NAME : SHERAZ

ID : 7862

Subject : Irrigation Eng

:: Dr Jahangir Durrani

Qno #1

Part (a)

★ **Delta**

Definition, It can be defined as, A crop needs a certain amount of water at fixed interval through out its base period. Depth of each watering : 5cm (2") – 10cm (4")

⇒ The depth of water in Cm or inches required for the crop through out the base period is called Delta of the crop.

★ Duty

Definition. It can be defined as The duty of water is the relationship between volume of water and the area of crop it matures. Volume of water is generally expressed by a Unit discharge flowing for a time of base period of the Crop.

1 Cu.m per Sec or 1 Cu.ft/sec of water for B days matures D hectares or acres of land. Then the duty of water for the particular crop is D hectares / Cumecs or D acres / cusecs.

Relation b/w duty & delta [MKS & FPS]

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

$$V = 86{,}400\, m^3$$

- By definition of duty, $1 m^3$ of water Supplied for B days matures D hectares of land. This quantity of water (V) matures D ha of land or 10^4 D m^2 of area.

Total depth of water applied on this land $= \frac{\text{Volume}}{\text{area}} = \frac{86400\,B}{10^4\,D}$

$= \frac{8.64\,B}{D}$ m

By definition, This total depth of water is called Delta Δ.

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

Where Δ is in Cm, B is in days

D is duty in ha/cumec.

In FPS units $\Delta = 1.98\,B/D$ ft

Where Δ is in ft, B in days and D is in Acres/Cusec.

Qno # 1 (part B)

Solution,

No of required watering $= \frac{140}{35} = 4$

Depth of water required each time $= 9cm$

Total depth required in 140 days $= 9 \times 4 = 36$

So $\boxed{\Delta \text{ for wheat} = 36cm}$

Qno # 1 (part c)

Indus water treaty

Explanation The Indus water treaty is a water distribution treaty between India and Pakistan, brokered by the world bank to use the waters available in the Indus System of Rivers located in India. This treaty was signed on September/19/1960 between India and Pakistan. This treaty gave the three western rivers Indus, Chenab & Jhelum to Pakistan and Beas, Sutlej and Ravi to India.

Q no # 1 (Part D)

Significance of duty of crop

The Significance can be expressed as, the term duty means the area of land that can be irrigated with unit volume of irrigation water. Duty represents the irrigating capacity of a unit. It is the relation between the area of a crop irrigated and quantity of irrigation water required during the entire period of the growth of that crop.

Qno #2

(Part a)

Factor effecting Consumptive use

Following are the factors which effect Consumptive use

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

Temperature, The rate of Consumptive use of water by crops in any particular locality is probably effecting more by temperature, which for long-time periods is a good measure of Solar radiation, than by any other factor.

Humidity in air,

Evaporation and transpiration are accelerated on days of low humidity and slowed ~~down~~ during periods of high humidity. During periods of low relative humidity, greater rate of use of water by vegetation may be expected.

Velocity of wind,

The rate of evaporation is more when velocity of wind is greater. As the air is moving faster So the rate of evaporation will be higher but if velocity is low than the rate of evaporation is also low.

Soil topography

Soil topography is the major factor. when the soil is made more fertile through the application of measure or by some other means. The yields may be expected to measure with a small increase

Sun light.

Sun light is a natural factor. At days in Summer there is more Sunlight due to which rate of evaporation is very high. while in winter the rate of evaporation is very low.

Qno # 2 (part -b)

Solution.

Rain fall (cm) = 10

water application efficiency = 80% = 0.8

Commulative Consumptive use = 40cm

required → FIR = ?

CIR = ?

As

$$CIR = C_u - R_e$$

$$= 40 - 10 = 30cm$$

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

Qno #2 (part c)

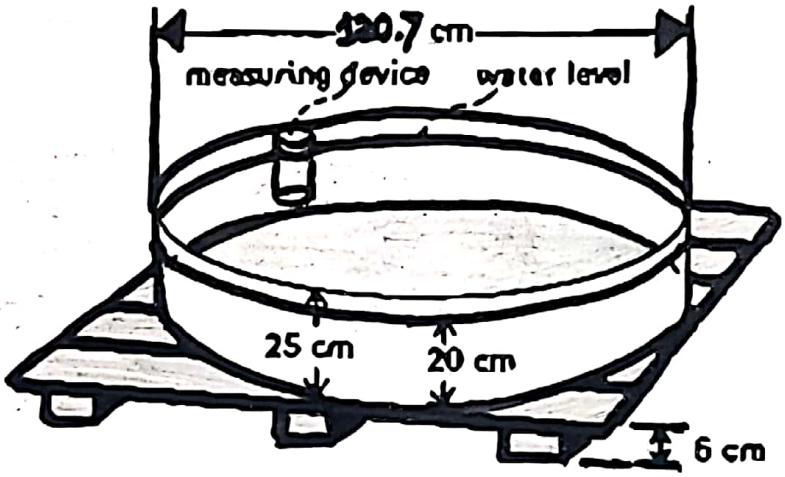
Class A plan Evaporation (EP)

