

" Mid term Exam "

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Q.10) Define "Delta" Δ & "Duty" D
 derive their relationship in
 "MKS" and "FPS" System:-

Ans Delta:- It is the total depth of water required by a crop during entire base periods. It is expressed in terms of depth Δ denoted by " Δ ". The depth of water in "cm" or "Inch" for the crop throughout the base period is called Delta of the crop.

Duty:- The duty of water is defined as number of Hectare that can be irrigated by constant supply of water at the rate of one Cumec throughout the base period. It is expressed in hectares/Cumec D is denoted by " D ".

"Derive Relationship In "MKS" & "FPS" System

In "MKS" System :-

Let Duty = D (hectares / Cumecs)

Delta = A meters base period = " B " days

One cumec of water flowing continuously

for " B " days gives a depth of water

" A " over the area of " D " hectare

vol of water @ $1 \text{ m}^3/\text{sec}$ in one day = $1 \times 24 \times 60 \times 60$

$$= 86400 \text{ m}^3 = 86400 \text{ m}^2 \cdot \text{m} \quad \text{--- (1)}$$

As 1 Hectare = 10000 m^2

$$1 \text{ m}^2 = 1104 \text{ H}$$

then eqn (1) became

vol of water @ $1 \text{ m}^3/\text{sec}$ in " B " days = $86400 B \text{ m}^3$

$$= 86400 B \times 1104 \text{ H} \cdot \text{m}$$

$$= 8.64 \times B \text{ H} \cdot \text{m} \quad \text{(ii)}$$

Depth of water required by crop

$$A = 8.64 \times B \text{ H} \cdot \text{m} / D \text{ H}$$

In "FPS" System :-

Let Duty = D (Acres / Cuses)

Delta = A Feet Base period = B days

one cusec for water flowing continuously

for " B " days give a depth

val of water @ $1 \text{ ft}^3 \text{ sec}$ in one day =

$$1 \times 24 \times 60 \times 60 = 86400^3$$

val of water = $1 \text{ ft}^3 \text{ sec}$ in B days

$$= 1 \times 24 \times 60 \times 60 = 86400 \text{ B ft}^3$$

$$= 86400 \text{ ft}^2 \cdot \text{ft} \quad \text{--- (1)}$$

As

$$1 \text{ Acre} = 43560 \text{ ft}^2$$

$$1 \text{ ft} = 143560 \text{ Acre}$$

val of water @ $1 \text{ ft}^3 \text{ sec}$ in B days =

$$1.983 \text{ B Acre ft} \quad \text{--- (2)}$$

$$\text{Acre A} = 1.983 \text{ B D ft}$$

(b) if wheat requires about 9cm of water after every 35 days & the base period or crop period of wheat is 140 days find the delta for wheat.

Given data

$$\text{Water requirement} = 9 \text{ cm}$$

$$\text{Days interval} = 35 \text{ days}$$

$$\text{Base period} = 140 \text{ days}$$

$$\text{Delta of wheat } (\Delta) = ?$$

Sol:-

$$35 \text{ days} = 9 \text{ cm}$$

$$140 \text{ day} = \Delta$$

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

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

(c) Explain "Indus Water Treaty"

Ans In the year "1960". India & Pakistan signed a water distribution agreement. This agreement took nine years of negotiations & divide the control of six rivers between the two nations once signed.

- ▲ Under the treaty India got control of Beas, Ravi, Sutlej
- ▲ While Pakistan got control of Indus, Chenab, Jhelum.

(d) Write significance of Duty of Crop.

Ans The term duty means the area of land that can be irrigated with unit volume of water. Duty represents the irrigation capacity of a unit. It is the relation between the area of a crop irrigated & the quantity of irrigation water required during the entire period of the growth of the crop.

Q2(a) Explain the factors affecting Consumptive use.

- Ans
- (1) Temperature
 - (2) Humidity in Air
 - (3) velocity of Wind
 - (4) Soil topography
 - (5) Sunlight
 - (6) Plant Pests & Diseases.

(1) Temperature:-

The rate of Consumptive use of water by crops in any particular locality is probably affected more by temp which for long-time period is a good measure of Solar radiation than by any other factor.

(2) Humidity in Air:-

Evaporation & transpiration are accelerated on days of low humidity & slowed during periods of high humidity. During period of low relative humidity, greater rate of use of water by vegetation may be expected.

(3) Velocity of Wind:-

Evaporation of water from land & plant surface takes place more rapidly where there is moving air than

under calm air conditions. Hot air wind & other unusual wind conditions.

(4) Soil topography:-

If a soil is made more fertile through the applications of manure or by some other means, the yields may be expected to increase with an accompanying small increase in use of water.

(5) Sunlight :-

Since Sun is the main source of all energy used by crop growth & evaporation of water. During summer more water is evaporated.

(6) Plants Pests & diseases:-

Where plants pests & diseases seriously affect the natural growth of the plants, it is reasonable to assume that transpiration will likewise decrease. It is recognised that some damage to crop is caused every year by pests & diseases.

Q2(b) Wheat is to growth at a certain place, the useful rainfall for the whole season is 10cm & its cumulative consumptive use is 40cm. Determine Consumptive Irrigation requirement (CIR) & field Irrigation requirement (FIR) if the water application efficiency is 80%.

