:- It is a simplest method but least relaible ___ since seepage from a water body pond and lake can not be estimated ..

which are in contact with water surface (Sensible Heat)

H_{at} → Loss of energy through seepage water

H_{ad} → Advected energy loss {i.e. transfer of energy of the soil}.

Net energy received by system.

$$H_n = H_E + H_a + H_{ad} + H_{at} + H_s$$ → Heat energy stored in

$$((1-r) H_c - H_b) = H_E + H_a + H_{ad} + H_{at} + H_s.$$

$$H_E = \rho_w E_L \cdot L$$

where ρ_w → Density of water

E_L → Depth of water evaporated

L → Latent Heat of water {585 cal/gm}

$$-H_b = (\rho_w E_L \times L) + H_a + H_{ad} + H_{at} + H_s$$

Then

$$E \ldots = \frac{((1-r) H_c - H_b) - (H_a + H_{ad} + H_{at} + H_s)}{\rho_w \cdot L}$$

Note :- (I)

...sible Heat Loss (H_a) is given by ...en" Ratio.

$$H_a = (\beta \ldots E_L \cdot L)$$

↓ Bowen

N... ...tio

$\Rightarrow E_L = 0.7 \times 20$

$E_L = 14 \text{ cm}$

$V_E = 14 \times 10^{-2} \times 10 \times 10^{-6}$

(V_E → vol^n of evoporation)

$V_E = 1.4 \text{ Mm}^3$.

Apply the Water Budget Equation

Since fall is given hence

outgoing > incoming

$$\boxed{V_O - V_I = \Delta V_S}$$

(V_O → vol^n of outflow, V_I → Vol. of inflow, ΔV_S → change in storage)

$$(V_{OQ} + V_E + V_S) - (V_P + V_{IS}) = \Delta V_S$$

(V_S → vol^n of seepage water.)

$$(38.88 + 1.4 + V_S) - (1 + 25.92) = 15$$

$$V_S = 1.64 \text{ Mm}^3$$

(Mm³ → Volume of Seepage for 1 month.)

<u>Hence discharge in cumes.</u>

$$= \frac{1.64 \times 10^6}{30 \times 24 \times 60 \times 60}$$

$$= 0.6327 \text{ m}^3/\text{s}$$