

NAME : S. ALI - RAZA.

ID 7744 .

SEC 1 C .

MID TERM PAPER Submission
of Irrigation Engineering .

Question # 2 (a).

ANSWER:-

Duty & Delta are very basic definitions used in the calculation of irrigation water demand of the crops.

To put it simple, Duty is the area of land that can be irrigated with a unit volume of water supplied across the base period where as delta is the depth of water required to raise a crop over a unit area.

As the quantity of irrigation water required changes for each crop the duty & delta values also change.

* EXAMPLE:-

The delta value

for rice around (1500 mm) is more than wheat around (500 mm). They are dependent on the type of soil type of crop, cultivation method etc.

The relationship Blw duty & delta is very easy to establish & is as follows:-

Consider B is the base period of the crops, flow into the field is in cumecs, then volume of water supplied during the base period, V can be expressed as.

$$V \text{ cubic (metres)} = B \text{ (days)} \\ * 24 \text{ (hours)} * 60 \text{ (minutes)} \\ * 60 \text{ (seconds)}$$

$$V = 86400 * B \text{ cubic metres}$$

If area of D hectares is irrigated,

Area of the crop irrigated
= 1×10000 square meters
(As 1 hectare = 10000 square
meters)

Now depth of water required
raise a crop in unit
area (Delta) = Volume
of water supplied during
the base period / Area
of crop irrigated.

$$\Delta = 86400 \times B/D \times 10000$$
$$= 8.64 B/D.$$

Question 2 Part (B).

* ANSWER -

Assuming the base
period to be representative
the crop period as
per usual practice, we
can easily infer that
water is required at
an average interval of
35 days upto a total
period of 140 days.

\Rightarrow It means that 5 ($140/35$)
no. of watering are required
for 35 days.

\Rightarrow The depth of water
required in 140 days
 $= 5 \times 9 = 45 \text{ cm}$

hence Δ (delta) for wheat
 $= 45 \text{ cm.}$
Ans.

PART (C).

* ANSWER -

* INDUS WATER TREATY -

\Rightarrow This treaty divided the
use of rivers & canals
B/w the two countries

\Rightarrow Pakistan obtained exclusive
rights for the three
western rivers, namely
Indus, Ravi, Jhelum & Chenab.

=> And India retained rights to the three eastern rivers, namely Ravi, Beas & Sutlej.

=> The treaty also guaranteed ten years of uninterrupted water supply. During this period Pakistan was build huge dams, financed partly by long-term world bank loans & compensation money from India.

=> Three multipurpose dams Wazirak, Mangla & Tarbella were built.

=> A system of eight link canals was also built.

=> five barges and 9 gated siphon were also constructed under this treaty.

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PART (D)

* DUTY OF A CROP:-

⇒ It helps us in the designing an efficient canal irrigation system.

⇒ Knowing the total available water at the head of a main canal, & the over all 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.

⇒ If we know the crops are required to be irrigated & their duties, we can work out the discharge required for designing the channel.

⇒ It helps to grow agricultural crops maintain land scapes & re vegetate the distributed soils in dry areas.

Question #2 Part (a).

* FACTORS AFFECTING

CONSUMPTIVE USE:-

Some of the major factors affecting consumptive use are given below:-

(1) PRECIPITATION:-

The amount and rate of precipitation may have some minor effect on the amount of water consumptively used during any summer, under the certain conditions.

=> It may occur as a series of frequent light showers during the hot summers.

⇒ Such showers may add little or nothing to the soil moisture for use by the plants through transpiration.

(2) TEMPERATURE 1-

The rate of consumptive use of water by crops in any particular locality is probably affected more by temperature, which for long time periods is a good measure of solar radiation than by any other factor.

(3) HUMIDITY 1-

Evaporation & transpiration are accelerated on days of low humidity & slowed during periods of high humidity. During periods of low relative humidity greater rate of use of water by vegetation

may be expected.

(3).

(4) WIND MOVEMENT:-

Evaporation of water from land & plant surface takes place more rapidly, when there is moving air under calm air conditions. Hot dry winds & 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.

(5) GROWING SEASON:-

The growing season which is tied rather closely to temperature, has a major effect on the seasonal use of water by plants.

Q2 Part (B).

* GIVEN DATA -

Rainfall for whole season = 10cm.

Commutative consumptive use is 40cm.

water application efficiency is 80%.

* REQUIRED -

$$C.I.R = ?$$

$$F.I.R = ?$$

Sol -

$$CU = \sum K.f = K \sum_{t=1}^4 P/40 (1.8t + 32)$$

where $CU = 40\text{cm}$.

