* Define Kor-watering, Kor-period & Kor-depth

Kor-watering (K)

- The first watering given to a crop when is few centimeters (3-cm) in height is called Kor-watering (પાક ૩ાડ થોડો મોટો થાય ત્યારે જે પ્રથમ પાણી આપવામાં આવે છે તેને Kor-watering કહેવામાં આવે છે.)
- Generally, it is the maximum watering

Kor-depth (S)

- The depth of watering (amount of water in cm, mm, m) given in Kor-watering is called Kor-depth
- Kor-depth for Rice = 19-cm
  Wheat = 13.5-cm
  Sugarcane = 16.5-cm

Kor-period (b)

- The time-period in days in which the Kor-water is applied is called Kor-period
- Kor-period for Rice = 2-4 weeks (14-28 days)
  Wheat = 3-8 weeks (21-56 days)

Outlet factor

- The measurement of duty at the head of water-course or at the outlet of minor is called outlet factor

Ex-3.14 Purnima (66)

A water course has a culturable commanded area of 1200 ha. The intensity of irrigation for crop A is 40% & for B is 35% both the crops being Rabi crops. Crop A has a Kor period of 20-days & crop B has Kor period of 15-days. Calculate the discharge of the water course if the Kor depth for crop A is 10-cm & for B is 16-cm.

Soln:

Given data:

$$A = 1200 \text{ ha} = C.C.A.$$

For crop-A

$I.I. = 40\% = 0.4$

$b = 20\text{-days}$

$Q = ?$

$\delta = 10\text{-cm}$

- we know that

$$\text{Irrigable area} = I.I. \times C.C.A.$$
$$= 0.4 \times 1200$$
$$= 480 \text{ ha}$$

&

$$\text{Duty}(d) = \frac{864 \times b}{\delta}$$

$$= \frac{864 \times 20 \text{ (days)}}{10 \text{ (cm)}}$$

$$= 1728 \text{ ha/cumec}$$

Note: Here, Kor-period & Kor-depth (δ) is nothing but they are based period (B) & Delta (D) for a particular portion of irrigation.

So,

$B \rightarrow b$

$\Delta \rightarrow \delta$

$D \rightarrow d$

$$\text{Discharge } (q) = \frac{\text{Irrigable Area (ha)}}{\text{Duty } (d) \quad (\text{ha/cumec})}$$

$$= \frac{480}{1728} \text{ cumec}$$

$$= 0.278 \text{ cumec}$$

For Crop-B

I.I. = 35% = 0.35
b = 15-days
q = ?
δ = 16-cm

Here,

irrigable area = I.I. × C.C.A.
= 0.35 × 1200
= 420 ha

$$\text{Duty } (d) = \frac{864 \times b}{\delta} = \frac{864 \times 15}{16} = 810 \text{ ha/cum}$$

So,

$$\text{Discharge } (q) = \frac{\text{Irrigable area}}{\text{Duty } (d)}$$

$$= \frac{420}{810} = 0.519 \text{ cum}$$

Total design discharge = $q_A + q_B = 0.278 + 0.519 \simeq 0.8$

हर्षित Page No.: Date:

EX-3.17 (68) Punamia

The base period, intensity of irrigation & duty of various crops under a canal system are given in the below table. Find the reservoir capacity if the canal losses are 20% & reservoir losses are 12%.

Crop	Base period (days)	Duty @field (ha/cumec)	Area under the crop (ha)
Wheat	120	1800	4800
Sugar-Cane	360	800	5600
Cotton	200	1400	2400
Rice	120	900	3200
vegetables	120	700	1400

Soln:-

Note :- Here clearly mentioned that the reservoir capacity it means we need to find the volume of water stedie in static condition in m^3 but not in flowing condition (m^3/s)

For wheat

$$\text{Discharge } (Q) = \frac{\text{Area (ha)}}{\text{Duty (ha/cumec)}} = \frac{4800}{1800} = 2.66 \text{ cumec}$$

$$\text{Volume of water in } m^3 = 2.66 \left(\frac{m^3}{s}\right) \times 120 \text{ (days)}$$

$$= 2.66 \times 120 \times \underbrace{24 \times 60 \times 60}_{86,400} \left(\frac{m^3}{s} \times s\right)$$

$$= 2764.8 \times 10^4 \ m^3$$

हर्षित
Page No. :
Date :

Note :- Do calculation procedure for all crops & make as tabulated form

Column(5) x column(2) x 86,400

Column-(4) / Column-(3)

1 Crop	2 Base period (days)	3 Duty @ field (ha/cumec)	4 Area under crop (ha)	5 Discharge (m^3/s)	6 Volume of water (m^3)
Wheat	120	1800	4800	2.66	2764.8×10^4
Sugar-Cane	360	800	5600	7.0	$21,772.8 \times 10^4$
Cotton	200	1400	2400	1.71	2962.2×10^4
Rice	120	900	3200	3.55	3686.4×10^4
vegetables	120	700	1400	2.0	2073.6×10^4
Total =					$33,259.8 \times 10^4$

Here, total volume of all crops requirement $= 33,259.8 \times 10^4\ m^3$

Now, 20% are canal losses & 12% are reservoir loses.

