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Subject: IRRIGATION ENGINEERING

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CE: 324

Mid Term Examination

Semester 6th

(a) Define "Delta" and "duty" and Derive their relationship in MKS and FPS Systems:-

DELTA:-

A Crops needs a Certain amount of water at fixed Interval ~~of~~ Time Through out its base peroid Depth (The Time of watering TO get matured) of each watering 5cm (2") - 10cm (4")

⇒ Definitions:-

The depth of water in 10Cm or in inches required for the Crop through out The base peroid Called Delta of the Crop-

⇒ ~~Exptot~~. For example:-

Let Rice depth of water at Interval of 10day - Base peroid is 120days what is Delta of rice-

40cm → 10days

for 120 day

(2)

Duty:-

The Term duty means the area of Land that can be Irrigated with unit volume Irrigation water.

Duty represents the Irrigation Capacity of a unit. It is the relation between the area of Crop Irrigated and quantity of Irrigation water required during the entire period of the growth of the Crop.

volume of water is generally expressed by a unit discharge flowing for a time of base period of the Crop.

1cu.m per per sec or 1cu ft/se of water for 8 days.

matures D hectares or acres of Land then the Duty of water for that particular crop is D hectore/cusec or D acres/cusecs

Relation of Delta and Duty in

MKS

Let

Duty = D (hectares/cumecs)

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

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" day = $1 \times 24 \times 60 \times 60 = 86400 B m^3$

$= 86400 m^2 m$

As 1 Hectare = $10000 m^2$

$1 m^2 = 1104 H$

Then equation becomes.

volume of water @ $1m^3$ sec in B days =

$86400 B m^3 = 86400 B \times 1104 H \cdot m$

volume of water.

water @ $1 m^3/sec$ in B days
$= 8.64 \times B H \cdot m \rightarrow (ii)$

Depth of water required by Crop A
= volume Area A $= 8.64 \times B D m$

(b) **Relation of Delta and Duty in FPS**

Let
Duty = D (Acres/Cusecs)
Delta = A feet Base period = B days
By definition =

One Cusec of water flowing continuously 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 $= 1 \times 24 \times 60 \times 60 = 86400 ft^3$
$= 86400 ft^2 . ft \rightarrow (i)$

As 1 Acre $= 43560 ft^2$
eq (i) =>

volume of water $1 ft^3 sec$ in B days
$= 86400 B ft^3$
$= 86400 B \times 43560$ Acre-ft
volume of water @ $1 ft^3 sec$ in B days $= 1.983 \times B$ Acre-ft

Depth of water required by Crop A =

Volume Area $A = 1.983 B$ Acre ft D. Acres

$= 1.983 \times B D$ ft

D is duty in ha/cumec.

QNO1 (b)

Given data:-

Depth of water = 9cm

Base period = 140 days

Required:-

Delta for wheat, Δ = ?

Solution:-

As we know that

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

= 4

Total depth of water required

= No of watering × Depth of water

= 4 × 9 = 36cm

Δ for wheat = 36cm.

QNO 1 (c)
Explain Indus Water Treaty:-

ANSWER:- It is the distribution Treaty between India and pakistan brokered by the world Bank TO use the water available in the indus System of Rivers located in India. The Indus Waters Treaty (IWT) was Signed In Karachi on 19 September 1960 by the first prime Minister of India pandit Jawahark Nehru and the president of pakistan Ayub Khan

⇒ purpose of Indus Water Treaty:-

The purpose of Indus water Treaty is an aggreement that was made to Chalk Out the control over the 6 rivers that run across India and pakistan Into the Indus Basin!

River given to pakistan:-

Control of water flowing in three western river of Indus Chenab and Jehlum with mean annual flow of 80 MAF were given to pakistan.

River given to India:-

Eastern river of India Beas, River and Sutlej with mean annual flow 33 MAF was given to India.

QNO1(d)

Write Significance of Duty of Crop?

