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Sec = "B"

Semister = 6Th

IRRIGATION Eng

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Q:1.a)

Define "Delta" & Duty & Derive their relationship in MKS and FPS systems:->

Ans:-> Definition:->

Delta of water: The depth of water cm or inches required for the crops throughout the base period is known as Delta of crop.

Generally a crop needs a certain volume of water at fixed intervals throughout its base period.

Duty of water :->

The duty of water is the Relationship b/w the volume of water and the area of crop it matures.

• 1 cubic.m per sec or $1 ft^3/sec$ of water for 8 days matures 0 hectares or acres.

of land. Than the duty of water for that particular crop is D hectare/cumecs or Dacres/cusec.

## Relationship b/w Duty & Delta in FPS System:

let

D = Duty (acres/cusecs)

A = A feet base period = B days by

Definition. one cusec of water flowing continously for "B" days gives a depth of water "A" cover in "D" acres.

Volume of water ($ft^3/sec$) in one day =

$1 \times 24 \times 60 \times 60 = 86400\ ft^3/sec.$

Volume of water ($ft^3/sec$) in B day =

$1 \times 24 \times 60 \times 60 = 86400 \cdot B \cdot ft^3$

$= 86400 B ft^3 \rightarrow (1)$

1 Acre = $43560\ ft^2$

$1\ ft^2$ = 143560 Acre

putting in eqn (1) it becomes.

$= 86400 B \times 43560$

Volume of water = 1.983 B Acre ft = x (ii)
($ft^3$ sec) in B days.

Depth of water required by crops = $\frac{1.983 \times B \text{ ft}}{D}$.

## Relation B/w Duty & Delta in MKS System:-

Let there be a crop of base period B days. Let '1' cumec ($m^3$/sec) of water be Applied to this crop on the field for B days.

Now the volume of water is applied to this crop during B days = V

$$V = (84 \times 60 \times 60 \times B)\ m^3$$

$$= 86400\ m^3$$

By Definition of Duty, $1\ m^3$ of water supplied for B days matures D hectares of land. this quantity of water (V) matures D ha of land $10^4$ D $m^2$ of area.

Total depth of water applied on this land

$$= \frac{\text{Volume}}{\text{Area}} = \frac{8640\,B}{10^4\,D} = \frac{8.64}{D}\,m$$

By Def :->

This total depth of water is called Delta $\Delta$.

By Def. This total depth of water is Delta $\Delta$.

Therefore $\Delta = 8.64\,B/D\,m = 864\,B/D\,cm$

where $\Delta$ in cm, B is in days.

D is duty in hector/cumec.

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⇒ b) IF Wheat Requires about 90 cm of water after each 35 days and the base period or crop period of Wheat is 140 days. Find out the delta for wheat?

Sol :→ B = 140 days

Δ = ?

Water Required for Wheat = 9 cm

No of Days = 35 days.

By Ratio Method.

9 cm : 35 days

Δ : 140 days

$35\Delta = 140 \times 9$

$\Delta = \frac{140 \text{ days} \times 9 \text{ cm}}{35 \text{ days}} \Rightarrow \boxed{\Delta = 36 \text{ cm}}$

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(c) Explain Indus Water treaty :-

The Indus Water treaty (IWT) is a water distribution treaty b/w India and pakistan signed on sept-19-1960. The treaty was signed by -president Ayub Khan and PM J. Nehro. It was brokered by the world Bank.

The indus water treaty deals with river indus and its five tributaries which are classified into two categries.

| Eastern Rivers | Western Rivers |
|---|---|
| 1) Sutlej | 1) Jehlum |
| 2) Beas | 2) Chanab |
| 3) Ravi | 3) indus |

According to the treaty, all the water of eastern rivers shall be Available for unrestriction use in India.

- India should let unrestricted flow of water from western rivers to Pakistan.
- The treaty says that india can use the water in western rivers in non consumptive needs.
- The treaty allocats 80% of wades from the six-river indus water system to pakistan.
- A permanent indus commission was set set up as a bidateral commission to implement and manage the treaty.

d) Importance of Duty :-

It helps in designing efficient canal irrigation system. Knowing the

The available supply at the head of the main canal and the overall duty of all the crops required to be irrigated in different seasons of the year the area which can be irrigated can be worked out.

Inversely if we know the crop area required to be irrigated and their duties, we can work out the discharge required for designing the canal.

Q No: 02 (a)

Explain the factor effecting Consumptive use

Factors effecting consumptive use.

Tempradure, Humidity in air Velocity of wind, Soil Topography. Sunlight etc.

(1) Temperature:.

Compsumptive use of water is directly effected by the tempradure. At high tempradure the plant tends to show dormancy while at low tempradure there is a devastated plant growth.

(2) Humidity :->

Evaporation is inversly proportional to humidity at low humidity evaporation rate is more while at high humidity evaporat is slowed down.

3) Velocity :-

Evaporation rate is more when there is more velocity as air is moving faster so there will be more evaporation if the velocity of wind is low than rate of evaporation is also low.

4) Soil Topography :-

If a soil is made more fertile through the application of mature or by to increase with an a Companying small increase in use of water, However an increase in fertility of the soil causes a decrease in the amount of water consumed per unit of crop yield.