Volume of water @ canal (80% utilize)

$$= \frac{33,259.8 \times 10^4}{0.8}$$

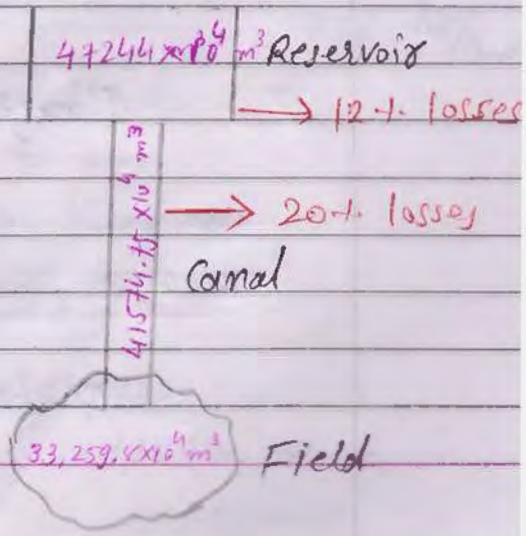
$$= 41574.75 \times 10^4\ m^3$$

&

Volume of water @ reservoir (88% utilize)

$$= \frac{41574.75 \times 10^4}{0.88}$$

$$= 47244 \times 10^4\ m^3$$



Ex-3.2
Garg
(79)

The gross Command area for a distributary is 6000 ha, 80% of which is culturable irrigable. The intensity of irrigation for Rabi season is 50% & that for Kharif season is ~~30%~~ 25%. A Rabi season crop has a Kor period of 4 weeks & Kharif season crop has Kor period of 2.5 weeks. Determine the discharge required at the outlet of minor, if the Kor depth is 13.5 cm & 19 cm for Rabi & Kharif crop, respectively.

Soln:

Given data:

G.C.A. = 6000 ha

So,

C.C.A. = 0.8 × 6000 = 4800 ha

For Rabi crop

I.I. = 50% = 0.5
b = 4 weeks = 4 × 7 = 28 days
q = ?
δ = 13.5 cm

- we know that

Irrigable area = I.I. × C.C.A
= 0.5 × 4800
= 2400 ha

NOW,

$$\text{Discharge } (Q) = \frac{\text{Irrigable Area } (A)}{\text{Duty } (d)}$$

but,

$$\text{Duty}(d) = \frac{864 \times b}{\delta} = \frac{864 \times 28}{13.5} = 1792 \text{ ha/cumec}$$

So,

$$Q = \frac{2400 \text{ (ha)}}{1792 \text{ (ha/cumec)}} = 1.34 \text{ cumec}$$

For Kharif season

$$I.I = 25\% = 0.25$$
$$b = 2.5 \text{ weeks} = 2.5 \times 7 = 17.5 \text{ days}$$
$$Q = ?$$
$$\delta = 19.5 \text{ cm}$$

- we know that

$$\text{Irrigable area} = I.I. \times C.C.A.$$
$$= 0.25 \times 4800$$
$$= 1200 \text{ ha}$$

&

$$\text{Duty}(d) = \frac{864 \times 6}{\delta} = \frac{864 \times 17.5}{19.5} = 796 \text{ ha/cumec}$$

So,

$$\text{Discharge}(Q) = \frac{\text{Irrigable area}(A)}{\text{Duty}(d)}$$

$$= \frac{1200 \text{ (ha)}}{796 \text{ (ha/cumec)}}$$

$$= 1.51 \text{ cumec}$$

Ex-3.4

Garg (81)

The cultivable commended area for a distributary is 15,000 ha. The intensity of irrigation for Rabi (wheat) is 40% & for Kharif (~~Rabi~~ Rice) is 15%. If the total water requirement of the two crops are 37.5 cm & 120 cm & their period of growth are 160 days & 140 days respectively

a- Determine the outlet discharge from average demand considerations

b- Also determine the peak demand discharge assuming that the Kor water depth for two crops are 13.5 cm & 19 cm & their Kor periods are 4 weeks & 2 weeks respectively.

Soln:-

Given data;

C.C.A. = 15,000 ha

For Rabi (wheat)

Irrigable area = I.I. × C.C.A.

= 0.4 × 15,000

= 6000 ha

For Kharif (Rice)

Irrigable area = I.I. × C.C.A.

= 0.15 × 15,000

= 2250 ha

a.) Determine the outlet discharge from average demand considerations.

For Rabi (wheat)

Duty (Δ) =

For Rabi (wheat)

$$\text{Discharge } (Q) = \frac{\text{Irrigable Area (ha)}}{\text{Duty (D) (ha/cumec)}}$$

but

$$\text{Duty } (D) = \frac{864 \times B}{\Delta}$$

For Rabi (wheat)

Given that

$\Delta = 37.5$ cm

$B = 160$ days

So,

$$\text{Duty } (D) = \frac{864 \times B}{\Delta} = \frac{864 \times 160}{37.5} = 3686 \frac{\text{ha}}{\text{cumec}}$$

&

$$\text{Discharge } (Q) = \frac{\text{Irrigable area (ha)}}{\text{Duty (ha/cumec)}}$$

$$= \frac{6000}{3686}$$

$$= 1.63 \text{ cumec } (m^3/s)$$

Similarly for Kharif (Rice) crop use

For Kharif (Rice) crop

Given that

$$\Delta = 120\text{-cm}$$
$$B = 140\text{-days}$$

$$\text{Duty } (D) = \frac{864 \times B}{\Delta} = \frac{864 \times 140}{120} = 1008 \text{ ha/cumec}$$

So,

$$\text{Discharge } (Q) = \frac{\text{Irrigable area (ha)}}{\text{Duty (ha/cumec)}}$$

$$= \frac{2250}{1008} \text{ (ha)} / \text{(ha/cumec)}$$

$$= 2.23 \text{ cumec } (m^3/s)$$

b.) Also determine the peak demand discharge, assuming that the Kor water depth for two crops are 13.5-cm & 19-cm & their Kor periods are 4-weeks & 2-weeks respec

For Rabi (Wheat) crop

Given that

$$\delta = 13.5\text{-cm}$$
$$b = 4\text{-weeks}$$
$$= 4 \times 7$$
$$= 28\text{-days}$$