MID TERM PAPER

ON line

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ID # 7878

Section = "A"

Subject = Irregation Engineering

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Section A

Q1a Define "Delta" and Duty and derive their relationship in MKS and FPS Systems.

Delta :- every crop requires certain amount in water per hactare for it maturity The total amount of water supplied to the crop from first to last watering is stored on the land without Without any Loss then there will be a thick layer of water standing on that land theis depth of water layer is known as Delta for the crop it denoted by Δ and expressed in cm Delta for same common crop is given in Table.

Water Require to Crops & Soil water Relation

Kharif Crop	Delta in cm
Rice	125
maize	45
Groundnut	30
Rabi crop	Delta in cm
wheat	40
mustard	45
Gram	30
Potato	75

Dulty :- The duty of water is defined as ~~AO~~ hum on hectares the can be irrigated by constant supply of water at the rate of one cumec throughout in the base period is the expressed in the heetares cumee & in denoted by the D of the water not constant but it varies with various faetors

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like Soil condition method of ploughing method of application of water etc the duties of some common crops are table

Crop	Out in hectares/cumec
Rice	900
wheat	1800
Cotton	1400
Sugarcan	800

Duty Deta M.K.S System.

Duty = D (hectar / cumecs)

Delta = A meters Base period = B day By definition

↳ one Cumec of water flowing Continuously for "B" days gives a depth of water A over an area of D hectares

↳ volum of water in $1m^3$ Sec in one day
$= 1 \times 24 \times 60 \times 60 = 86400 m^3$

↳ volume of water in $1m^3$ Sec in "B" days =
$1 \times 24 \times 60 \times 60 = 86400\,B\,m^3 = 86400\,m^2 m$ — (i)

As 1 Hectare $= 10000\,m^2$

$1\,m^2 = 1104$ ft

The eq (1) becomes.

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volume of water in $1m^3$ sec in "B" day = $86400 B m^3$ = 86400×1104 H-m volume of water in $1m^3$ sec in "B" day = 8.64 in B H-m — (ii)

Depth of water required by crop.

A = volumn Area $A = 8.64 \times B$- H- M/D HA

$= 8.64 \times BM$.

in F.P.S System.

Duty = D (Acres/ Cusees)

Delta = A feet Base period = B day in definition

L> one Cusec of water flowing continuosly for B days gives a depth of water A over an area of D acres.

L> volume of water in $1ft^3$ Sec in "B" days = $1 \times 24 \times 60 \times 60 = 86400 B ft^3 = 86400 ft^2 ft$ — (i)

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

The eq (i) become

L> volume of the water in $1ft^3$ sec in "B" day = $86400 Bf^3 = 86400B \times 148560$ Acre ft volumn of water in $1f^3$ Sec in "B" day = 1.983B Acre ft → (ii)

L> Depth of water required by crop A = volume Area A = 1.983 B

Acre - ft D Acre = A $1.983 \times BD ft$.

end.

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Section A

Q1 b) if wheat require about 9 cm of water after every 35 days and the base period crop period of wheat is 140 days Find out the delta for wheat?

Given data.

water requirement of wheat = 9cm
interval days = 35
Base of period = 140 days
Delta of wheat (Δ) = ?

Solution.

140 days = Δ
35 days = 9cm

By formulas

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

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

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Section A

Q1c explan indus water treaty:.

The regulation of the indus water treaty (1960) india can use only 20% and total water carried by indus river system the water is used for irrigation in punjab Haryana and Southern and wester part of rajasthan. indus water treat and the dividing of rivers and excluding Agh-Afghanistan and China and Sub-optimal treat of meed to the expanded to the whole basin.
The indus water treaty is a water distribution treat in and pakistan brokered by the world bank to use in water available in the india whil laying down precise regulation for india to build project the indus of water treaty was in signed karachi on September in 1960 by first prime minister of india pandit jawaharlal where and then president of pakistan Ayub khan. and this agreement control over the water flowing in three eastern rivers of india the Beas the Ravi and the Sutlej with meen annual flow of 33million aere fee was given to india.

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Section A

Q1c

Write Significance of duty of crop:-

The duty means the area of land and can be irrigated with the unit volume of irrigation water duty represents the irrigation capacity of a unit it is relation between the are of crop irrigated and the quantity of the irrigation in water required during the all period of growth of crop.