Given data:-

$$\text{Useful rainfall (cm)} = 10$$

$$\text{Water application efficiency } (\eta_a) = 80\%$$

$$\text{Cumulative Consumptive use } (C_u) = 40\text{cm}$$

Required :-

$$(\text{FIR}) = ?$$

$$(\text{CIR}) = ?$$

Sol:-

As we know

$$\text{CIR} = C_u - R_e = 40 - 10$$

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

$$\text{FIR} = \frac{\text{CIR}}{\eta_a} = \frac{30}{0.8} = 37.5\text{cm}$$

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

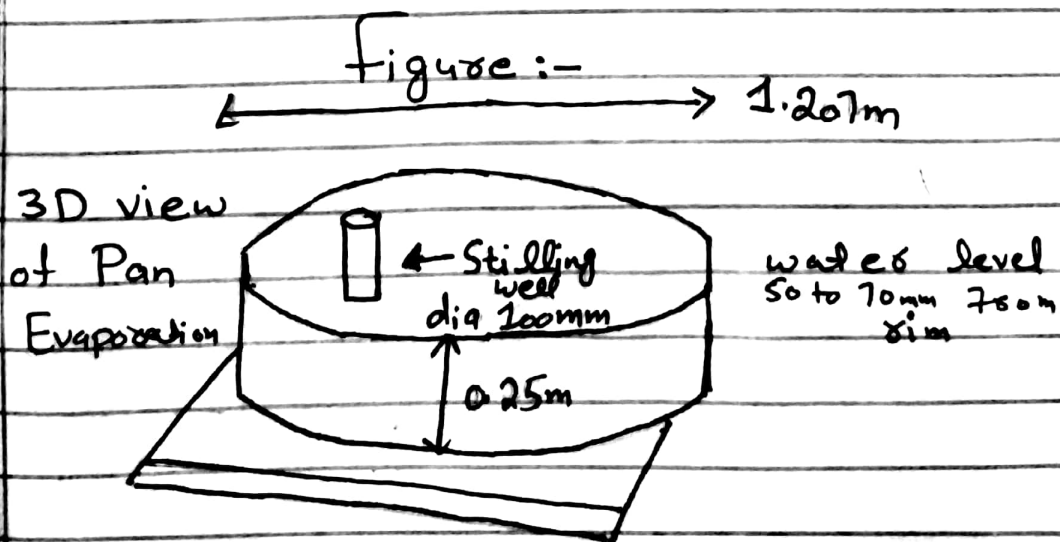
2(c) Explain Class A Pan Evaporation (EP) measurement with the help of diagram.

Ans Pan evaporation is a measurement that combine or integrates the effects of several climate elements: temp, humidity, rainfall, drought dispersion, solar radiation & wind.

EP can be experimentally determined by directly measuring the quantity of water evaporated from this standard class a pan. This pan is 1.0m in dia, 25cm deep, & bottom is raised 15cm above the ground surface, the depth of water is kept fixed range & water surface is atleast 5cm & not more than 7.5cm below the top.

"The pan evaporation (EP) can be also determined by Christiansen formula"

$$E_p = 0.459 R \cdot C_T \cdot C_w \cdot C_h \cdot C_s \cdot C_e$$



Q.2d) Explain Crop Seasons (Rabi & Kharif) & Kharif Rabi Ratio

Ans

Kharif Crop

(1)

It is a crop which are sown at the beginning of the rainy season. e.g between "April & May".

(2)

These crops are known as monsoon crops.

(3)

Major Kharif crops are rice, maize, cotton, Jowar, bajra etc

(4)

It require a lot of water & hot weather.

(5)

Flowering requires shorter day length

(6)

Harvesting months "Sep to Oct"

Rabi Crop

This crops are sown at the end of monsoon or at the beginning of winter season. (Sep & Oct).

These crops are known as winter or spring crops.

Major Rabi crops are wheat, gram, peas, barley etc.

A warm climate for seed & cold climate for growth of crop.

Flowering requires longer day length

Harvesting months "March to April"

Q3 Define & explain the following terms

(a) Field Capacity:-

Field Capacity is the amount of soil moisture or water content held in soil after excess water has drained away and the rate of downward movement has materially decreased. The physical definition of field capacity is the bulk water content retained in soil at 333/kg of hydraulic head.

(b) Permanent Wilting Point:-

The minimal point of soil moisture the plant requires not to wilt. If moisture decreases to this or any lower point a plant wilts can no longer recover its turgidity when placed in a saturated atmosphere for 12 hrs.

(c) Available & readily available moisture content:-

Available moisture content:-

The difference in moisture content of the soil between

Field Capacity (F.C) $\&$ permanent wilting is termed the available moisture.

Readily Available moisture:-

Soil moisture content near the wilting point is not readily available to the plant. Hence, the term readily available moisture has been used to refer to that portion of the Available moisture that is most easily extracted by plants. :-

(d) **Optimum Utilization of water:-**
If a crop is sown and produced under absolutely identical conditions using different amount of water depths, the yield is found to vary. The yield increase with water at max value as shown in fig:-

