SYED JAWWAD

7386

IRRIGATION ENGINEERING

Q1 - Part A

DUTY:-

The relationship between the supply of water and the crops that can be irrigated by Constant supply of water.

Example:- If 3 Cumecs of water is required for the Crop sown in, an area 5100 hectares, the duty of irrigation will be 5100/3 = 1700 hectares/Cumecs and the discharge of 3 Cumecs is required throughout the base Period.

Delta:-

It is defined as the requirement of water by a Crop at a depth. It is denoted by Δ. Depth of Each watering 5cm(2") - 10cm(4")

RELATION IN MKS SYSTEM:-

Let

Duty = D (hectares/Cumecs)

Delta = A meters base Period = B days by definition

One Cumec of water flowing Continously for "B" days gives a depth of water "A" over an area of "D" hectares

Volume of water @ $1m^3$ sec in one day = $1 \times 24 \times 60 \times 60$
$= 86400 m^3$

Volume of water @ $1m^3$ sec in "B" days = $1 \times 24 \times 60 \times 60$
$= 86400 B m^3$
$= 86400 m^2\text{-}m$ - (i)

As. 1 Hectare = $10000 m^2$

$1 m^2 = 1104$ H

Then Equation (i) becomes

Volume of water @ 1 m^3 Sec In "B" days = $86400 B m^3 = 86400 B \times 1104$ H-m

Volume of water @ $1 m^3$ Sec in "B" days = $8.64 \times B$ H-m - (ii)

Depth of water required by Crop - A = Volume Area - A = $8.64 \times B$ H-m / HA

$= 8.64 \times B$ m

Relation In FPS System:-

Let Duty = D (Acres/Cusecs)

Delta = A feet Base Period = B days by Definition

One Csec of water flowing continously for "B" days gives a depth of water "A" over an area of "D" acres

Volume of water @ 1 ft^3 Sec in "B" days = $1 \times 24 \times 60 \times 60$

$= 86400 B ft^3$

$= 86400 ft^2 ft$ - (i)

As 1 Acre = $43560 ft^2$ $1 ft^2 = 143560$ Acre

Then Equation i becomes

Volume of water @ 1 ft^3 Sec in "B" days = $86400 B ft^3$

$= 86400 \times 43560$ Acre ft Volume

of water @ 1 ft^3 Sec in "B" days = $1.983 \times B$ Acre ft (ii)

Depth of water required by Crop, A = Volume Area = 1.983

B Acre - ft D Acre A = $1.983 \times B$ D ft.

Q1-Part -B

Q: Wheat requires about 9cm of water after every 35 days and the base period or crop period of wheat is 140 days. Find out the delta for wheat?

Sol:-

Given data:-

water requirement of wheat = 9cm

Days interval = 35 days

Base Period = 140 days

Delta of wheat (Δ):-

:) 35 days = 9cm

140 days = Δ

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

$\Delta = 36\text{cm}$

Q1 - Part c

INDUS WATER TREATY:-

The Indus water treaty is basically a Pact between India and ~~bedered~~ Pakistan bedered by world bank for the distribution of water of Indus Rivers located in India. This was a mutual agreement between Pandit Jawahar Lal Nehru from India and President Ayub khan from Pakistan.

According to this Agreement, River ~~Bees~~ Beas, Ravi and Sutlej were assigned to India where as River Chenab, Jehlum and Indus were given to Pakistan. Since Pakistan was recieving more water. India was given right to use western rivers as well. The Purpose of this Agreement is to support the goodwill and Co-operation between two Countries.

This treaty has said to be the most Successful Pact between the two ~~Countries~~ Countries despite of these wars and certain war like situations. Disputes took Place but they ~~were~~ were taken care with Legal Procedures.

Q1 - Part-D

Significance Of Duty:-

The Importance of duty is to design a Canal Irrigation System by knowing the total duty of Crops and their requirement of Irrigation in different Seasons of the year and vice versa if the Crop Duty and the Irrigation requirement is known.

FACTORS AFFECTING CONSUMPTIVE USE:-

1. TEMPRATURE
2. HUMIDITY
3. VELOCITY OF WIND
4. SOIL FERTILITY
5. SUNLIGHT.

(1) TEMPRATURE:-

Rate of Consumptive Use is affected more by temprature as abnormally low temprature has a great Affect on Plant growth and might retard it. Unusually high temprature may produce dormancy

(2) HUMIDITY:-

Low Humidity leads to the acceleration of Evaporation and transpiration where as these Processes Slow down in Case of high humidity and low humidity leads to more use of water for vegetation.

(3) VELOCITY OF WIND:-

Under Calm Conditions, moving air Plays a vital Role in Evaporation of water from Land and Plant Surfaces.

Hot dry winds Cause more water Consumption However, thair is a limit of water Usage.

4) Soil Fertility:-

If the soil is made fertile by some means, the yield may expected to increase causing less water use.

5) Sunlight:-

Sun is the source of energy used in crop growth so the more longer the day in a region. the more the sunlight allowing plant to continue longer transpiration.