5) Sun Light :-

At days in summer there is more sunlight than usual so high evaporation occurs when on winter there is low evaporation rate.

QNO:2 (b)

Wheat is to be grown at a certain place the usefule rainfall for the whole season is 10 cm. and its comulative Consumptive use is 40 cm. Determine Consumptive irrigation requirement (CIR) and Field irrigation Requirment (FIR) if the water application efficiency is 80%

=> Soil. Given

Usefull Rainfall (cm) = 10

water application efficiency (ηa) = 80% = 0.8

Comulative consumplive use (Cu) = 40cm

Required :->

Field irrigation Requirment (FIR) = ?

Comsumplive irrigation requirmend CIR: ?

CIR = Cu - Re. => 40 - 10 = 30cm.

$FIR = \frac{CIR}{\eta a} = \frac{30}{0.8} = 37.5 cm.$

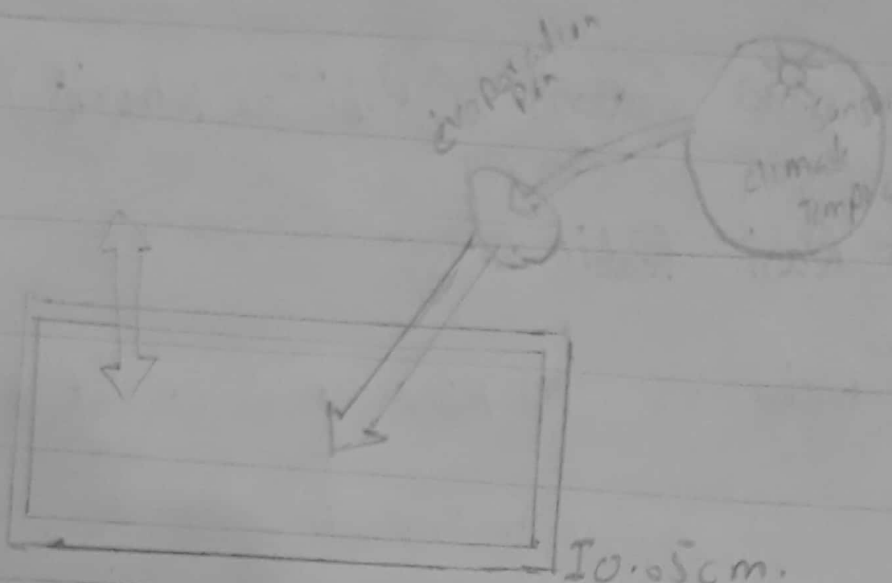
Q:No:2 (c)

Explain class A pan evaporation (EP) measurment with the help of a diagram.

Ans:→

Class A Pan Evaporation(EP) measurment:→

EP can be experimentally determined by directly measuring the quantity of water evaporated from this standard class a PAN. this pan is 1.0m is diameter, 25 cm deep, & bottom is raised 15 cm above the ground surface. The depth of water is to be kept in a fixed range such that the water surface is at least 5cm and never more than 7.5 cm, blow the top of Pan.




The Pan evaporation EP can also determined by using the Christiansen formula which states.

$EP = 0.49\ R.ct.cw.ch^{\circ}.cs.cc$

R = extra terrestrial radiation in the same units as EP in cm or mm.

ct = coefficient for temprature

cw = coefficient for wind velocity.

Q No: 02(d)

Explain crop seasons (Rabi & Kharif) &

Kharif Rabi Ratio :-

Ans:- "Rabi" :- 1st october to 31st march winter.

"Rabi crops" Rabi crops are wheat, Barley Gram mustard potatoes.

(8) Kharif : 1th April to 30ist in summer

Kharif crops :- Kasib crops are Rice, Jowar etc.

Rabi & Kharif Ratio :-

The Area is irrigated for Rabi crops Generally more that for Kharif Crops Generally more than that for Kharif crops. The ratio of proposed area is to be irrigated in kharif season to that in Rabi season is called as Rabi & Kharif ration. The Ratio is [1:2] that is Kharif area is one half of that Rabi

Q: 03(a)

Define and Explain the ballowing terms

Ans: Field Capacity

When all gravity water has drained down to water table. a certain amount of water is retained by surface soil this water which cannot be easily drained under the action of gravity.

Part(b) Permanent wilting point :->

It is defined as the minimum amount of water in the soil that the plant requires nat to will. If the soil water content decreases to this or any lower point a plant wilts and no longer recover its turgidity which placed in a saturated atmosphere for 12 hrs.

⇒ Part (c)

Available and readily available moisture contents :->

a ⇒ Available moisture content :->

The difference in moisture content

of the soil b/w field capacity and Permanent wilting is termed the available moisture. Available moisture can be expressed as percentage moisture, Pw, as.

Percentage Pr or a depth

(b) Readily available moisture content:-

It is the water that a plant can easily extracted from the soil Raw is the soil moisture held between field capacity and a nominated refill point for unrestricted growth. In this rang of soil moisture plant are neither waterlogged or stressed.

Part: (d): Optimum utilisation of water :-

The yield increase with water on reaches a certain maximum value and than falls down the quantity of water at which the yield is max is called optimum water depth. Therefore the optimum utilisation of water means getting maximum yield with any amount of water