Name:→ Naseer-Muhammad
I.D:→ 7885
Section:→ A
Department:→ civil engineering Department
Subject:→ Irrigation engineering
exam:→ Mid term exam
Date:→ 13th, April 2020
Instructor:→ Dr. Jahangir Durrani
Semester:→ 6th

Q1:a):→ Define "Delta" and Duty and derive their relationship in MKS and FPS system?

(1) (a)
Ans:→
*):→ Delta:→ The depth of water in cm or inches for the crop through out the base period is called Delta.

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

=> Denoted by "Δ"

*):→ Duty :→ The duty of water is the relationship between the volume 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.

*):→ Relationship Between Duty, Delta and Base period in M.K.S system:→

Let,

Duty = D (hectares/cumecs)

Delta = A meters Base period = B days By definition.

one cumec of water flowing continously for "B" by days gives a depth of water "A" over an area of "D" hectares.

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

$= 86400\ m^3$

volume of water $1m^3sec$ in 'B' days $= 1 \times 24 \times 60 \times 60$

$= 86400B\ m^3$

$= 86400\ m^2m \rightarrow (i)$

As 1 Hactare = $10000\ m^2$

$1m^2 = 1104H$

Then, equation (i) becomes.

Volume of water $1 m^3$ sec in "B" days =

$86400 B\ m^3 = 86400 B \times 1104$ H.m Volume of water $1\ m^3$ sec in 'B' days =

$= 8.64 \times B$ H.m ⟶ (ii)

Depth of water required by crop, A = Volume

Area A = $8.64 \times B$ H.m DHA = $8.64 \times B$ Dm

***):→ In F.P.S System:→**

Let,

Duty = "D" (Acres/cusecs)

Delta = "A" feet Base period = "B" days By definition.

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

$= 86400^3$

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

$\Rightarrow 86400 B\ ft^3 = 8640\ ft^2 ft$ → (i)

As, 1 Acre = $43560\ ft^2$ $1\ ft^2 = 143560$ Acre

Then, equation (i) becomes.

Volume of water 1 ft^3sec in "B" days = 86400Bft^3

$\Rightarrow$ 86400B x 43560 Acre-ft volume of water 1 ft^3sec in "B" day = 1.983 x B Acre-ft $\rightarrow$ (II)

Depth of water required by crop, A = Volume Area = A = 1.983B Acre-ft D Acre A = 1.983xB D ft.

(D1) b):→ If wheat requires about 9cm of water after every 35 days and base period or crop Period of wheat is 140 days. Find out the delta for ~~wheat~~ wheat?

Ans (i) b):→

Given Data

water requirement of wheat = 9cm

Days interval = 35 days

Base Period = 140 days

Required, Delta of wheat (Δ) = ?

Solution:→

35 days = 9cm

140 days = Δ

by cross multiplication

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

Δ = 36cm.

Q1):C):→ Explain Indus water water treaty?

Ans:→ Indus water treaty:→

The indus water treaty is a water distribution treaty between india and Pakistan sign by Prime minister Jawanharlal Nehro and Pakistan president Ayub Khan. It was brokered by the world bank.

*):→ Points:→

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

*):→ Eastern river:→

→ Sutlej → Beas → Ravi

*):→ Western river:→

→ Jhelum →Chenab →Indus

i):→ According to the treaty, all the water of eastern rivers shall be available for unrestrical use of india.

ii):→ India should let unrestricled flow of water from western rivers to Pakistan.

iii):→ It doesn't mean that india can't use western rivers. The treaty says that india can use western river in non consumptive needs.

iv):→ The treaty allocaks 80% of water from the six river water system to pakistan.

~~v):→ A permanent~~

v):→ A permanent indus commision was set up as bilateral commision to implement and mange the treaty.

Q1

d):→ write significance of Duty of a crop?

Ans):→ Significance of Duty :→

i)→ It helps in designing efficent canal irrigation system. knowing the total available water at the head of the main canal and the overall duty for all the crop required to be irrigated in different seasons of the year, the area which can be irrigated can be worked out

ii):→ Inversly if we know the crop area required to be irrigated and their duties we can workout the discharge required for desiging the canals.

①2

a):→ Explain the factors affecting consumptive use?

Ans:→ Factor Affecting consumptive use:→

→ The following are factor affecting consumptive use.

•→ Temperature •→ Humidity in air

•→ Velocity of wind •→ soil Topo Graphy

•→ sunlight. •→ Precipitation.

•):→ Temperature:→ The rate of consumptive use of water by crops in any particular locality is probably affected more by temperature which for long-time period is a measure of solar radiation, than by any other factor.