The water at flowing rate one cubic meter per second runs continuously for B days and matures 200 heatars then duf of water That particular crop will to be defined of 200 hectares per Cumec to the base of B day the duty is define as the area irrigated per cumic of discharge running of the base period B the duty is generally represented by the letter D.

The Quantitativel duty is defined is the area land expressed by the hectares That can be irrigated with unit discharge that is 1 cumec flowing through out the base period expressed indays.

The overal duty for and all the crops required be irregated in different season of the year the are can be irragated can be worked out.

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Section A

Features of the indus Water treaty:-

The indus flow for india and country is allowed and used 20%. its water in irrigation generation power transport purpose.

The administer ~~how~~ treaty to river indus if tributaries the flow in both the contries will be utilize.

and treaty provides arbitration meechanism to solve amicably disputes.

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Section A

Q2a Explain the factors effecting consumptive use

Sunshin hours:- The longer the duration of the Sunshine hour the larger will be the total amount of energy received from the Sun the increases the rate of evaporation and their the rate of consumptive use of crops

Velocity of wind:- when ~~geater~~ greater the velocity of wind the more will be the rate of evaporvation beeause the saturated film of air containing the water will be easily removed

~~Tempert~~ Temperature:- The temp increas Saturation vapor pressure so consumptive use of water increas beeause a evaporation increase and also pressure increase and results increase

Humidity in Air:- The greater the air humidity The Smaller will be the rate of consumptive from the point of high moisture content to the point of low moisture content of it the humidity is high water vapar can not be easily removeed

i> consumptive uses with varies temperature humidity velocity of wind Sunshine houre method of irrigation moisture.

ii> availability ~~consu~~ consumptive use = Evapotranspiration = Evaporation + transpiration it is expressed in term of depth of water.

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consumptive use:-

The quantity of water use in vegetation growth of the area.

The water amount required a crop for vegatated growth of evapotranspiration of plant of building tissue plus intercepted precipitation evaperation from soil.

- Soil Fertility:-

The made soil more fertil through a application of manure or some anther That yield will be effected the increase an accopanyoing small increase of use of water.

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Section A

Q2b

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

Given data

useful Rainfall (cm) = 10cm
water application Efficiency (η_a) = 80% = 0.8
cummulative comsumptive use (CU) = 40cm

Required = ?

Fielel irrigation Requirement (FIR) = ?
Comsumptive irrigation Requirement (CIR) = ?

Solution.

formula.

Comsumptive Irrigation Requirement

$$CIR = CU - Rc$$
$$= 40 - 10$$
$$\boxed{CIR = 30cm}$$

Field Irrigation Requirement FIR

$$= \frac{CIR}{\eta_a} = \frac{30}{0.8}$$
$$\boxed{37.5cm}$$

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Section A

Q2c

explan class A pan evaporation(Ep) with the help of diagram.

evaporation can be experimentally determined by directly measuring the quantity of wate evaporated from this standerd class a pan this pan is 1.0m in diameter 25cm above the ground surface the depth of water is to be kept in a fixed such that the wate surface is at leas 5cm and never more than 7.5cm below the top of pan. measurement that combines or integrates the effect of several climate element temperature humidity rain fall drought dispersion solar radiation and wind evaporation is greatest hot wind dry sunny day and greatly reduced when clouds block the sun and when air is cool calm and humid pan evaporation measurment enable.

The pan evaporation Ep can also determined by using the christiouses formula which states

