Name : M. Muqaddas Khan
ID : 7787
Section : A
Program : BE (Civil)
Module : 6th
Subject : Irrigation Engineering
Instructor : Dr. Jahangir Durrani
Date : 13th April 2020

(Q NO # 1)

Part(a):-

Delta:- The depth of water in cm or inches required for the crop through out the base period is called Delta of the crop.

Duty:-

A unit discharge flowing for a time of base period of the crop. It shows the relation between the volume of water and the area of the crop it matures.

Relationship b/w Delta and Duty in MKS System

D = Duty in hectares/cumec

Δ = Total depth of water in meter base period.

B = Base period in days.

So if we take a field of area "D" hectors water supplied to the field corresponding to the water depth Δ meter will be

$\Delta \times D$ hectares meter $= \Delta \times D \times 10^4$ – cubic meter – ①

Again for the same field of D hectares, one cumec of water is required to flow during the entire base period,

Hence water supplied to this field is,

$= (1) \times (B \times 24 \times 60 \times 60)\ m^3$ – ②

Equating eq ① & ② Equation

$$D \times \Delta \times 10^4 = B \times 24 \times 60 \times 60$$

$$\Delta = \frac{B \times 24 \times 60 \times 60}{D \times 10^4}$$

$$= 8.64\ B/D \text{ meter}$$

As Δ is in meter

D is in Sq meter

B is in days.

Relationship between Delta and Duty in FPS System

let Duty = D (Acres/cusec)

Delta = A feet base period = B days

by definition

One cusec of water flowing continuously for B days given

a depth of water A over an area of D acres.

⇒ volume of water $1 ft^3$ sec in one day

$= 1 \times 24 \times 60 \times 60 = 86400\ ft^3$ — ①

⇒ volume of water $1 ft^3$ sec in B days

$= 1 \times 24 \times 60 \times 60 = 86400\ ft^3$ — ①

As we know that

1, Acre $= 43560\ ft^2$ $1 ft^2$

or $= 143560$ acre

Then,

Equation 1 becomes :-

⇒ volume of water $1 ft^3$ sec in B day

$= 86400\ ft^3$

And $= 86400 \times 143560$ acre ft volume

Also volume of water $1 ft^3$ sec in B days

$= 1.983$ B acre ft — ②

Depth of water required by a crop

= volume area A = 1.983 B acre

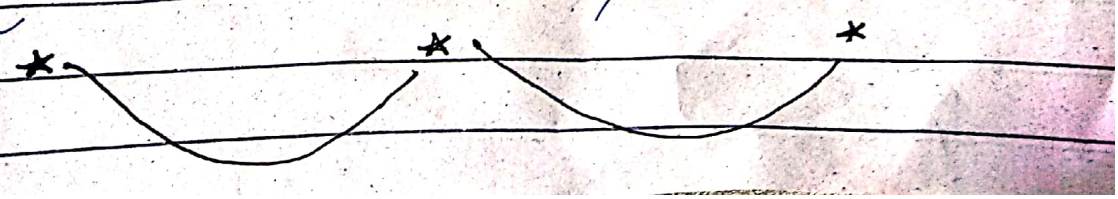
D area A $= 1.983 \times B/D$ ft

↳ $\Delta = 1.983\ B/D$ ft

Δ is in feet

B is in days

& D in acres/cusec.



(1) → part (b). Problem

(Given data):→

Water requirment of wheat = 9cm

Days Interval = 35 days

Base Period = 140 days

Delta of wheat (Δ) = ?

Solution:—

As we Know That

35 days = 9 cm

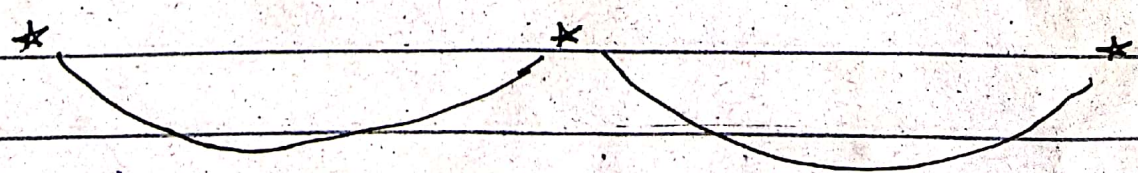
and 140 days = Δ

By cross multiplication we will get

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

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

$$\boxed{\Delta = 36 \text{ cm}}$$ Ans:—



Q1 Part C :-

(Indus water Treaty)

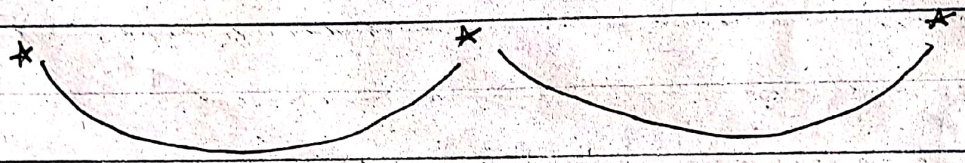
On the year 1960, India and pakistan Signed a water distribution agreement which is renown as Indus water treaty in which world bank becomes the third party.