•):→ Humidity in air:→ Evaporation and transpiration are accelerated on days of low humidity and slowed 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:→

→ Evaporation of water from land and plant surfaces takes place more rapidly when there is moving air than under clam air conditions. Hot dry winds and other unusual wind conditions during the growing period will affect the amount of water consumptively used. However, there is a limit in the amount of water that can be utilized. As soon as the land surface is dry, evaporation practically stops and transpiration is limited by the ability of the plants to extract and convey the soil moisture through the plants.

•):→ Sunlight:→

Although latitude may hardly be called a climatic factor, it does have considerable influence on the rate of consumptive use of water by various plants. Because of the earth's movement and axial inclination, the hours of daylight during the summer are much greater in the northern latitudes than at the Equator. Since the sun is the soure of all energy used in crop growth and evaporation of water, this longer day may allow plant transpiration to continue for a longer period each day.

Q2) b):→

Ans (b):→ Given Data

Useful rainfall (cm) = 10

water application efficency (na) = 80% = 0.8

Commulative consumptive use (cu) = 40cm

Required,

Fir = ? , CIR = ?

Solution:→

consumptive irrigation requirement

$CIR = Cu - Re$

$= 40 - 10$

$CIR = 30cm.$

Field irrigation requirement

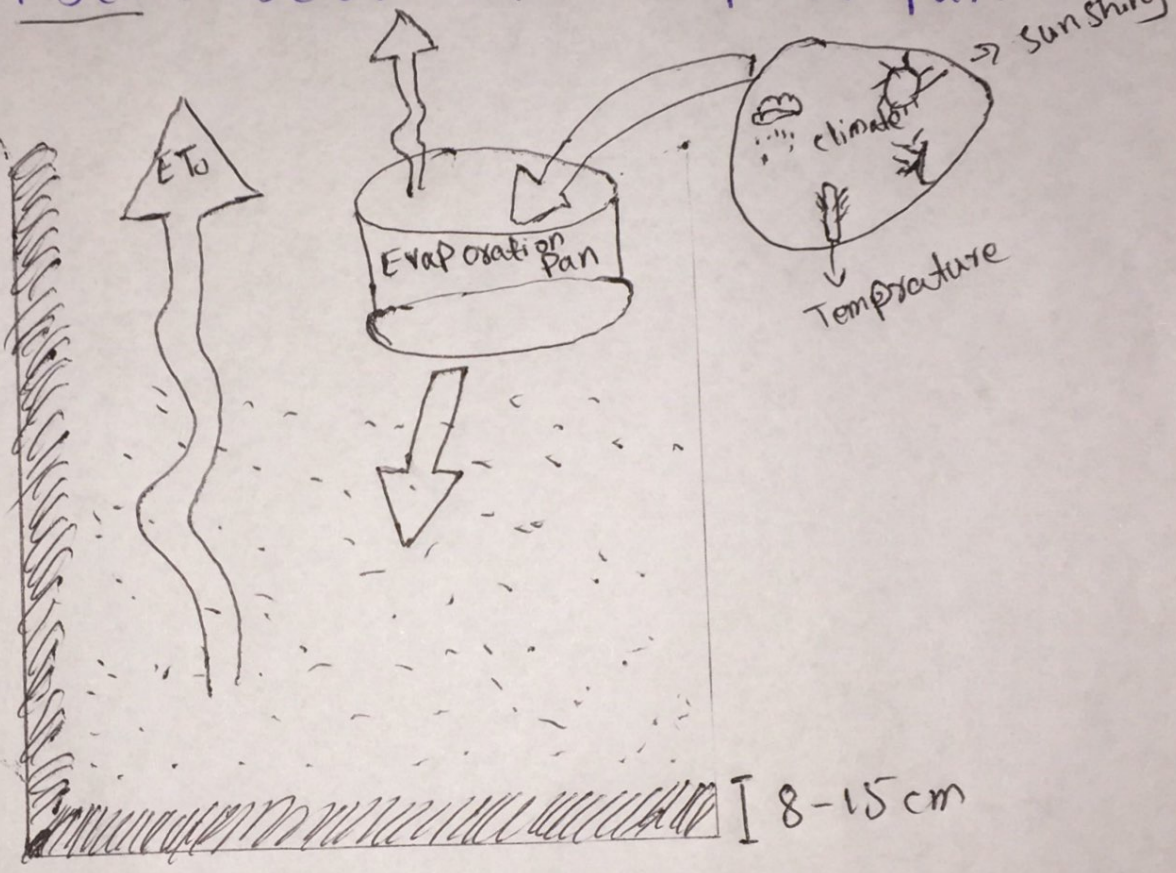
$$FIR = \frac{CIR}{na} = \frac{30}{0.8} = 37.5cm.$$

