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Question NO 01:-

Part a:-

→ Delta OF Water:-

The depth of water in cm or inches required for the crops throughout the base Period is known as delta of the crops.

Generally a crop need a certain volume of water at fixed intervals throughout its base Period.

→ Duty OF Water:-

The duty of water is the relationship b/w the volume of water and the area of crops it matures.

- 1 cubic.m.P.s or 1 ft^3/sec of water for Bdays matures Dhectares or acres of land then the duty of water for that Particular crop is Dhectares/cumecs or Dacres/cusec

→ Relationship b/w Duty and Delta in FPS System:

let,

D = Duty (acres/cusec)

Δ = Δ feet base Period - Bdays by def

one cusec of water flowing continously for B days give 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 =

$1 \times 24 \times 60 \times 60 = 86400\ B\ ft^3$ → (i)

~~$= 86400\ B ft^3$~~ → (i)

1 area = $43560\ ft^2$

$1\ ft^2 = 143560$ Acre

Putting in eq it becomes

$= 86400\ B \times 43560$ Acre-ft

Volume of water = $1.983B$ Acre ft → (ii)

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

→ Relationship b/w duty & Delta in MKS System:-

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 days = V

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

$$= 86400\,m^3$$

- By definition of duty, $1\,m^3$ of water supplied B days matures D hectares of land. This quantity of water (V) matures D ha of land $10^4 D\,m^2$ of area.
- Total depth of water applied on this land.

$$= \frac{\text{Volume}}{\text{Area}} = \frac{86400B}{10^4 B} = \frac{8.64B}{D}\,m$$

By dq This total depth of water is called Delta Δ.

Therefore $\Delta = 8.64\,B/D\,m = 864\,B/D\,cm$

where Δ in cm, B is in days

D is duty in hectar/cumec

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Part b:.

Solution:-

$B = 140$ days

$\Delta = ?$

water required for wheat = 9cm

No of day = 34 days

By ratio method.

$9cm = 35$ days

$\Delta = 140$ days

$35\Delta = 140 \times 9$

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

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

Question NO 1:-

Part C:-

→ **Indus Water treaty:-**

The indus water treaty is a water distribution treaty b/w india and Pakistan Signed on Sept 19, 1960. The treaty was signed by President Ayub khan and PM. J. Nehro. It was by world bank.

The indus water treaty deals with river indus and its five tributaries which are classified into two categories.

Eastern Rivers	Western Rivers
1:- Sutlej	1:- Jhelum
2:- Beas	2:- chenab
3:- Ravi	3:- Indus

- According to the treaty, all the water of eastern rivers shall be availble for unrestricted use in india
- India should let unrestricted flow of water from western rivers to Pakistan.

- The treaty says that india can use the water in western raivers in non-consumptive needs.
- The treaty allocates 80% of water from the six reiver indus water system to Pakistan.
- A Permanent indus commission was set up as a bilateral commission to implemant and manage the treaty.

Part D:-

→ Significance of Duty of a crop ?-

→ Importance of Duty:-

It helps in Designing efficient canal irrigation system. Knowing the total availble water at the head of the main canal and the overall duty of all the crop required to be irrigated can be worked out.

- Inversly if we know the crop area required to be irrigated and their duties, we can work out discharge required for designing the canal.

Ques No 02:-

Part A:-

→ Factor AFFECTING Comsumptive use :-

- Temperature
- Humidity in air
- velocity of wind
- Soil topography
- Sun light

1:- Temperature :-

Comsumptive use of water is directly affected by the temperature. At high temperature the Plants tends to show while at low temperature, there is devasted Plant growth.

2:- Humidity:-

Evaporation is invessly Proportional to humidity as at low humidity evaporation rate is more while at high ~~temperature~~ humidity evaporation is slowed down

3:- Velocity:-

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

4:- Soil :- Topography:-

It is a soil mode more fertile through the application of matures or by some other means, the yield may be expected to increase with an accompying small increase in use of water. However an increase in fertility of the soil causes a decrease in the amount of water consumed. Per unit of crop yield.