This agreement took nine years of negotiations and divides the control of Six rivers between the two nations onece agaen. Signed. Under this Trealy India gol control on → Beas
→ Ravi
→ Sutlaj

while pakistan gol control over:
→ Indus
→ chenab
→ Jhelum.

Under this Treaty all the water of the three eastern rivers averaging around 33 million acre-feet (MAF) were allogated to India for

exclusive use.
while the water of western rivers - Indus, Jhelum and Chenab averaging to around 135 MAF were allocated to Pakistan except for specified domestic, non-consumptive and agriculture use permitted to India according to Treaty.

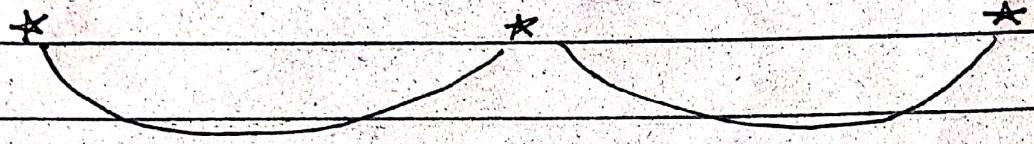


Qn1 part D:-

Importance or Significance of Duty of Crop.

→ Duty of crops helps in designing efficient canal irrigation system. Knowing the total available water at the head of the main canal and the overall duty for all the crops required to be irrigated in different seasons of the year, the area which can be irrigated and their duty 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



Q no # 2

Q2 Part (a)

Factor effecting consumptive use

These are some of factors effecting consumptive use which are given below:

1 → Humidity in air:-

As well as these is low humidity then ther the process of Evaporation and Transpiration are accelarated while these process are slowed down in high humidity.

2 → Temprature :-
Low Temprature Slow down the growth of a crop while while High Temprature may produce dormacy.
The rate of consumption of water by crops in any particular locality is probably effecting more by Temprature.

3 → Plant pests and Disease :-
where plant pests and disease seriously effect the natural growth of the plant.. It is reasonable to assume that the Transpiration will like decrease.

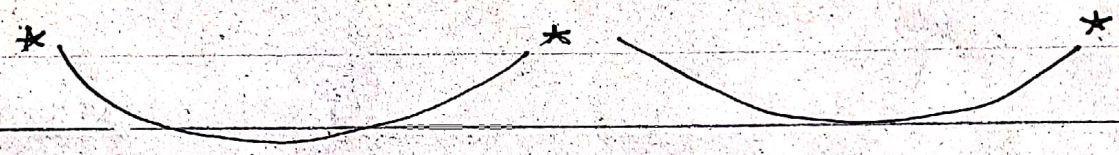
4 → Soil Fertility :-
An On increase in fertility of the Soil causes a decrease in the amount of water consumed per unit of crop yield.

5 → Sunlight plus latitude :-
Latitude have considerable influence on the rate of consumtive use of water. The hours of day light during the Summer are much

greater in northern latitude, then that the Equater. this longer days may allow plant Transpiration to continue for longer Period each day.

6→ Wind movement:-

Evaporation increase with moving air or movement of wind while in calm air the proces is decrease.



Q2 Part (b):-

Given data

Useful rainfall = cm = 10

Water application efficiency = na = 80%

Consulative Consumptive use = Cu = 40cm

Required data:-

Feild irrigation Requirement = FIR = ?

Consumptive " " = CIR = ?

