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SUBMITTED TO : Dr. Jahangir Durrani

SUBJECT : Irrigation Engnicering

SECTION : B

Module : 6th

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Q No. 1 Define "Delta" and "DUTY" and drive their relation-ship in M K S and EPS system.

Delta:

It is define as "The depth of water in "cm" or "m" that is required for the crops through out the Base Period is known as delta of the crop

⇒ majorly, a crop needs specific volume of water

in order to accumodate its base period

DUTY : DUTY of water is expressed as the number of hactare of land that can be irrigated for the full growth of the given crop by supplying 1 cumec water continuously during the entire base period of that crop.

Relationship b/w Duty & Delta in MKS system.

⇒ Let there be a crop of base period B days. Let one cumec (m/sec) of water be applied to this crop on the one the ~~filled~~ field B days.

Now the volume of water applied to this crop during B days.

$V = (24 \times 60 \times 60 \times B)\ m^3 = 86.4 B\ m^3$

By definition of duty, $1\ m^3$ of water supplied for B

days matures D hactares of land. This quantity of water "V" matures of D ha of land or 10^4 Dm^2 of area.

⇒ Total depth of water applied on this land

$$\frac{\text{Volume}}{\text{Area}} = \frac{86400\,B}{D\,(m)} = 864\,B/D \text{ cm}$$

where Δ is in Cm, B is in Days D is duty in ha/cumec

Relationship b/w Duty and Delta in FPS system:

Let

Δ = Delta

D = Duty (areas/cusec)

B = Days

One cusec of water flowing continously for "B" days gives depth of water flowing continuously for B days

gives a depth of water "A" over an "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 = $1 \times 24 \times 60 \times 60 = 86400$ ft^3 —> (i)

$\therefore$ 1 Acre = 43560 ft^2

Putting in equ (i) = $86400B/43560$

vol of water (ft^3/sec) in B day = 1.983 Acre ft — (ii)

Depth of water required for crop = $\frac{1.983\ B}{D}$ ft

$$\Delta = \frac{1.983\ B}{D} \text{ ft}$$

(b) If wheat requires about 9 cm of water after every 35 days and base period or crop Period of wheat is 140 days Find out the delta

for wheat?

Given data

water required for wheat = 9cm

No of days = 35 days

B days = 140 days

Required:

$\Delta = ?$

By using ratio method

$9\ cm = 35\ days$

$\Delta = 140\ days$

$35\ \Delta = 9 \times 140\ days$

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

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

(c) Explain Indus water Treaty?

⇒ The Indus water treaty (IWT) is a water distribution treaty

b/w India and Pakistan signed at 19 sep, 1960.
The treaty was signed by president Ayub KHAN and P.M J. Nehru. It was broken by the world bank.

The indus water treaty deals with rivers Indus and it's five tributaries which are classified into two catagories

Eastern Rivers	westren Rivers.
SUTLEJ	JEHLEM
BEAS	CHENAB
RAVI	INDUS

⇒ According to the treaty all the water of eastren rivers shall be available for unricted use India. India shall let unrestricted flow of water from westren rivers of Pakistan.

⇒ The treaty says that

(7)

India can use the water in western rivers in "non-consiuptive" needs.

⇒ The treaty allows 80% of water from the six rivers Indus water system to Pakistan.

⇒ A permenant Indus Commision was set up as a bilateral Commision to implement and manage the treaty

(d) Write Significance of duty of a crop.

⇒ It helps in designing efficient Cannal Irrigation system. If we know the overall duty of all the crops required to be irrigated in different seasons of the year and the total avilable water at the head of the main canal, the area which can be irrigated and can be worked out.

If we know the crop area required to be irrigated along with their duties so we can worked out the discharge requiered for designing the canal

$$Q = A/D \quad ; A = QD$$

Q2

(a) Explain the factor affecting consumptive use.

Ans Following are the factor consumptive use.

→ Temperature

→ Humidity in air.

→ velocity of wind

→ Soil Topography

→ Sunlight etc.

(i) Temperature:

Consumptive use of water is directly

affected by the temperature. At high temperature the Plants tends to show dormacy while at low temperature there is devasted Plant growth.

