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Q1 Define Delta & Duty & derive their relation in MKS & FBS System.

Ans(a) **Delta**

The depth of water in cm or inches required for the Crop throughout the base period is known as Delta of Crop.

Duty:- The term duty mean the area of land that can be Irrigated with Unit volume of Irrigation water. It is the relation b/w the area of Crop Irrigated & Quantity of Irrigation water require during the entire Period of growth of that Crop.

Relation B/w Delta & Duty

let there be a Crop of base period B days
let one Cumec (m^3/sec) of water be applied to this Crop on the field for B days,

- Now the Volume of water applied to this Crop during B day $V = (24 \times 60 \times 60 \times B)\ m^3 = 86,400\ m^3$

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By definition of Duty. 1 m^3 of water Supplied for B days matures D hectare of land. This quantity of water V matures D has of land. ~~This~~ or 10^4 D m^2 of area.

Total depth of water applied on this land

= Volume/Area = $86400\,B/10^4 D = 8.64\,B/D$ cm

where Δ is in cm, B in days.

D is duty in ha/cumec

In FPS Unit $\Delta = 1.98\,B/D$ ft

where Δ is in ft, B in days & D is in Acre/cusec

(b) **Given Data**

Water requirment of wheat = 9 cm

Days Interval = 35 days

Base Peroid = 140 days

Required

Delta of Wheat (Δ) = ?

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Solution:-

For 35 days = 9 cm

So for 140 days = Δ

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

$$\Delta = 36\text{ cm}$$

(c) **Indus Water Treaty**

The Indus water treaty is a water distributin blw India & Pakistan brokered by the world Bank to use the water available in the Indus System of rivers located in India.

The Indus water was signed in Karachi on Sep. 19, 1960 by PM of India

According to this Aggrement Control over the water flowing in three "eastern rivers" of India, the beav, the Ravi & Sutlej

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with the mean annual flow of 33 million acre-feet. MAF was given to India while Control over the water flowing the Indos the Chenab & the jhelum with mean Annual flow of 80 MAF was given to Pakistn

This treaty is Consider to be one of the most Succesful water Sharing endeavours in the world today.

(d) **Importance/ Significance of Duty**

- It help in designing efficient Cannal Irregation System. Knowing the total available water at the head of main Cannal & overall duty for all the Crops required to be Irregated in different Seasn of the year which Can be Irregated Can be Irregated Can be work out.

- Inversly If we know the Crop area required to be Irregated & their duties we Can workout the discharge require for designing the Cannals.

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(a)
Q2: Factors Affecting Consumptive Uses with Details.

Ans Following are factors affecting Consumptive Uses.

1) Precipitation:.

Storms may be of such intensity & amount that a large %age of the moisture will enter the soil & become available for Plant transpiration. This available soil moisture may materially reduce the amount of Irregation water needed.

2) Humidity:.

Evaporation & transpiration are accelerated on days of low humidity & slowed during Period of high humidity greater rate of Use of water by vegetation may be expected.

3) Wind Movement

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3) **Wind Movement:..**

Dry wind Ep other unusual wind Conditions during the growing period will affect the amount of water.

4) **Soil Fertility:..** Increase in fertility of the Soil Causes a decrease in the amount of water Consumed per unit of crop yield.

5) **Temperature.**

low temperature retard plant growth Ep unusually high temperature may produced dormancy. Transpiration is influenced not only by temperature but also by the leaf Surface.

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(b)

Given Data

Useful Rain fall = 10

Water Application Efficiency $(\eta_a) = 80\% = 0.8$

Comulative Comsumptive Use $(C_u) = 40\,cm$

Required

FIR = ?

CIR = ?