$E = 0.459\ R.c + cw.ch.cs.ce$

R = extra terrestrial radiation in the same units

Ep = in cm or mm

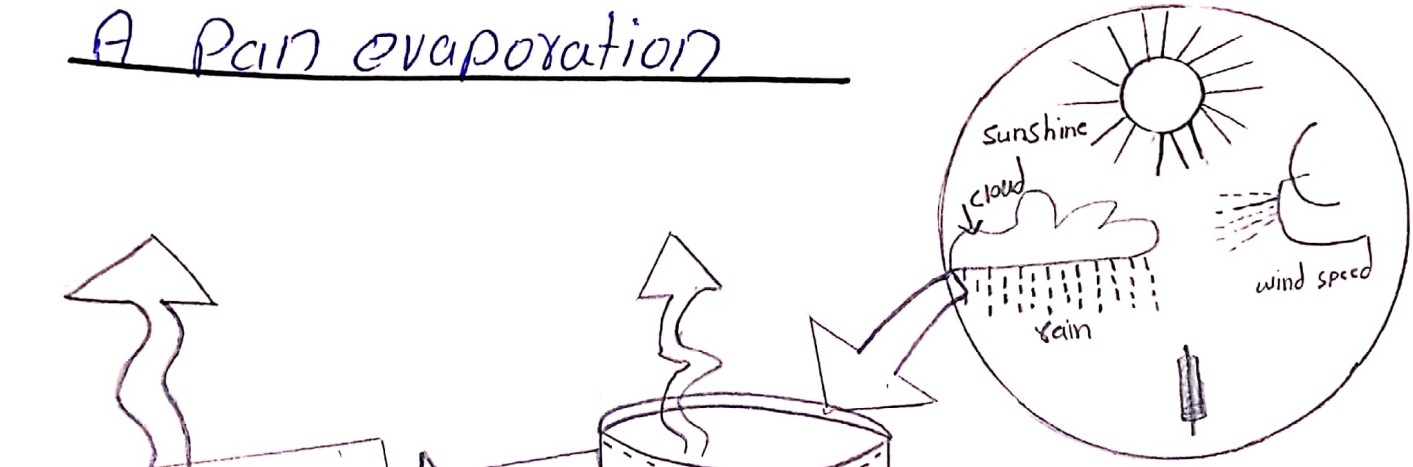
ct = So efficient for temperature

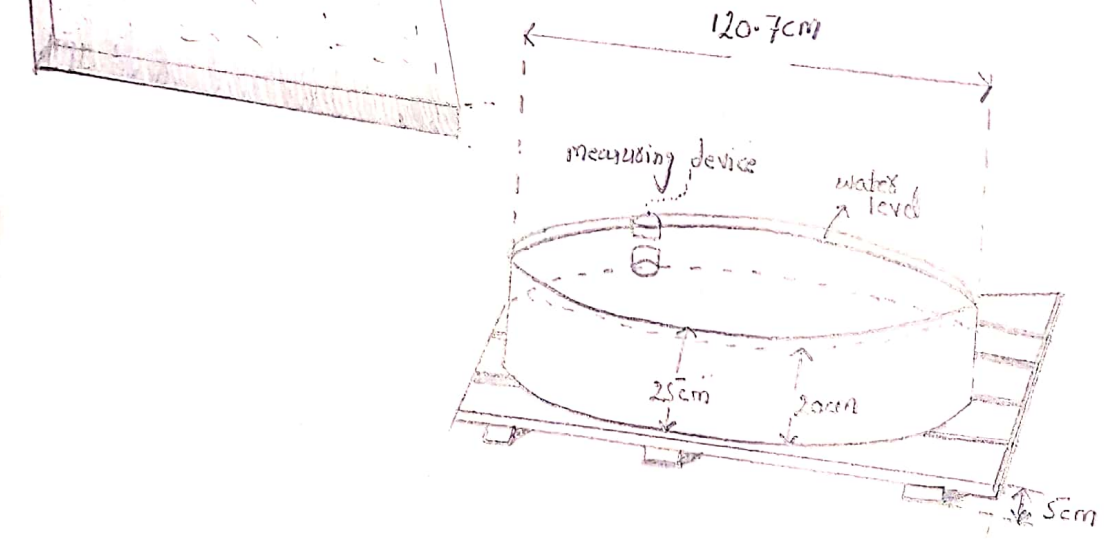
cw = co-efficient for relative humiclity

cs = co-efficient for percent of possible Sunshine

ce = co-efficient for elevation.

A Pan evaporation





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Section A

2nd

Explain Crop Seasons (Rabi and Kharif) and Kharif Rabi Ration!.

Crop Seasons:- The period during which some particular types of crops can be grown every year on the same land is known as Crop Season the following are the crop Season.

Kharif Season:- the Season ranges form june to october the crop are Sown in the every beginning of monsoon and harvested at the end of autumn the major kharif crops are Rice millet maize jute Groundnut etc.

