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ID : 7796

SECTION : A

SUBJECT : IRRIGATION ENGG

INSTRUCTOR: JAHANGIR DURRANI

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Ans 1 @:

Delta:

The total amount of water required to the crop throughout its base period, to get enough matured.

Duty:

The total land that can be irrigated with unit volume of water. It is the relationship between the area of crop & the amount of irrigated water.

Relationship between Delta & Duty:

In MKS:

D = Duty in hectare

Δ = total depth of water supplied in meter

B = Base period in days

If we take a feild of area D hectare water supplied to the feild corresponding to the water to the water depth Δ meters will be

$\Delta \times D$ hectares-meter

$= D \times \Delta \times 10^4$ cubic meter → (1)

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Again for the same feild of D hectare, one cumec of water is required to flow during the entire base period, hence water required to this feild = $1 \times (B \times 24 \times 60 \times 60) m^3 \rightarrow (2)$

Equating eq (1) & (2) we get;

$$D \times \Delta \times 10^4 = B \times 24 \times 60 \times 60$$

$$\Delta = \frac{B \times 24 \times 60 \times 60}{D \times 10^4} = 8.64 \frac{B}{D} \text{ meter}$$

In FPS system:

Let Duty = D Acres/cusecs

Delta = A feet Base = B days by definition one cusec of water flowing continously for B days given a depth of water A over an area of D acres.

volume of water $1 ft^3$ sec in one day

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

volume of water $1 ft^3$ in sec in B days $= 1 \times 24 \times 60 \times 60 = 86400 B ft^3$

$$= 86400 ft^2 \rightarrow (1)$$

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As 1 acre = 43560 ft^2

= 143560 acre then, eq ① become

Volume of water 1 ft^3 sec

in B days = 8640 B ft^3

= 8640 B × 143560 Acre-ft volume of water

1 ft^3 sec in "B" days = 1.983 B Acre ft

Depth of water required by crop A =

Volume Area A

= 1.983 B Acre-ft D Area A

= 1.983 × B/D ft

Δ = 1.983 B/D ft

where "Δ" is in ft

"B" in days

"D" in acre / cusec

(B) Given data:

water requirement of wheat = 9 cm

Days interval = 35 days

Base period = 140 days

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Required:

Delta of wheat (Δ) = ?

Solution:

35 days = 9 cm

140 days = Δ

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

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

(c) Indus water treaty:

History:

It was signed on 19th September 1960 by Prime minister of India Pandit Jawaharlal Nehru & President of Pakistan Ayub Khan.

Statement:

It is water distribution treaty between Pakistan & India for the usage of water available in the rivers of India.

According to this treaty India was given control of eastren rivers Beas, Ravi & Sutlej, while the

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control of western rivers Indus, Chenab & Jehlum was given to Pakistan.

However this treaty is still followed by both countries upto a certain level.

Recently PM Modhi decided to end this treaty but it dosent work.

(c) Significance of duty of a crop:

It helps us in designing an efficient canal irrigation system. Knowing the total available water at the head of a main canal, and overall duty for all the crops to be irrigated in different seasons of the year, the area which can be irrigated can be worked out. Inversely, if we know the crops area required to be irrigated and their duties, we can work out the discharge required for designing the channel.

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Ans 2

ⓐ Factors affecting consumptive use.

1- Sunlight:

It is a source of all energy used in crop growth & evaporation of water, this may allow plant to continue transpiration.

2- Movement of wind:

Evaporation of water from land & plant surface take place more rapidly when their is moving wind, wind condition during growing period will effect the amount of water consumptively used.

3- Temperature:

The rate of consumptive use of water by crop in any particular locality is probably affected more by temperature.

4- Humidity:

Evaporation & transpiration are accelated on days of low humidity & slow during period of of high humidity.

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5- Latitude:

Although Latitude may hardly be called a climatic factor it does have consedarable influence on the rate of consumptive use of water by various plants.

6- Quality of water:

The quality of water supply may have an appreable effect on consumptive use.