Solution

We know that

$$CIR = C_u - R_e$$

$$CIR = 40 - 10$$

$$\boxed{CIR = 30cm}$$

Also

$$FIR = \frac{CIR}{\eta_a} = \frac{30}{0.8}$$

$$\boxed{FIR = 37.5cm}$$

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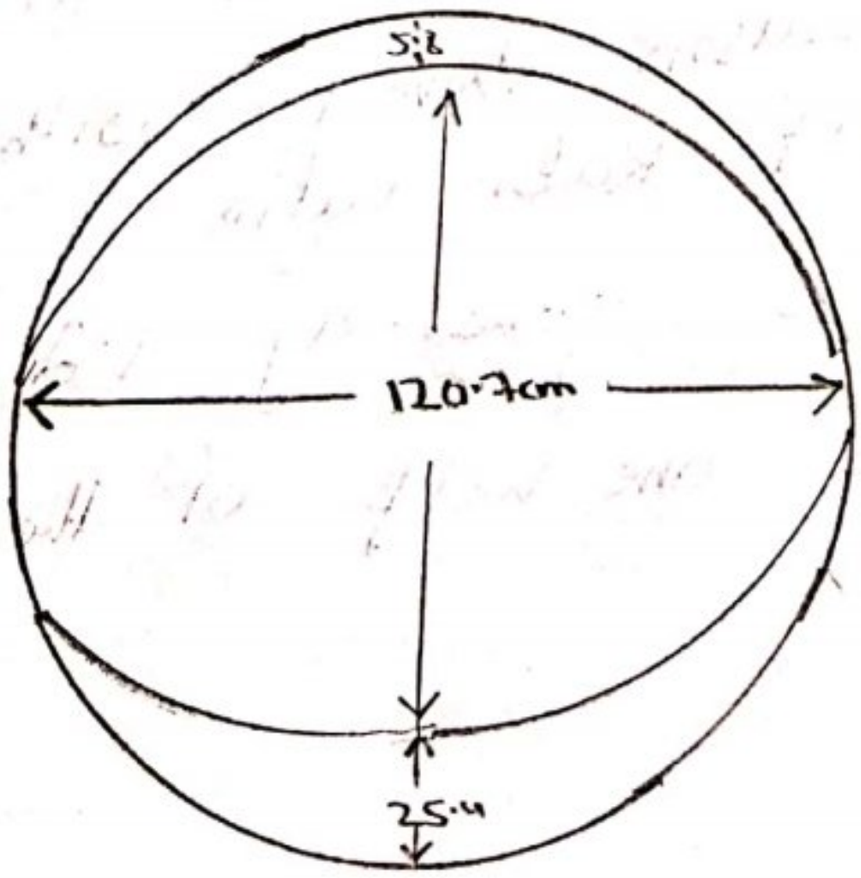
Class A Pan Evaporation Measurement

The class A Evaporation Pan may be a standard device for manual measurment of evaporation (Austrailian Bureau of Meterology class A type).

The Pan represents an open body of water. Its Crammed with water & exposed on a flat platuea. The evaporation rate is Calculated by the change in level of the free water surface (daily manual reading) & therefor the recorded rainfall in (mm)

Data are often Calculated for any Period require for estimation of evaporation & evapotranspiration rates.



(d) ## Crops Seasons:..

In Pakistan there are two crop Seasons "Kharif" & "Rabi"

Kharif: Crop which is Sowing in beginig in April & harvest b/w October & December Examples are Rice, maize cotton etc

Rabi Crops:.. Crops that are Sown in Winter & harvest within Springs Example are Wheat, Gram. onion etc

Kharif Rabi Ratio

The Area to be Irregated for Rabi Crop is Usually quite that for the Kharif crop The ratio of proposed Area to be Irregated in Kharif Season there to within Rabi Season is named. Kharif Rabi ratio.

This ratio is generally 1:2 ie, Kharif area is one half of the Rabi area.

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Q-3 Define & Explain the following terms

Ans (a) **Field Capacity:-**

Field Capacity is greatest amount of water the soil can hold under the drainage.

☞ For most soil It is obtained after two days of drainage after the soil was saturated by heavy rain or Irregation

☞ It is basically the optimum amount of water needed for agriculture

☞ After the drainage has stopped, the large soil Pores are filled with air & water & the Smaller Pores are still full of water, At this stage the soil are called af field Capacity.

(b) **Permanent Wilting Point:-**

That water Content at which plants can no longer extract Sufficient amount of water from the soil for its growth.

In Simple words we can say that it is the lower end of the available moisture range.

Common Sense that if the plant donot get Sufficient water to meet it needs. this plant will milt permanantly.

☞ A plant is said to be permanently wilted when it will not recover after been placing in a Saturated atmosphere.

There are two stages of willting points.

1) Temporary Wilting Point

It occurs when the rate of transpiration is more then water absorption due to shrinkage of roots

This type of willting recover when water is replenished in the soil around roots hairs

2) Permanent Willting :-

Rate of transpiration is more then rate of absorption but difference is below critical level.

⇒ Plant eventually dies in permanent wilting.

(c) **Available Moisture Content:-**

The difference in moisture Contents of Soil b/w the field Capacity & Permanent wilting Point is Called Available moisture Content.

Readily Available Moisture Content:-

It is the portion of the available moisture that is most easily extracted by Plants

☞ It is approx:, 75% of available moistove

(d) **Optimum Utilization of Water:-**

If Crop is Sown & produced under absolutly identical Condition using different amoun. of water depths, the yield is found to be vary.

The yield increase with water, reaches to a Certain maximam Value & then fall down So, the quantity of water at which the yield is maximam is term as optimum water depth.

Therefor optimum Utilization of water generally mean getting maximam Yiedd with any amount of water

~~The~~ Soil