=> Humidity in Air:

Ever Evaporation is inversly proportional to humidity as at low humidity evporation rate is more while at high humdity evaporation is slowed down.

=> Velocity:

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

=> Soil Topography:

if a Soil

made more fertile through the Application of manure or by some other means. The yilds may be expected to increase with an accompnying small increase in use of water. However an increase in fertile of the soil cause decreases in the amount of water consumed per unit of crop yield.

⇒ **Sum light:**

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

(b) **part "B"**

Given data:

Usefull Rainfall (cm) = 10

water Application efficieng (na) = 80% = 0.8

Cumulative Consamptive use (cu) = 40cm

Required:

field Irrigation Requirmnt (FIR) = ?

Consumptive Irrigation Req (CIR) = ?

Solution:

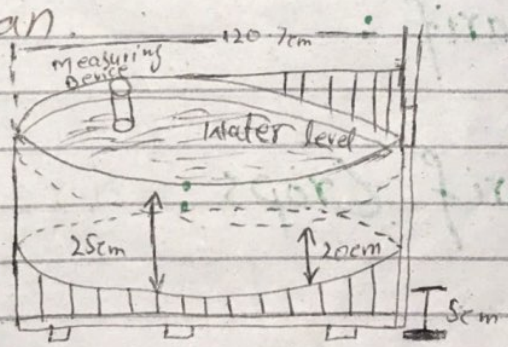
$$\therefore CIR = CU - Re = 40 - 10 = 30 \text{ cm}$$

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

(C) Explain class A plan evaporation (EP) measurement with the help of diagram?

Ans:- Class A plan Evaporation EP measurment:

⇒ EP Can be Experimently determind directly measured the quantity of water evaporated from this standerd Class A pan. This pan is 1.0 m in dia, 25cm deep and bottom is raised 15 cm above the ground surface. The depth of water is to be kept in a fixed rang such that the water surface is at least 5 cm and Never more than 7.5 cm, below the top of pan.



⇒ A pan evaporation EP Can also determind by using the chistiansen formula which states.

$$EP = 0.459\ R \cdot ct \cdot cw \cdot ch \cdot cs \cdot ce$$

(12)

R = Extra terrestrial radiation is same unit as EP in cm or mm.

Ct = Coefficient for Temperature
CW = Coefficient for wind velocity.

d

Explain Crop Season (Rabi & Kharif) & Kharif Rabi Ratio ?

Ans (i) Rabi : 1th October to 31st march ← Winter.

Rabi Crops : Rabi Crops are, Wheat, Barley, Gram, Mustard, patates

(ii) Kharif : 1th April to 30st September in Summer.

Kharif Crops : Kharif Crops are Rice, Bajra, Jawar, Cotton.

Rabi & Kharif Ratio : The area is irragated for Rabi Crops Generally more than that for Kharif Crops Generally more than that for Kharif crop. The ratio of proposed

area is to be irrigated in Kharif Season to that in Rabi Season is Called as Rabi & Kharif Ratio. The Ratio is [1:2] that is Kharif area is one half of that Rabi areas.

Q No 3: Define & Explain the following?

Ans: (a) **Field Capacity:** When all gravity water has drained down to water tables. A Certain of water is retained by Surface Soil. This water which can't be easily drained under the action of gravity and is Called F.C.

(b) **Permanent wilting Point (P.W.P):**

A plant Extract water from Soil till a permanent wilting is reached (P.W.P) is that water Content at which a plant can no longer extract sufficient water for its growth and wilts up.

Water available to plant = (field capacity - pwp water)

(c) Available & Readily available moisture:

Available Moisture Content: The difference in moisture content of the soil between field capacity and permanent wilting is termed the available moisture. Available moisture can be expressed as: percentage moisture PW as percentage PV or as depthed.

Readily available moisture content:

it is that water that a plant can easily extract from the soil.

RAW is the soil moisture held between field capacity and a nominated refill point for unrestricted growth. In this range of soil moisture point are neither waterlogged or water stressed.

(d) **optimum utilization of water:** This field increases with water can reaches a certain maximum value and then falls down. The quantity at which the field is

is maximum is called the optimum water depth. Therefore the optimum utilization of water means getting maximum field whith with any amount of water.

THE END