7- Soil fertility:

The increase in fertility of the soil causes a decrease in amount of water consumed per unit of coop yeild.

(b) Given data:

useful rainfall (cm) = 10

water application efficiency (η_a) = 80%.
= 0.8

comulative consumptive use (Cu) = 40cm

Required:

Feild irrigation Requirement (FIR) = ?

Consumptive irrigation requirement (CIR) = ?

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Solution:

By formula,

consumptive irrigation Requirement (CIR) = CU - Re

= 40 - 10

CIR = 30 cm

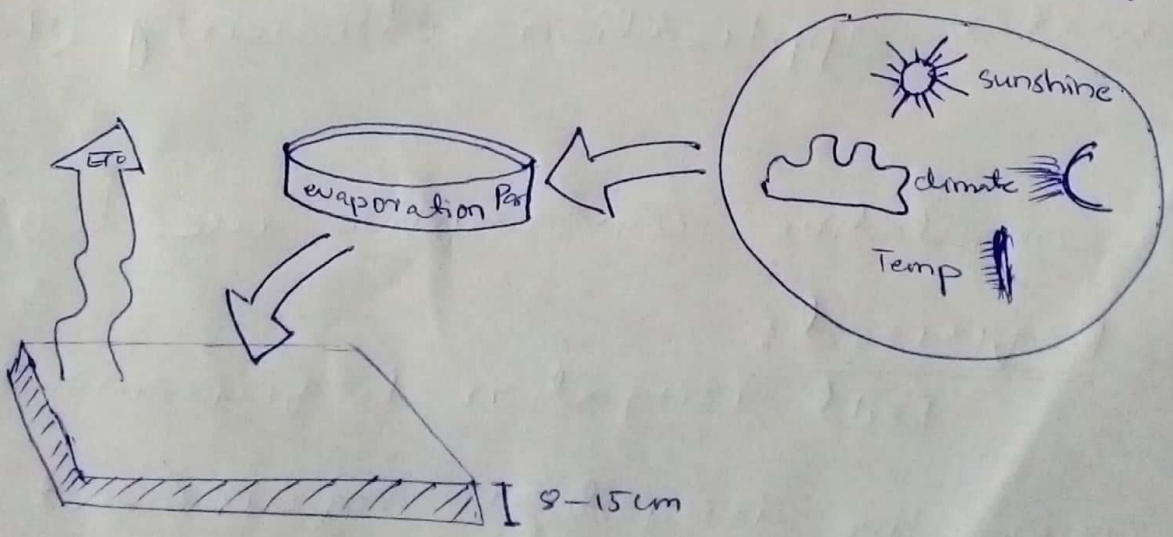
Field irrigation Requirement (FIR)

$$= \frac{CIR}{\eta a}$$

$$= \frac{30}{0.8} = 37.5 \text{ cm}$$

(c) Class A pan evaporation:

It is a standard device for manual measurement of evaporation The pan represents an open body of water, it is filled with water & is exposed on a flat plateau.



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① Kharif crops:

These are the crops which grown during monsoon season or rainy days, they are also called monsoon crops.

Their seeds are sown at the beginning of the monsoon and are harvested at the end of the season.

These crops depends on the rainfall pattern.

Example:

Paddy, maize, jowar, bajra, cotton, sugarcane, pulses etc.

Rabi crops:

These are the crops which grown in winter season.

They are also known as winter crops, Their seeds are sown at the beginning of the winter season & are harvested in the spring season.

They are cultivated in dry season.

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Example:

wheat, oat, barly, potato mustard, sunflower etc.

Kharib Rabi Ratio:

"The area to be irrigated for kharif crop is less than Rabi crop. This ratio of proposal area to be irrigated in kharif season to that in the Rabi season is called kharif Rabi ratio."

This ratio is generally 1.2 kharif area is one halfed of the Rabi area.

Ans 3:

(a) Feild capacity:

The amount of water content held in the soil after excess water has drained away & the rate of downward movement has decreased.

