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Section B

Subject :- CE 324 Irrigation Engineering

Semister :- 6th

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Question No # 01:-

a) :- Define "Delta" and Duty and derive their relationship in MKS FPS Systems

Answer

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")

- the depth of water in cm or inches required for the crop through out the base period is called Delta of the crop.
- Ex. Rice: 10cm of water at interval of 10 day. Base period is 120 days.

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 b/w the area of crop irrigated and quantity of irrigation water required during the entire period of the growth of that crop.

Relation of Delta and Duty in MKS

Let

Duty = D/hectares/cumecs)

Delta = A meters Base period = B day by definition

one cumec of water flowing continuosing for "B" days given 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 $= 10000 m^2$

$1 m^2 = 1/10000$ H

Thanto equation becomes

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

$86400 B m^3 = 86400 B \times 1/10000$ H·m volume of water @ $1m^3$sec in 'B' days =

$8.64 \times B$ H-m -> (ii)

Depth of water received by crop. Assume area

$A = 8.64 \times B$ Dm

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 given a depth of water 'A' over an area of 'D' acres

Volume of water 1 ft³/sec in one day =

$1 \times 24 \times 60 \times 60 = 86400\ ft^3 = 86400\ ft^3/ft^2$

As 1 Acre = 43560 ft²

eq (i) ⇒

Volume of water 1 ft³/sec in 'B' days = $86400\ B\ ft^3$ =

$86400B \times 43560$ Acre-ft

Volume of water @

1 ft³ sec in B days =

$1.983 \times B$ Acre-ft → (ii)

Depth of Water Requirement by Crop, As

Volume Area A = 1.983B Area. 1+D. Area. As

1.983 ∧ B D/t

D is duty in ha/cumec

(Q No 1 (b)

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

Given data:-

Depth of water = 9cm

Base period = 140 days

Required:-

Delta for wheat, Δ = ?

Solution:-

As

No of watering required = 140/35 = 4

total depth of water required = No of watering × Depth of water

= 4 × 9 = 36cm

Δ for wheat = 36cm

Result

Δ for wheat = 36cm

Q NO 1 (c)

Explain Indus water Treaty

ANSWER:.

Introduction:.

It was signed in year in 1960 by former prime minister Jawaharlal Nehru and president of pakistan, Ayub khan.

Purpose of Indus water Treaty:.

the purpose of Indus water treaty is an aggrement 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 India Indus Chenab and Jehlum with mean annul flow of 80 MAF were given to pakistan

River given to India:-

Easter river of India, Beas, River and Satty with mean annul flow of 33 MAF was given to India.

Q No 1 (d)

Significance of Duty of a Crop:

→ It helps in designing efficient canal irrigation system. Knowing the total avable 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 can be worked out.

→ Inversly if we know the crop area required to be irrigated and their duties, we can work out the discharge required for designing the canal.

① No 3 (a)

Explain the factor affecting consumptive use

Answer:

Following are the factors affecting consumptive use:

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 good measure of solar radiations than by any other factor Abnormally low Temperature retard plant growth and unusually high temperature many produce 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 many be expected.

WIND movement :- evaporation of water from land and plant surface takes place more rapidly when where is moving air than under calm 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 soil moisture through the plants.

LATITUDE AND SUNLIGHT: (18)

Although latitude may hardly be called a Climatic factors, it does have considerable influence on the rate of consumptive use of water by various plants. Because of the earthis movement and axial inclination the hours of daylight during the Summer are mush greater in the northern latitudes than at the Equator.

Quality of water: Some investigations have shown that the quality of the water supply many have an appreciable effects on consumptive use. whether or not plants actually transpire more or less if water is highly saline may be debatable.

(13)

Q No 8 (b)

What is to be grown at a certain place the useful rainfall for whole season is 10cm and commulative consumptive use is 40cm.

Determine consumptive irrigation requirement (CIR) and field irrigation Requirement (FIR) if water efficiency is 80%.

Given data:

Useful rainfall (cm) = 10cm

water application efficiency (η_a) = 80% = 0.8

Commulative Consumptive use (CU) = 40cm

Required Data:

Field Irrigation Requirement (FIR) = ?