Solution:-

By Applying formula

$$CIR = Cu - Re$$

Now putting the values we get

$$CIR = 40 - 10$$

Further

$$\boxed{CIR = 30 \text{ cm}}$$

As we know that

$$\text{Field Irrigation Requirement} = \frac{CIR}{na}.$$

OR

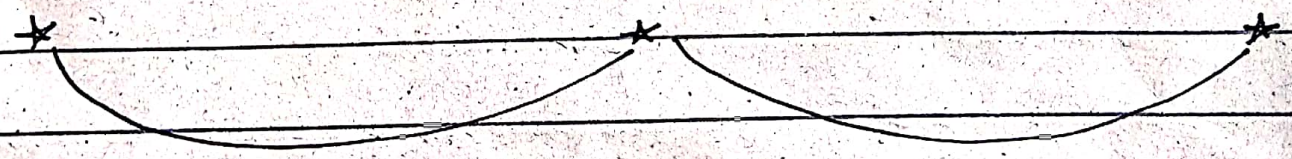
$$FIR = \frac{CIR}{na}.$$

So

$$FIR = \frac{30}{80} \times 100$$

By Solving we get

$$\boxed{FIR = 37.5 \text{ cm}}$$

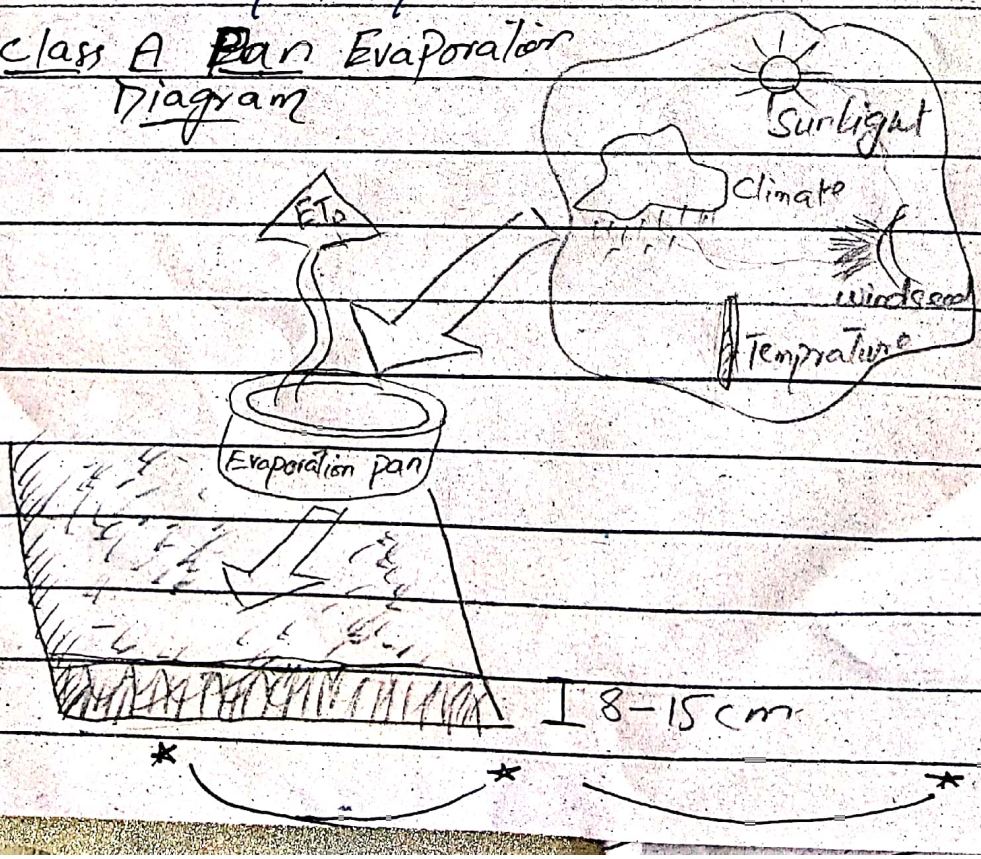


Q2 part (c) :-

class A pan Evaporation (EP) measurment :-

↳ Ep can be experimentally determined by directly measuring the quantity of water evaporated from this standared class a pan. This pan 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 least 5cm, and never more then 7.5cm, below the top of pan.

=> class A Pan Evaporation Diagram



Q2 Part D :-

Croping Seasons
(RAISI & Kharif)

1 Rabi :-

Rabi Season take place at 1st October to 31st march of winter. this crop are agricalteral crops that are Soon winter. It is also known as winter crop the opposite of this is the kharif crop which are grown after the the Rabi crop.

Examples: Wheat, Barley, Gram, Mustard potatoes etc.

2 Kharif :-

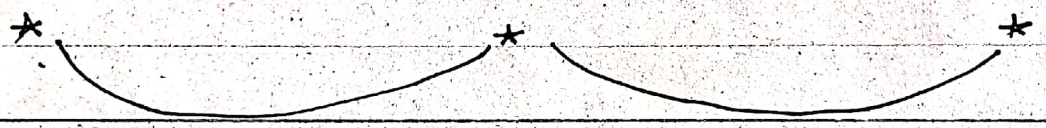
There Season is from 1st April to 30 September - Summer. It is also harvested and cultivated in India.

Examples :-

Sugur can, coton, maize Rice and millet are the major kharif crop in India.

=> Kharif RABI Ratio :-

The area to be irrigated for Rabi crops generally more then that for Kharif crops. This Ratio of proposed areas, to be irrigated in Kharif season to that in Rabi Season is called, Kharif Rabi ratio. This ratio is generally 1:2 i.e. Kharif area is one half of Rabi area.



Q No#3

Ans:- Explanation of the following Term :-

① Field capacity (F.C) ② Permanent welting point ③ Available & Readily available moisture contents ④ Optimum utlization of water.

① Field Capacity (F.C) :-

When all the gravity water has drainage

down to water table, a certain amount of water is retained by Surface Soil. This water which can not be easily drained under the action of gravity and is called F.C

period of drainage = 2-5 days
FC is measured after 2 or 3 day.

② Permanent wilting point:-

Whenever plant extract water from Soil to reach permanent wilting then permanent wilting point or P.W.P is that water content at which a plant can no longer extract Sufficient water from its growth and wilts up.

③ Available & Readily available moisture:-

A.W.C:-

It is the difference b/w field capacity & P.W in moisture content of the Soil is termed as available moisture content.

Readily available moisture :-

R.A.M.C :-

It is portion of of available moisture which is most easily extracted by plants and is approximatery 75 to 80% available moisture.

(4) Optimum Utilization of water :-

If a crop is sown and produced under absolutely identical condition using different amount of water depth, the yield is found to vary. the yield increases with water, reaches a certain maximum value & then falls down as shown in the following fig.