Answer:-

It helps in designing an efficient Canal irrigation System. water at the head of the main Canal and the overall duty for the all the Crops required to be irrigated in the different Seasons of the year the area which Can be irrigated Can be worked out.

→ Inversly if we know the Crop area required to be Irrigated and their duties we Can work out the discharg required for designing the Canal

$$\Delta = \frac{A}{D} \rightarrow A = \Delta D$$

QNO 2 (a)

Explain the factor effecting Consumptive use-

ANSWER:-

Following are the factors effecting Consumptive use-

Temperature
Humidity in air.
Velocity of wind
Soil Topography
Sunlight

⇒ Temperature:-

The rate of Consumptive use of water by crops in any particular locality is probably effected more by Temperature which for long time period it's good measure of Solar radiation than by any other factor Abnormally low temperature retard plant growth and unusually high temperature may produced dormancy

⇒ Humidity:-

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 take place more rapidly when there is moving air than under clain air condition during the growing period will effect the amount of water consumptively used however there is a limit in the amount of water that can be utilized.

⇒ Latitud? AND SunLight:-
Although latitude may hardly be called a climate factor it does have considerable influence on the rate of consumptive use of water by various plant Because of the earth movement and axial inclination the hours of daylight during Summer and much greater in norther at the equator Since the Sun is the source of all energy used in crop growth and evaporation of water.

QNO2 (b) Wheat is to be grown at a certain place the useful rainfall for whole season is 10cm and Cummulative Consumption use 40cm Determine Consumptive irrigative requirement (CIR) and Field Irrigation Requirement (FIR) if water efficiency is 80%

⇒ Given data:-
useful rainfall (m) = 10cm
water application efficiency (ηa) = 80% = 0.8
Commulative Consumptive use (CU) = 40cm-

⇒ Required data:-
Field Irrigation Requirment (FIR) = ?
Consumptive Irrigatin Requirment (CIR) = ?

⇒ Solution:-
Consumptive Irrigation Reqairment CIR = CU - Re
= 40 - 10
CIR = 30cm

$$\Rightarrow FIR = \frac{CIR}{\eta a} = \frac{30}{0.8} = 37.5cm$$

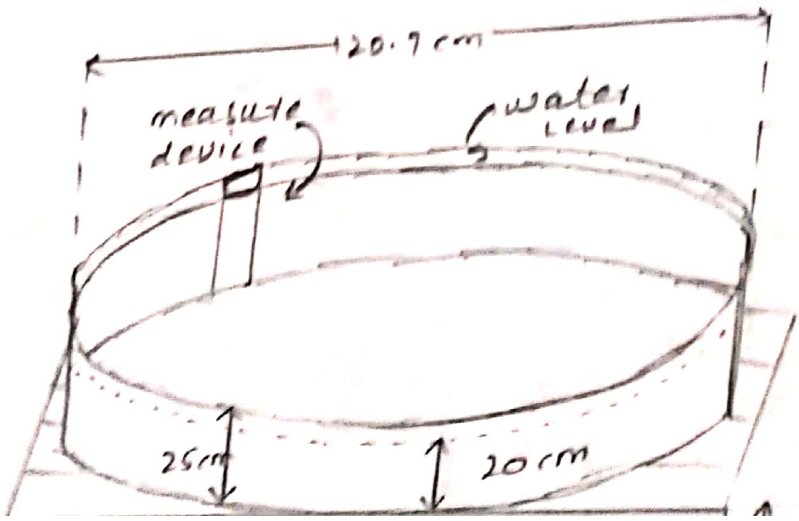
Result CIR = 30cm
FIR = 37.5

QNO 2 (c)

Explain class A pan Evaporation (EP) measurement with help of diagrams:-

Answer:-

Evaporation can be experimentally determined by directly measuring the quantity of water evaporated from this standered class a pan- The pan is 1.0m is 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 least 5cm and never more then 7.5cm below the top of pan.