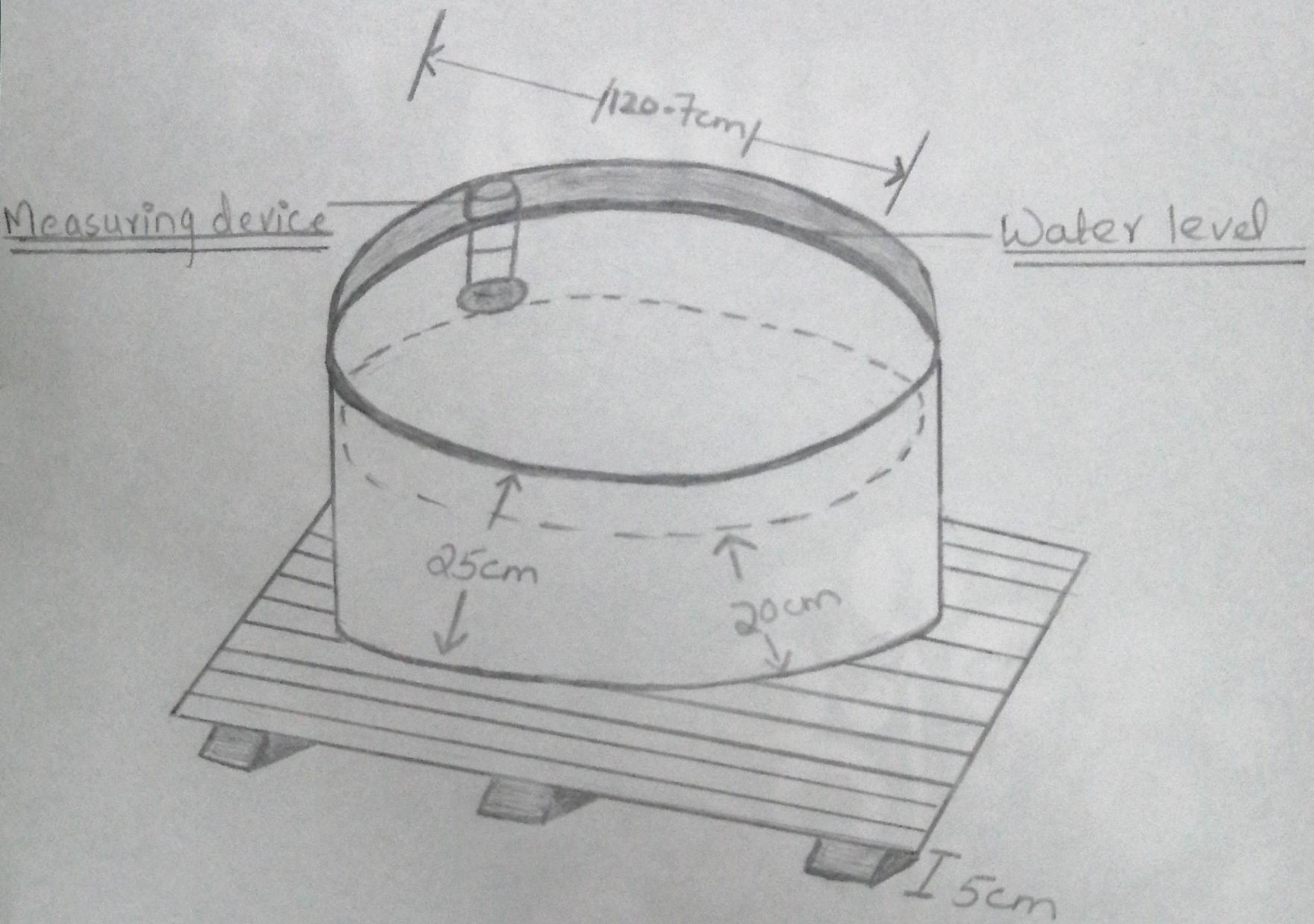
$$\text{So } C.I.R = 40 - 10 = \boxed{30\text{cm}}$$

$$F.I.R = \frac{C.I.R}{E_a} \Rightarrow 30/0.8$$

$$\boxed{F.I.R = 37.5\text{cm}}$$

Question 2 Part (c)

"DIAGRAM"



Question 2 Part (1)

* ANSWER:-

CROP SEASON:-

They are hot weather crop season rabi season & kharif season. The hot weather crop season ranges from february to may & the crops which can sustain heat & humid conditions are gram.

The kharif crops are rice, bajra, jowar, maize, cotton, tobacco, groundnut etc.

The rabi crops are wheat, barley, gram, linseed, mustard, potatoes etc.

"Kharif crops require about two to three times the quantity required by the rabi crops.

⇒ Kharif - Rabi Ratio -

The areas to be irrigated for Rabi crops is generally more than that of the Kharif crop. The ratio of proposed areas 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 areas is one half of the Rabi areas.

Question # 31-

(a) FIELD CAPACITY:-

Field capacity is the amount of soil moisture or water content held in soil after excess water has drained away & the rate of downward movement has materially decreased, which usually takes place within 2-3 days after a rain or irrigation on previous soils of uniform structure & texture.

(B) PERMANENT WILTING

POINT -

Permanent wilting point (PWP) or wilting point (WP) is defined as the minimum amount of water in the soil that the plant requires not to wilt. If the soil water content decreases to this or any lower point a plant wilts & can no longer recover its turgidity when placed in a saturated atmosphere for 12 hours.

(C) AVAILABLE MOISTURE CONTENT -

The difference in moisture content of the soil between field capacity (F.C) & permanent wilting is termed the available moisture. Available moisture can be expressed as percentage moisture P_w , as percentage P_v or as depth d .

* READILY MOISTURE CONTENT -

Soil moisture content near the wilting point is not readily available to plant. Hence the term readily available moisture that is more easily extracted by plants approximately 75% of the available moisture.

(1) OPTIMUM UTILIZATION of WATER:-

The quantity of water at which the yield is maximum is called the optimum water depth. Therefore optimum utilization of irrigation generally means getting maximum yield with any amount of water.

