Name :- Fawad Gul

ID :- 7373

Sec :- B

Subject :- Irrigation

Submitted to :- Engr. Dr Jahangir Durrani

D

(Q.1a) Define "Delta" and "Duty" and derive their relationship in MKS & FPS system.

Ans **Delta of water**

The Depth of water in cm or inched required for the crops throughout the base period is known as delta of the crops.

Generally a crops need a certain volume of water at fixed throughout out in base period.

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Duty of water

The duty of water is the relationship between the volume of water and the area of crops it matures.

– 1 cubic-m per sec or 1 ft³/sec of water for 8 days matures 0 hectares or acres of land.

Then the duty of water that particular crop is 0 hectare / cumec or acres / cusec.

"Relationship b/w Duty & Delta in FPS system"

let D = Duty (acres/cumecs)

Δ = A feet base period = Base by def.

One cusec of water delivering continously for "B" days gives a depth "A" over an "D" acres.

Volume of water (ft³/sec) in one day

$= 1 \times 24 \times 60 \times 60$

$= 86400$ ft³/sec

Volume of water (ft³/sec) in B day =

$= 1 \times 24 \times 60 \times 60$

$= 86400$ B ft

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

$1 \text{ ft}^2 = 143560 \text{ Acre}$

Putting in eq (1) become

$= 86400 B \times 43560 \text{ Acre} - \text{ft}$

Volume of water $= 1.983 B$ Acre ft — (11).

(ft^3/sec) B day.

Depth of water required by crops

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

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"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 for B days matures D hectares of land. This quantity of water (V) mature D hac of land $10^4 D\, m^2$ of area.

→ Total depth of water applied on this land.

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

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

D is duty in hadar / cume.

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Q11) If wheat required about 9cm of water every 35 days and the base period or Crop Period of wheat is 140 days - Find out the delta for wheat?

Sol:

B = 140days

D = .?

water Required for wheat = 9cm

No of Days = 35 days.

By Ram Method

Δ = 140 days.

9cm = 35 days

35 Δ = 140 × 9

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

Δ = 36 cm.

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Q.12) Explain Indus water Treaty?

"Indus water Treaty:

The Indus water treaty (IWT) is a water distribution treaty between India and Pakistan Signed on Sep 19, 1960. The treaty was signed on Sep by President Ayub Khan and PM J. Nehru - It was brokered by The world Bank.

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

Eastern River	Western Rivers.
1) Sutlj	1) Jhelum
2) Beas	2) Chanab
3) Ravi	3) Indus.

→ According to the treaty, all the water of eastern rivers shall be available for unrestrict use in India.

→ India should let unrestricted flow of water from western river to Pakistan.

→ The treaty allocated 80% of water from the six-river Indus water system to pakistan.

→ A permanent Indus Commission was set up as a bilateral Commission to implement and manage the treaty.

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Q10) Write Significance of Duty of a Crops

Significance of duty of a Crops:

→ It help in designing efficient Canal irrigation System. Knowing the total available water at the head of the main Canal and the overall duty of all the Crops required to be irrigated in different Seasons of the year the area which can be irrigated can be worked out.

→ Inversely if we know the Crop area required to be irrigated and their duties, we can work out the discharge required for designing the Canal.

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Q(8) Explain the factor affecting Consumptive use

Ans: Factor affecting Consumptive use are given below:

1) Temperature.
2) Humidity in air
3) velocity of wind.
4) Soil topography
5) Sun light etc.

1) Temperature:

Consumptive use of water is directly affected by the temperature. At high temperature the plant tends to shows clarrang while at low temperatures There is a decrease rated plant growth.

2) Humidity:

Evaporation is inversely proportional to humidity as at low humidity evaporation rate is more while at high humidity evaporation is showed down.

3) Velocity:

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

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4) Soil Topography:

If a soil is made more fertile through the application of manure or by some other means. The yields may be expected to increase with an always ranging small increased in use of water. However an increase in fertile of the soil causes a decreases in the amount of water consumed per unit of crop yield.

5) Sunlight:

At days in Summer there is more Sunligh then usual so high evaporation occurs when in winter there is low evaporation rate.

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Given Data.

Useful Rainfall (cm) = 10

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

Cumulative Consumptive use (C_u) = 40 cm.

Required:-

Field Irrigation Requirment (FIR) = ?

Consumptive Irrigation Requirement (CIR) = ?

Solution:-

$\Rightarrow CIR = C_u - R_e = 40 - 10 = 30\,cm$

$\Rightarrow FIR = CIR / \eta_a$

$= 30 / 0.8$

$= 37.5\ cm.$

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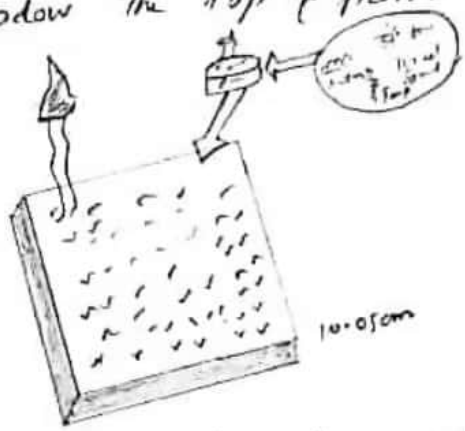
(Q2c)

(4) 1

Explain Class A pan Evaporation (Ep) measurement with the help of Diagram.

→ Ep can be experimently determined directly measuring the quantity of water evaporation from this standard class a pan. This pan is 1.0m in dia · 25cm deep and bottom is raised 15cm above the ground surface. the depth of water is to the kept in a fixed range such that the water surface is at least 5cm. and never more then 7.5cm. below the top of pan.



→ A pan evaporation Ep can also determined by using the Christansen formula which states.

$$Ep = 0.459\ R.ct.Cw.ch.Cs.ce$$

R = extra · Tenestrial Radiation in the same unit as Ep in cm or mm

ct = Coefficent for Temperature

Cw = Coefficent of wind Velocity.

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Qsd)

(18)

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

1) "RABT": 1st October to 31st March - winter

"Rabi Crops:

Rabi Crops are wheat Barley Gram, Mustard Black toes.

2) Kharif Crops:-

Kharif Crops are Rice Bajra Jawar Maize Cotton.

"Rabi & Kharif Ratio:

The area is irrigated for Rabi Crops generally more that for Kharif Crops generally more than that for Kharif crops.

The ratio of proposed increased areasis to be irrigatted 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 area.

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Q3 Define and explain the following terms

a) "Field Capacity:-

When all gravity water has drained down to water table a by surface soil. This water which can not be easily drained under the action of gravity.

b) Permanent wilting point:-

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

If the soil water content decreases to this or any lower point a plant wilts and no longer recover its turgidity which placed in a saturated atmosphere for 12 hours.

c) "Available & readily available moisture" Contents:-

a Available Moisture Content:-

The difference in moisture content of the soil between capacity and permanent wilting is termed the available moisture. Available Moisture can be expressed as percentage moisture per, as percentage pv or as depthel.

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d) "Optimum Utilization of water:

"Readily available moisture Content:-

It is the water that a plant can easily extract from the soil RW is the soil moisture held between field capacity and a nominated refill point for unrestricted growth. In this range of soil moisture plant and neither waterlogged or water stressed.

E) "Optimum Utilization of water:

The yield increas with water can reaches a certain maximum value and than falls down. The quantity of water at which the yield is maximum is called the optimum water depth. Therefore the optimum utilization of water means getting maximum yield with any amount of water.

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