Name

Saqib Ahmad

ID

7798

Section

"A"

Subject

Irrigation Engineering

Semester

6th

Teacher

Dr. Jahangir Duranni

Exam

Mid - term

Date

14/04/2020

Q No 1
part (a)

Delta:

A crop needs a certain amount of water at fixed interval through out its base period. Depth of each watering 5cm (2") — 10cm (4")

Defination:

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

→ A duty is either a form of taxation or the responsibilities that are held by an individual.

Example:

→ Rice: 10cm of water at interval of 10 day. Base period is 120 days.

→ cotton is 50cm (20").

Duty :-

The term duty means the area of land that can be irrigated with unit volume of irrigation water.

Example :- If a crop requires about 12 watering at an interval of 10 days and a water depth of 10cm

Derive their relationship in MKS and FPS system.

In M.K.S system:-

Let
Duty = D (hectares/cumecs)
Delta = A meters Base period = B days
By defination.
One cumec of water flowing continously for "B" days gives a depth of water "A" over an area of "D" hectares.
Volume of water @ $1m^3$ sec in one day =
$1 \times 24 \times 60 \times 60 = 86400 m^3$
Volume of water @ $1m^3$ sec in "B" days =
$1 \times 24 \times 60 \times 60 = 86400 B m^3 = 86400 m^2 m$ — (i)

As, 1 Hectare $= 10000 m^2$
$1 m^2 = 1/10^4 H$
Then equation (i) becomes
Volume of water @ $1 m^3$ sec in "B" days =
$86400 B m^3 = 86400 B \times 1/10^4$ H-m Volume of water @ $1 m^3$ sec in "B" days $= 8.64 B$ Hm

(iii) Depth of Water required by crop, A = Volume
Area $A = 8.64 \times B$ H-m D H $A = 8.64 \times B D m$

In F.P.S system:-
Let
Duty = D (Acres/cusecs)
Delta = A feet Base period = B days By defination,
One cusec of water flowing continously

for "B" days gives a depth of water "A" over an area of D acres.

Volume of water @ 1 ft^3 sec in one day =
$1 \times 24 \times 60 \times 60 = 86400 ft^3$

Volume of water @ 1 ft^3 sec in "B" days =
$1 \times 24 \times 60 \times 60 = 86400 ft^3 = 86400 ft^2 ft$

① As 1 Acre = 43560 ft^2 $1 ft^2 = \frac{1}{43560}$ Acre
Then equation i becomes.

Volume of water @ 1 ft^3 sec in "B" days =
$86400 B ft^3 = \frac{86400 B}{43560}$ Acre-ft volume of water @ 1 ft^3 sec in "B" days = 1.983 x B Acre-ft
Depth of water required by crop, A = Volume / Area
$A = 1.983 \frac{B \text{ Acre-ft}}{D \text{ Acre}}$ $A = 1.983 \frac{B}{D}$ ft

Part (b) Q No (01)

If wheat requires about 9cm of water after every 35 days and the base period or crop period of wheat is 140 days Find out the delta for wheat?

Given Data:

Days interval = 35 days
Base period = 140 days
Water requirement of wheat = 9cm

Required

Delta of wheat (Δ) = ?

Solution :-

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

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

Part (C) Q NO (01)

Explain indus Water Treaty:

The indus Waters Treaty is a water distribution treaty between India and Pakistan, brokered by the World Banis to use the water available in the indus system of Rivers located in india. The indus Water Treaty was signed in Karichi on September 19, 1960 by the first Prime Minister of India pandit Jawaharlal Nehru and then Presedent of Pakistan Ayub Khan. According to the agreement the India has the Beas, Ravi, Sutlej. With the means annual flow of 33 million acre-feet. The india control the western rivers of india. The indus Chenab and Jhelum with the mean annual flow of 80 MAF was given to the Pakistan. The water control by India.

Since the ractification of the treaty in 1960 with effect from 1 April 1960 per Article XII (2), India and Pakistan

have not engaged in any water wars. but within the framework of the treaty despite three wars and many war like situations. The 16% of total water carried by the Indus system of Rivers while Pakistan can use the remaining.