Q2-Part (B)

(8)

$Q_{2(b)}$: What is to be grown at a Certain Place, the use full rain-fall for the whole Season is 10cm and it's cumulative consumptive use is 40 cm. Determine Consumptive Irrigation requirement (CIR) and field Irrigation requirement (FIR). If the water application efficiency is 80%.

Sol:-

Given data:-

Useful Rainfall (cm) = 10

water ~~Efficiency~~ Application Efficiency (η_a) = 80% = 0.8

Commulative Consumptive use (Cu) = 40cm

Required:-

Field Irrigation Requirement (FIR) = ?

Consumptive Irrigation Requirement (CIR) = ?

By formula

=> Consumptive Irrigation Requirement (CIR) = Cu - Rc

= 40 - 10

CIR = 30cm

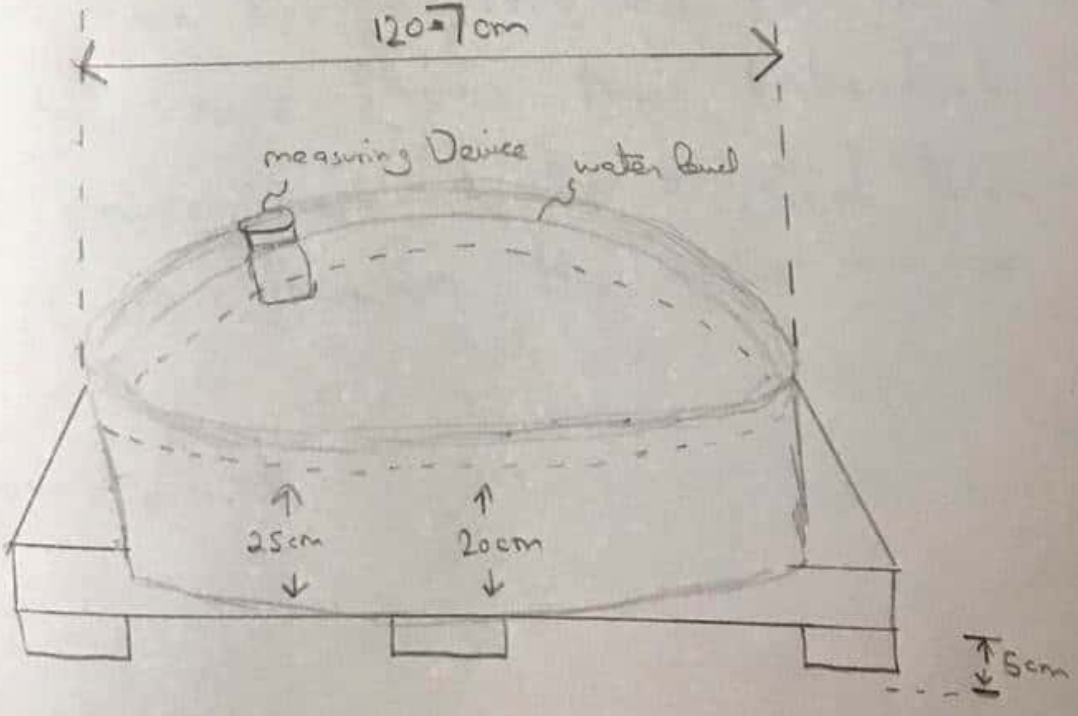
=> Field Irrigation Requirement (FIR) = $\frac{CIR}{\eta_a}$

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

Q2 - Part - C

CLASS A PAN EVAPORATION (EP) MEASUREMENT:-

. EP can be Experiment-ally determined by directly measuring the Quantity of water Evaporated from this Standard class a Pan. This Pan Is 1.0m in diameter, 25cm deep, and bottom is raised 15cm above the Ground Surface. The depth of water is to be kept in a fixed range such that the water Surface is at 5cm at least and never more than 7.5 cm, below the top of Pan.



(10)

Q 2 - Part - d

RABI:-
The winter stream starting from 1st October to 31st March

KHARIF:-
The Summer Seagon Starting from 1st April to 30th September

KHARIF/RABI RATIO:-
The area to be irrigated for the kharif and Rabi Crops shows their Ratio. Rabi Crops require more area to be irrigated than Kharif Crops therefore the ratio will be

1 : 2

Kharif / Rabi

PART - A

FIELD CAPACITY:-

water is drained down by gravity to water table but Certain Amount of water is retained by the Soil and is not drained by gravity. That is Called Field Capacity.

The Period of Drainage is 2-5 days and Field Capacity is measured after 2-5 days.

PERMENANT WILTING POINT:- PART-B

Permenant wilting Point is that Point where a Plant Can no longer extract water from Soil for it's growth and wilts up

water Available to Plant => F.C = P.W.P

AVAILABLE MOISTURE CONTENT:- PART-C

The Difference between field Capacity and Permenant Wilting Point in available moisture. It is denoted as Percentage Moisture Pw, Percentage Pv or as depth "d".

READILY AVAILABLE MOISTURE:-

Approx 75-80% max moisture which is Easily extracted by Plants.

PART-D

OPTIMUM UTILIZATION OF WATER:-

The Crop is Sown Under different water depths and Produced Under absolute identical Conditions. This Causes the yield to increase with water and it reaches a certain Value and then falls down.