This process take place in two to three days after rain or irrigation

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It is also defines as:

The bulk water content retained in soil at -33 KPA/kg of hydraulic head or suction pressure.

Feild capacity is characterized by measuring water content after wetting soil profile, covering it & monitring the change soil moisture in the profile.

(b) Permanent wilting point;

It is define as the minimum amount of water in the soil that the plant requires not to wilt.

If the soil water content decrease to this or any lower point a plant wilts and can no longer reduce its turgidity when place in a saturated atmosphere for 12 hours.

(c) Available moisture:

The diffrence in moisture content of the soil between feild capacity & permanent wilting is tcamed the available moisture

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available moisture can be expressed as percentage moisture P_w, as Percentage P_v or as depth d.

Radily 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, approximately 75% of the available moisture.

(d) Optimum utilization of water:

If a crop is sown and produced under absolutely identical conditions, using different amounts of water depths, the yeild is found to vary, the yeild increases with water reaches a certain maximum value and then falls down, the quantity of water at which the yeild is maximum is called optimum water depth.

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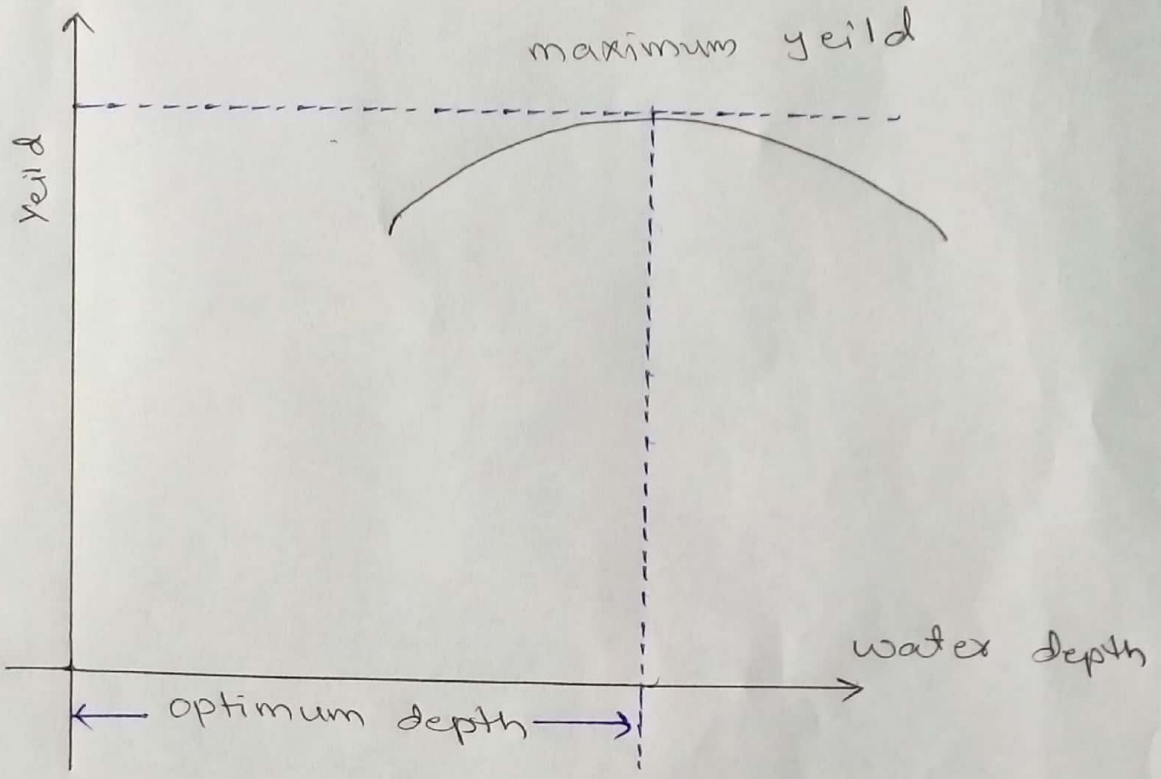

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