Consumptive Irrigation Requirement (CIR) = ?

Solution:

Consumptive Irrigation Requirement CIR

CU - Re

= 40 - 10

CIR = 30cm

Field Irrigation Requirement (FIR)

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

CIR = NIR
i.e neglect leaching requirements

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

RESULT:-

CIR = 30 cm

FIR = 37.5 cm

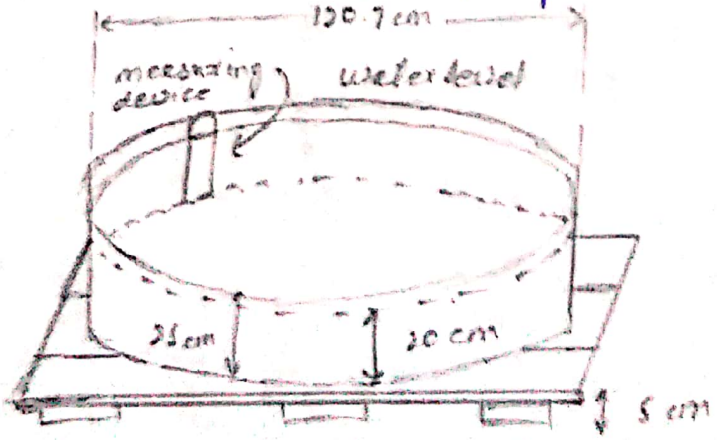
Q No3 (c) (15)

Explain Class a pan Evaporation (EP) measurement will helps of diagram.

Answer:

Evaporation can be experimenting determined by directly measuring the quantity of water evaporated from the Standard class A pan.

the pan is 1.0m in diameter, 25cm deep, and bottom is raised 15cm above the ground in a fixed range such that the water surface is least 5cm, and never more than 7.5cm below the top of pan.



(16)

Q No (3) (d)

Explain Crop Season (Rabi and Kharif) and Kharif Rabi :-

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

Kharif :- 1st April to 3th september, summer

Rabi :- 1st october - 31st march - winter

Kharif crops :- rice, maize, Sorghum, pearl bajra etc.

Rabi crop :- Barley, Riax seed, pea, wheat potato etc.

Kharif Rabi ratio :-

the area to be irrigated for Rabi crop is generally more than that of kharif crop.

this ratio of proposed area, to be irrigation 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) (a) (18)

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 cannot be easily drained under the action of gravity and is called field Capacity.

period of Drainage = 2-5 days

Fc is measured after 2 or 5 days

Field Capacity

Capillary water

Hygroscopic water.

Q NO 3 (b) (19)

Permanent wilting points

A plants 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 water.

Q NO3 (c) (20)

Available and Readily available moisture content

Available moisture content:

= = =

the difference in moisture content of the soil blw field capacity (F.C) and permanent wilting is termed as the available moisture. Available moisture can be expressed as percentage moisture.

Readily Available moisture.

= = =

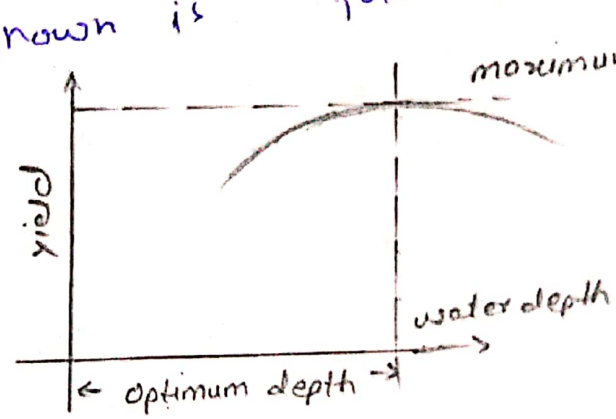
It is the portion of available moisture which is most easily extracted by plants and is approximately 75 to 80 % available moisture.

than at the Equator. Since the sun is the source of all energy used in crop growth and evaporation of water, this longer day may allow plant transpiration to continue produce an offset similar to that of lengthing growing season.

Q No 3(d) (22)

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 is found vary. the yield increase with water, reaches a certain maximum value and then falls down as shown is following big



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.