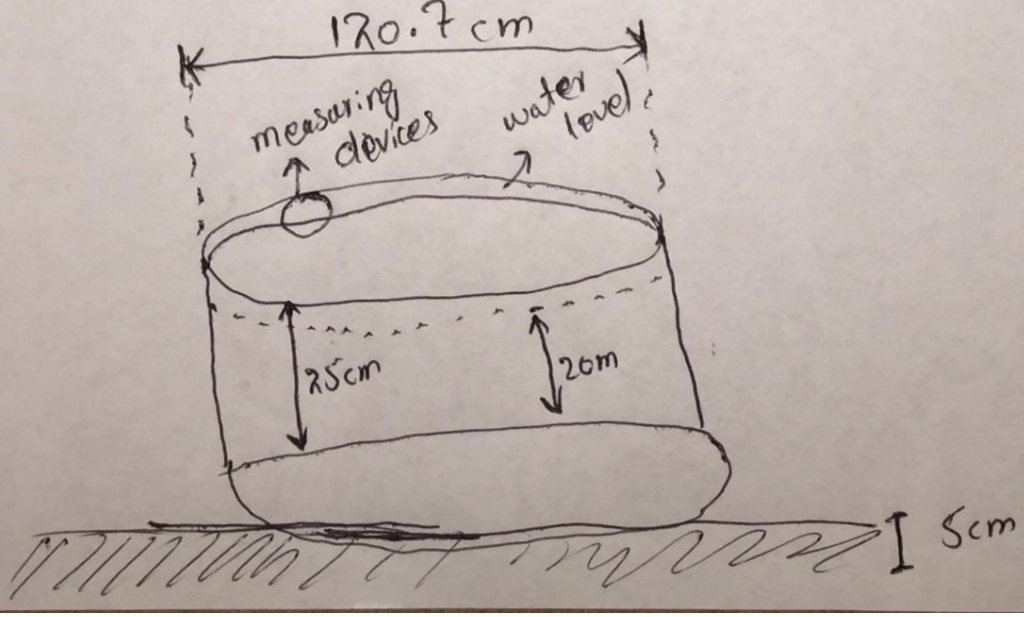
Q2(c):→ Explain class A Pan Evaporation (E.P) measurement with the hlep of diagram?

Ans (2)(c) :→ Class A Pan Evaporation (EP) measurement:→

=> Ep can be experimentally 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 rasied 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.





Q2:→

d):→ Explain crop seasons (Rabi and Kharif) and Kharif Rabi Ratio?

d)

Ans:→ **Rabi crop:→** Rabi crops are agricultural crops that are sown in winter and harvested in the spring in india and Pakistan. the term is derived from the Arabic word for "spring" which is used in the indian subcontent, where it is the spring harvest. The opposite of rabi crops are the rabi and zaid crop are harvested one after another respectively.

Example:→ Gram, Mustard, wheat, banana, guava, lemon, Grapes.

*):→ **Kharif crop:→** Kharif crop are domesticaled plants like rice that are cultivated and harvested in india, Bangladesh during the indian subcontent monsoon season which lasts from June to November depending on the area. Monsoon rains may begin as early as may in some parts of the indian from 3rd week of semptember to october again depending upon the reigion and

the major Khrif crops in india.
Example:→ sugarcane, maize, cotton, Rice, millet etc.

*):→ Kharif Rabi ratio:→ The area to be irrigated for rabi crop is generally more than that for the kharif crop. The ratio of proposed area, to be irrigated in kharif season to that in the Rabi season is called kharif Rabi ratio.
=>This ratio is generally 1.2 i.e kharif area is one half of the rabi area.

Q3:→ Define and explain the flowing terms?
a):→ Field capacity. (b):→ Permanent wilting point
c):→ Available and readily available mosture contents.
d):→ optimum utilization of water.

Ans:→
a):→ Field capacity:→ When all gravity water has drained 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 to gravity is called field capacity.

=> Period of drainage = 2-5 days.
→ field capacity after 2 or 5 days.

b):→ Permanent wilting Point:→ A plant can extract water from soil till a perment wilting is reached. Permanent wilting point is that water content at which a plant can no longer extract sufficient water.

Water Available to plant = Field capacity - Permanent wilting point

c):→ Available moisture content:→ The difference in moisture content of the soil b/w field capacity and perment wilting is termed as the available moisture. Available moisture can be expressed as percentage moisture Pw, as percentage Pv or as depth d.

Readily Available moisture content:→ It is that portion of available moisture which is most easily extracted by plants and is approximately 75 to 80% available moisture.

d):→ Optimum utilization of water:→

If a crop is sown and produced under absolutely identical conditions using different amounts 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 in figure.

→ The quantity of water at which the yield is maximum is called optimum water depth.