Part (d) Q No (1)

Write significance of Duty of a crop

The importance of the Duty of a crop is the designing efficent canal irrigation system knowing the totel available water at the head of the main canal and the overall duty for all crops required to be irrigated in different season of the year, the area which can be irregated can be worked out.

If we designing a canal for irregation of the crops than we will be known about the crops such as

Crops	Duty in hectares/cumec
Rice	775
Rabi	1800
Peennials	1100

Q No (02) Part (a)

Explain the factors affecting consumptive use.

Consumptive use:

Consumptive use for a particulor crop may be defined as the totel amount of water used by the plant in transpiration (building of plant tissues etc.) and evaporation from adjecent soils or from plant leaves, in any specific time.

Factor affecting consumptive use:

Tempreture:

When the tempreture is more than more water will be required for the crops and also the water will be required for the crops very soon.

Humidity in air:

When the humidity in the is more than less water will required for the crops.

Velocity of wind

It also depends in the velocity of wind If the velocity of the wind is more than more water will be required for the crops

Soil Topography:-

It also depend on the soil topography If the soil are hard and aggrigated than more water require If soil are soft and having less aggrigate than less water required.

Sunlight:-

If the sunlight is very fast/ powerfull than more water will be required for the soil If the sunlight light is dim or less powerfull than less water will be required for the crops

Part (b) Q No (02)

Wheat is to be grown at a certain place, the useful rainfall for the whole season is 10cm and its cumulative consumptive use is 40cm. Determine consumptive irrigation requirement (CIR) and Field Irrigation Requirement FIR if the water application efficiency is 80%.

Given data:-

Useful Rainfall (cm) = 10
Water application Efficiency (η_a) = 80% = 0.8
Cummulative consumptive use (CU) = 40cm

Required:-

Field Irrigation Requirement (FIR) = ?
Consumptive Irrigation Requirement CIR = ?

We use formulas

① Consumptive Irrigation Requirement (CIR) =

$CIR = Cu - Re$

$CIR = 40 - 10$

$CIR = 30cm$

② Field Irrigation Requirement (FIR) = $\frac{CIR}{\eta a}$

$FIR = \frac{CIR}{\eta a}$

$= \frac{30}{0.8} = 37.5cm$

Part (C) Q No (02)

Explain class A pan Evaporation (Ep) measurement with the helf of a diagram

Ans: The Evaporation can be explain 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 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 pan. The pan evaporation Ep can also determined by using the Christiasen formula which states