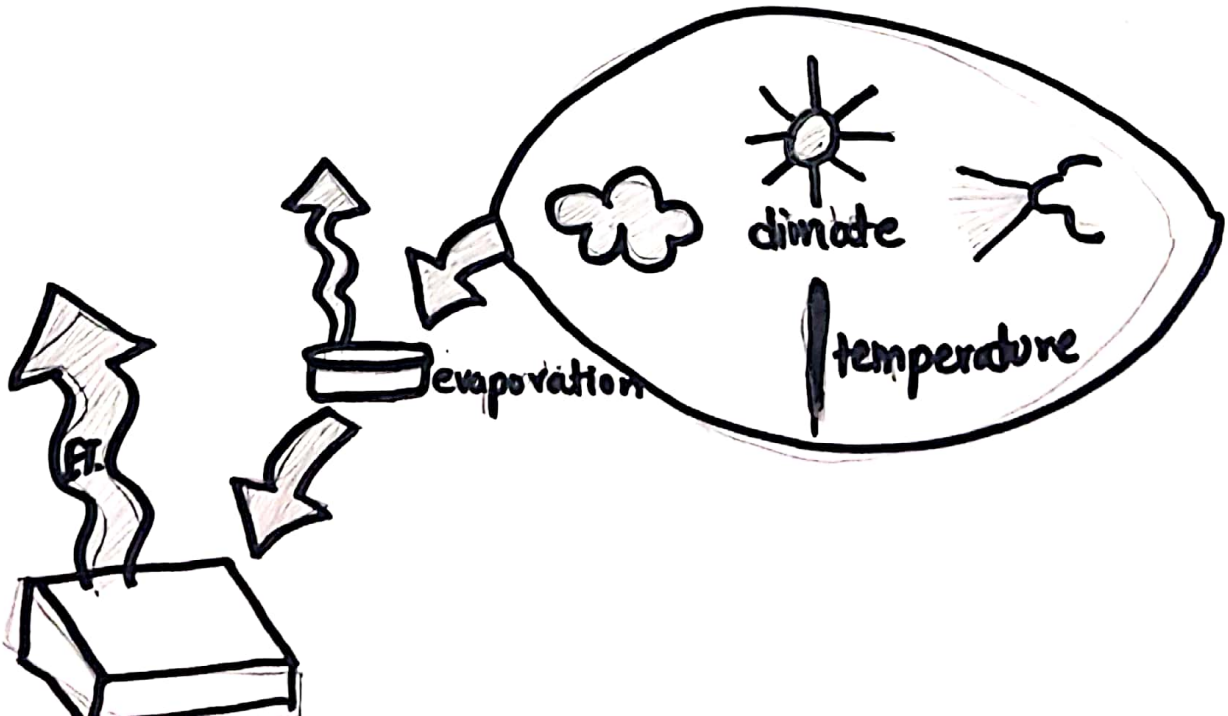
Explanation, Ep Can be experimentally by determined by directly measuring the quantity of water evaporated from this standard class a pan. This pan is 1.0m in diameter, 25cm deep and bottom is raised 15cm above the ground Surface. The deep of water is to be kept in a fixed range Such that the water Surface is atleast 5cm and never more than 7.5cm, below the top of pan.

Pan evaporation (E_p)

$$E_p \propto C_u = K \cdot E_p$$

where "K" is Co-efficient.





Qno # 2 (part d)

★ Croping Seasons

1) RABI - 1st October to 31st march - winter

2) KHARIF - 1st April to 30st September - Sommer

★ **kharif crops** : Rice, bajra, Jawar, Maize, Cotton.

★ **Rabi crops** : Wheat, barley, Gram, Mustard, potatoes.

★ **kharif Rabi ratio**, The area to be irrigated for rabi crops generally more than that for kharif crops. This ratio of proposed area's, to be irrigated in kharif season to that in Rabi Season is called kharib Rabi ratio. This ratio is generally 1 : 2 (i.e) kharif is one half of rabi area.

Qno # 3 Pg #15

⇒ Define and explain

(a) Field Capacity

Definition, It can be defined as, when all gravity water has drained down to water, a certain amount of water is retained by surface soil. This water which cannot be easily drained under the action of gravity is called field Capacity.

Explanation, Field Capacity is water available for plant growth. field Capacity is determined in laboratory Field Capacity is that point on which it reached maximum for the entire field. Field Capacity is measured after 2 or 5 days.

(b) permanent wilting point

Definition, It can be defined as. A plant can extract water from soil till a permanent wilting is reached. Permanent wilting point is that water Content at which plant can no longer extract sufficient water for its growth and wilts up.

Explanation, permanent wilting point is that point at which soil dried out so much that the plants cannot extract enough water to keep itself actively growing.