(10)

QNO(2)(d) Explain Crop Season (Rabi and Khariz) and Khariz Rabi

=> Answer:-

Crop Season:-

The growing season is the part of year during which local weather condition . i.e -> (rainfall and temperature) permit normal plant growth.

=> Khariz :-

1st April To 30th September
Summer.

=> RABI :-

1st October – 31st March
Winter

=> Khariz Crops:-

rice, maize, Sorghum, pearl, bajra e.t.c

=> RABI Crop:-

Barley, Flax Seed, pea, wheat potato e.t.c

=> Khariz Rabi ratio:- The area to be Irrigated for Rabi Crop is generally mor then that of khariz Crop the ratio of proposed area to be Irrigated in khariz Season to that in Rabi season is called Khariz Rabi ratio This ratio is generally 1:2 i.e khariz area is one half of Rabi area.

QNO(3) (a)

Field Capacity:-

Definition:- when the all 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 of gravity and is called Field Capacity.

period of Drainage = 2-5 days

FC is messured after 2 or 5 days

Field Capacity

Capillary water

Hygroscopic water.

(16)

Q NO 3 (b)

Permanent wilting point:

A plant can extract water from soil till a permanent wilting is reached p.w.p is that water content 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 wat

QNO3 (c):-

Available and Readily avalble Moisture Content:-

⇒ Available Moisture Content:-

The difference in moisture Content of the soil between field Capacity (F.C) and Permanent Wilting is termed as the available moisture - Available moisture can be expressed as percentage moisture.

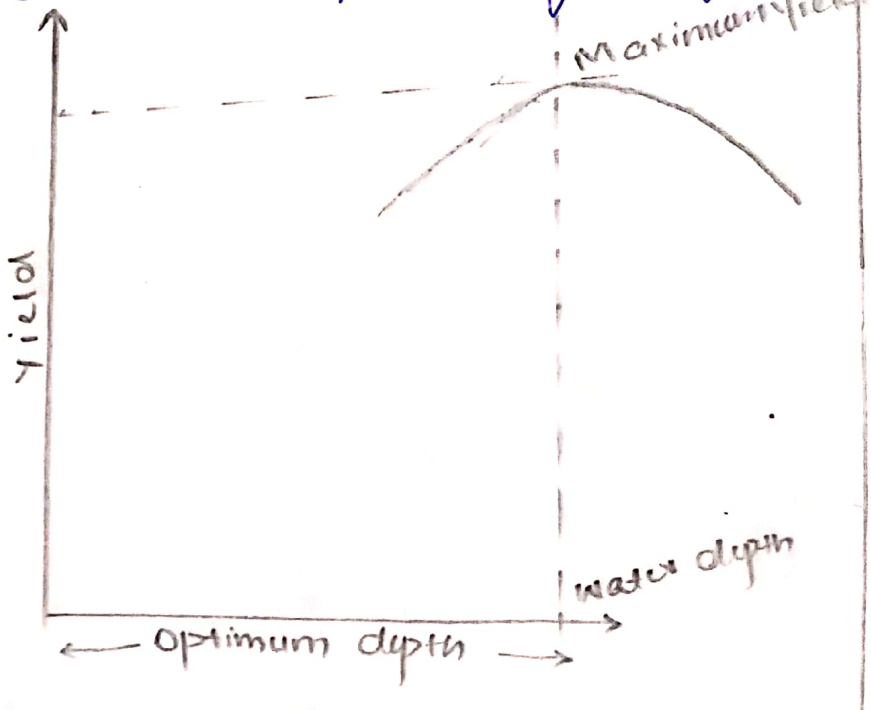
Readily Available Moisture:-

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

QNO 3(a)

Optimum utilization of water:-

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



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

Irrigation Efficiencies:- Efficiency is the ratio of water output of water to the water input and is usually expressed as percentage-