$Ep = 0.459\ R.Ct.Cw.Ch.Cs.Ce$

R = extra. Terrestrial radiation is the same units as Ep = in cm or mm

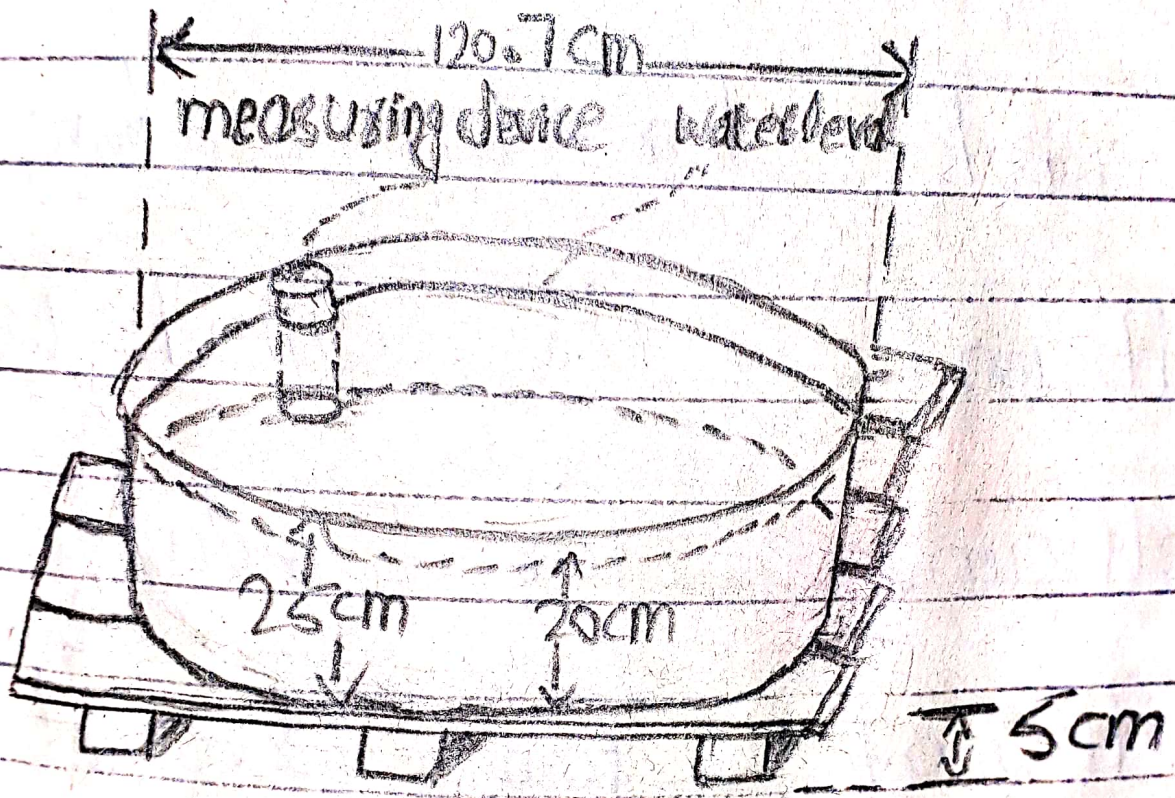
Ct = coefficient for tempreture

Cw = coefficent for wind velocity

Ch = coefficent for relative humidity

Cs = coefficent for percent of possible sunshine

Ce = coefficent for elevation.



Part (c) Q No (02)

Explain crop seasons (Rabi and Kharif) and Kharif Rabi Ratio.

① Rabi :: 1st October to 31st March - Winter.
② Kharif :: 1st April to 30st September - Summer.

Kharif crops :: Rice Bajra maize cotton
Rabi crops :: Wheat, Barley, Gram, Mustard

Potatoes . Karif Rabi Ratio ::

The area to be irrigated for rabi crops generally more than 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)
part (a)

Field capacity:
When all gravity water has drained down to water table, a certain amount of water is retained by surface soil. The water which can not be easily drained under the action of gravity and is called Field capacity.
period of drainge = 2-5 days
Field capacity is measured after 2 or 5 days

(1) Capillary water:
Water attached to soil by surface tention which can easily be extracted by plants by capillary action

(2) Hydroscopic water:
Water attached to soil by chemical bonds, which cannot be extracted by plants by capillary action.

Field capacity = (Weight of water retained in a certain volume of soil / Wt of same volume of soil) x 100. consider 1 sq.m area of soil, d m depth of root zone.
volume of soil = d x 1 cu.m
If γ kg/cu.m = density of soil = specific wt of soil.
Then wt. of d cu.m of soil = γ d kg, if F is Field capacity
F = Wt. of water retained in unit area of soil = F γ d kg/cu.m
Wt of water retained in unit area or volume:
Wet = γ_d.F

d_1 = depth of water stored in root zone = $\gamma_d \cdot F/W$ = kg/sq.m/kg/cu.m = m, W = specific wt of water = kg/cu.m.

Part (b) Q No 3

Permanent Wilting point (P.W.P):-

A plant can extract water soil till a permanent wilting is reached. Permanent wilting point is that water contect at which at which a plant can no longer extract sufficient water for its growth and wilts up.

Water Available to plant = Field capacity - P.W.P water

Part (c) Q No 3

Readily Available moisture content:-

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

Available moisture content:-

It is the difference between the amount of water in the soil at field capacity and the amount at the permanent wilting point referred to as the available water or moisture.

Part (d) Q No 4

Optimum Utilization of Water:

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