Mathematically

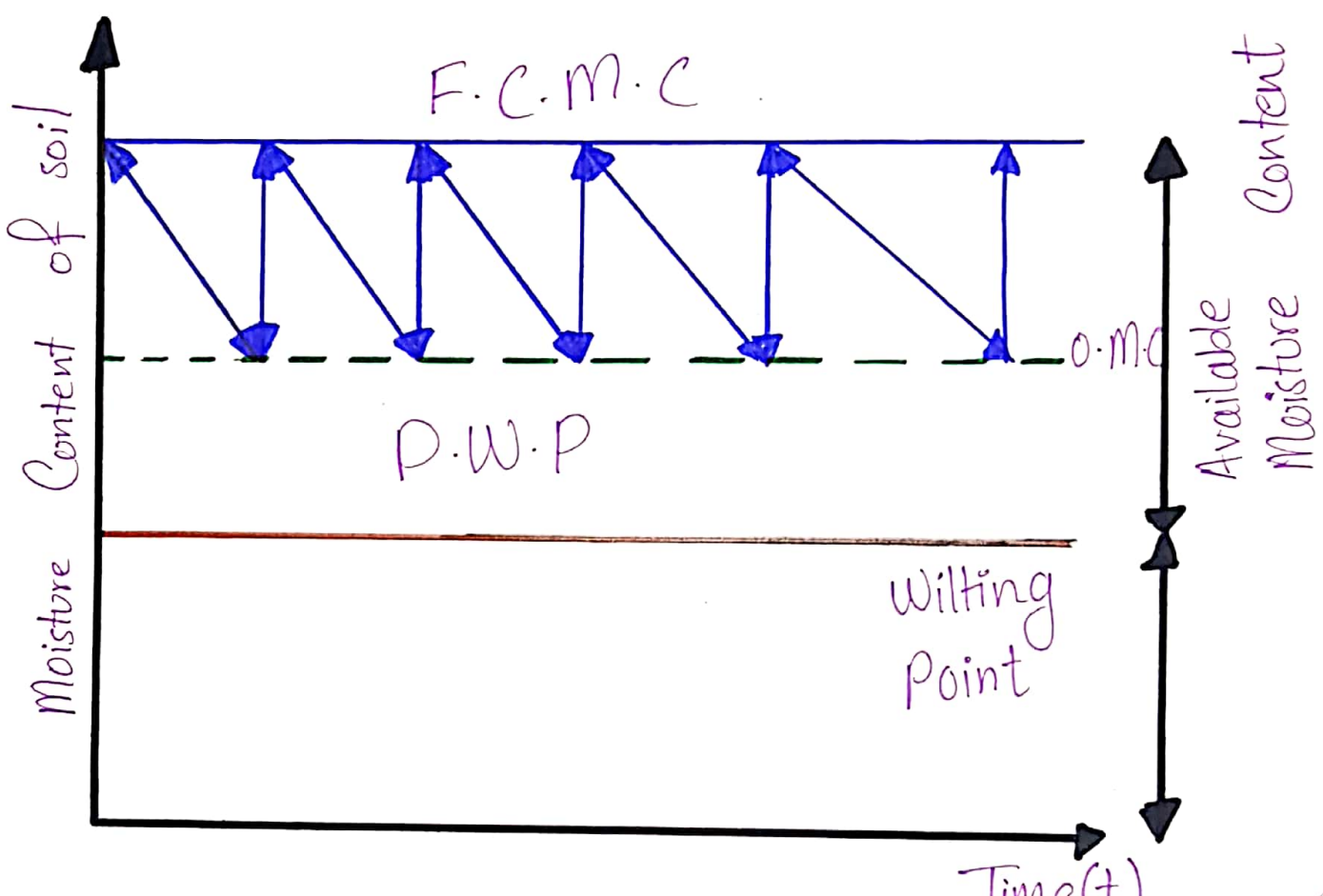
Water available to plant = F.C − P.W.P

(c) Available Moisture Content & Readily available moisture Content

Definition, The above two terms can be defined as, The difference in moisture Content of the Soil between field Capacity and permanent wilting is known as available moisture Content. Readily available moisture Content can be defined as It is the portion of available moisture which is most easily extracted by plants and is approximately 75 to 80 percent available moisture.

Explanation, Available and Readily available moisture content are extracted by plant to keep actively growing. It can be calculated by digging a hole and identify Soil texture and different layers of Soil.

Figure for better illustration



Qno #3 (part -d)

Optimum utilization of water

Definition, It can be defined as, Water resource management emphasizing planning, developing and managing of optimum utilization of water. if a crop is sown and produced under absolutely identical conditions using different amount of water depth, the yield is found to vary. The yield increases with water and reaches a certain maximum value and than falls down.

Explanation, The optimum utilization of water is very significant. for further elucidation. It is very vital

to know that, The quantity of water at which yield is maximum is called optimum water depth.