Rabi Season!- This Season ranges from octobey to march the crop are Sown in the very begining of winter and havested at the end of Spring the major Rabi ~~corp~~ crop are wheat Gram mustard cepesseed linseed puless onione etc -

Rabi 1st october to 31st march winter
KHARIF:- 1st April to 30st September Summer.

Rabi crops:- Wheat Barley Gram mustard. Potates.
Kharif crop:- Rice Bajra, jawar, maiza, cotton.

Kharif Rabi Ratio:- This area to be irrigated for rabi crop generally than that for kharif crops this ration of proposed areas to irrigated in kharif Season to that in Rabi Season This ratio is generally 1:2:1.e kharif area is one half of Rabi as ratio of areas of the two main crop season e.g kharif and Rabi.

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Section A

Q3 a) Define and explan the following terms.

Field capacity:- The field capacity is defined as the amount of maximum moisture that can can be held by the soil against gravity its expressed as percentage. amount of content held in the soil after excess water has drained away and the rate of downword movement has decreased this usually takes place 2-3 day after rain or irrigation in pervious soil of uniform structure.

When all gravity water has drined 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 = 2-5day

Field capacity is measured after 2 or 3 days

Field capacity ① Capillary water ② Hygroscopic water

↳ Capillary water:- water attached to soil by surface tension which can easily by extracted by plants by capillary action.

↳ Hygroscopic water:- water attached to soil by chemical bonds which can not by extracted bonds which can not be extracted plan by capillary action.

Field capacity = (weight of water retained in certan volume of soil) Int of Same volume of soil) x100 consider 1 sqm area of soil dm depth of root zone.

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Section A

Volume of Soil = d x 1 cum.

if γ kg / cu.m = density of Soil = Specific wt of Soil

Then wt of water of d cu.m of Soil = γ d kg

if F is Field capacity

F = Wt of water retained in unit area of Soil / γd

Wt of water retained in unit are of Soil / γd

Wt of water retained in unit area or volume = $wd_1 = \gamma d.f$

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.

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3b

Permanent Wilting Point P.W.P.

The defined as the minimum amoudt of water in the soil that the plant requires not to wilt it the soil water in the soil that decreases to this or any lower point a plant wilts and can no longer recover it turgidity when place in a saturated atmosphere for 12 hours.

↳ Soil water content bayond which plants cannot recover from water stress dead

↳ Still Some water in the soil but no enough to be of use to plants

↳ Treditionally defined as the water content corresponding to -15 bars of SWP

↳ it is the Lower end available moisture ray or the soil moisture content when plant permenent wilt.

↳ The permenent wilting point defined as the amount of moisture held by soil the ~~can~~ which can not be extracted by the plant root of transpiration.

↳ A plant can extract water from soil till permant wilting is reached P.W.P is that water content at which a plant can no longer extract sufficient water for it growth and wilts.

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

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Section A

Q3d optimum utilization water.

They increases with water reaches a certain maximum value and the falls down in Show the figure. the quantity of water at which the yield is maximum called optimum water depth there fore optmum utilzation water depth there fore optimum utilization of irrigation generally means getting maximum with any amount of water

↳ if a crop is Show and produced under absolutely indentical condition using different absolutely condition using different am of amount of water depth the yield is found to every the yei yield in creases with water reaches a certain maximum value and then falls down a Show the figure in quantity of water at which the yield maximum

↳ There fore optimum utilzation of irrigation generally means getting maximum yield with any amount of rate of water

↳ The types of water use are withrawal where water is taken from a river of Surface or underground reservoir and after use returned to natural water body e.g water use cooling in dastrial processes.

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Section A.

Q3C

Available and readily available moisture content

Readily available water (RAW) is the water the plant can easily extract from the soil Raw is the soil moisture held between field capacity and a nominated refill point for an restricted growth in this range of soil moisture plan are neithe water logged.

↳ The difference in moisture content of the soil between field capacity field capacity and permanent wilting is termed the available moisture available moisture can be moisture available moisture can be expressed as percentage moisture as percentage as depth

↳ Soil moisture content near the wilting point is not readily available to point Hence the term readly available moisture has been extracted by plant approximately 75% of the available moisture.

The available rang of water and can be stored of the soil available for growing crop is know moisture Content available.

The portion available moisture it is ~~easy~~ every easily extracted by the plant is approximately 80% available moistures.