5:- Sun light:-

At days in Summer, there is more sunlight than usual so high evaporation occurs when on winter there is low evaporation.

Part B:-

Given data:-

Usefull Rainfall (cm) = 10

water applicatin efficiency = 80% = 0.8

Comulative consumptive use (cu) = 40cm

Req:

Field irrigation Requirment (FIR) = ?

Consumptive irrigation requirement (CIR) = ?

:

Solution:-

→ $CIR = Cu - Re$

$= 40 - 10$

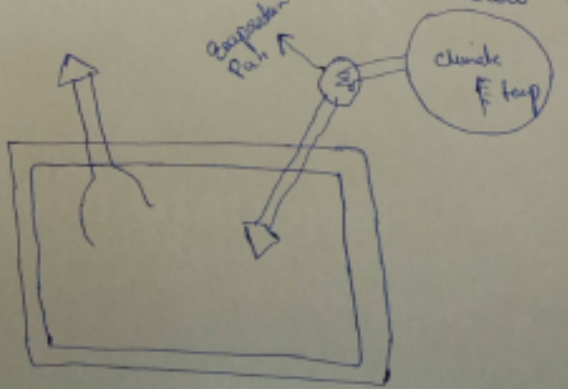
$= 30\,cm$

→ $FIR = \frac{CIR}{\eta a} = \frac{30}{0.8} = \boxed{37.5\,cm}$

Part c:-

→ **Class a pan Evaporation Measurment:-**

It can be experimentlly determined by directly measuring the quantity of water evaporated from this standard class Pan. This Pan is 1.0m in dia 35cm 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 least 5cm and never more than 7.5cm below the top of the Pan.



The Pan evaporation Ep can also be determined by using the Christiansen formula which state.

$Ep = 0.459 R.ct.w.ch\,cs.cc$

K = extra terrestional radiation

Same unit as Ep in cm or mm

ct = co-efficient for temperature.

w = " " wind velocity

Part D :-

→ Crop Season :-

1:- **Rabi** :-

1th october to 31st march winter

Rabi Crops:-

Rabi crops are wheat, Barly Gram mustard Potatoes.

2:- **Khariy**: 1st April to 30st in Summer

Khariy Crops:-

Khariy crops are Rice, Bajra Jawar Maize cotton.

Rabi & Khaif Ratio:-

The area is irrigated for rabi crops generally more that for khaif crops. The ratio of Proposed area is to be irrigated in khaif season to that in Rabi season is called as Rabi and khaif ~~Season~~ ratio. The ratio is [1:2], that is khaif area is one half of that Rabi Ratio.

Question No 03:-

Part A:-

A:- Field Capacity:-

when all gravity water has drained down to water table, a certain amount of water table which can not be easily drained under the action of gravity.

Part B:-

Permanent wilting Point:-

It is defined as the minimum amount of water in the soil that the Plant require not to will. If the soil water content Decrease to this 0.1 any lower Point, a Plants wilts and no longer recover its turgidity which Placed in a saturated atmosphere for 12hrs.

Part C :-

Availble and readily availble moisture Contant :-

a :- Availble Moisture content :-

The difference in moisture content of the soil b/w field capacity and Parmanent wilting is termed the availble moisture. Availble moisture can be expressed as Percentage moisture Pw as Percentage Ps or as Method.

b :- Readily availble Moisture content :-

water that a Plant can easily extracted from the soil Pow is the soil moisture held b/w field capacity and a nomiated regill Point for unrestricted growth. In this crange of soil moisture Plant are neither water logged or water stressed.

Part D :- optimum ultilization of water :-

The yield increase with water can reached a certained maximum value and falls down. The gravity of water at which depth, therefore the optimum utilization of water means getting maximum yield with any amount of water.