Peak demand means ~~discharge~~ (Maximum discharge)

So,

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

but

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

$$= \frac{864 \times 28}{13.5} =$$

$$= 1792 \text{ ha/cumec}$$

hence,

$$q = \frac{6000}{1792} = 3.35 \text{ cumec}$$

For Kharif (Rice) crop

Given that

$\delta = 19\text{-cm}$

$b = 2\text{-weeks} = 2 \times 7 = 14\text{-days}$

So,

$$\text{Duty (d)} = \frac{864 \times b}{\delta} = \frac{864 \times 14}{19} = 636 \text{ ha/cumec}$$

4

$$\text{Discharge } (q) = \frac{\text{Irrigable Area (A)}}{\text{Duty (d)}} = \frac{2250}{636} = 3.54 \text{ ha}$$

Hence, peak demand (max. discharge) = 3.54 cumec
(Out of both take max. discharge)

Ex-3.5
Garg
(81)

At a certain place in India, the transplantation of rice takes 16-days & the total depth of water required by the crop is 60-cm on the field. During this transplantation period of 16-days, rain starts falling & about 10 cm of rain is being utilised to fulfil the rice demand.

a- Assuming 25% losses of water in water-course, find the duty of water at the head of the water-course.

b- Find the duty of water at the head of distributary, assuming 15% losses from the distributary head to the watercourse head.

Sol^{n}:- Given data

Base period (B) = 16-days

Depth of net water (Δ) = Total depth - Rainfall de

= 60 - 10

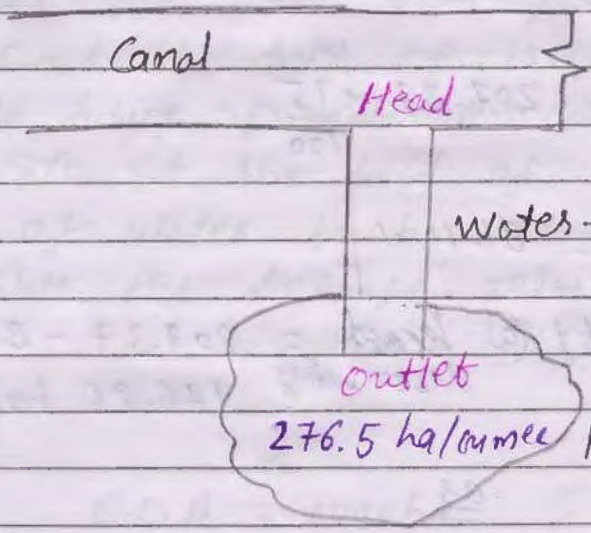
= 50-cm

Note:- Here total depth water required to rice is 60-cm but due to rainfall of 10-cm it is fulfill 10-cm so, we need to apply only 50-cm of water

So,

$$\text{Duty (D)} = \frac{864 \times B\,(\text{days})}{\Delta\,(\text{cm})} = \frac{864 \times 16}{50} = 276.5 \frac{\text{ha}}{\text{cu}}$$

a.) Assuming 25% losses of water in water course find the duty of water at the head of the water-course



Note :- Duty will be increased as we move ahead so, the duty will be more at outlet than the head

Here, duty at outlet = 276.5 ha/cumec

Losses @ 25% = 0.25

Losses = 276.5 × 0.25 = 69.12

Duty at head = 276.5 - 69.12 = 207.37 ha/cumec

OR

25% losses it means 75% water is utilized at head out of 100% outlet

So, Duty @ head = $\frac{276.5 \times 0.75}{}$ = 207.37 ha/cumec

b.> Find the duty of water at the end of distributary, assuming 15% losses from the distributary head to the watercourse head.

Hese 15% losses

5%,

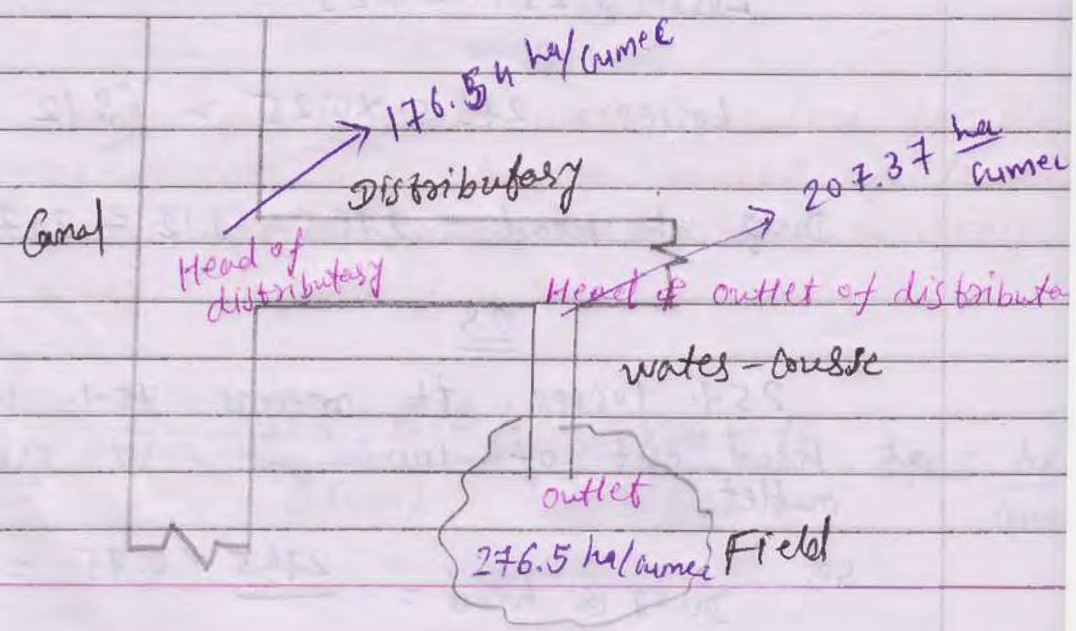
$$= 207.37 \times \frac{15}{100}$$

$$= 31.10\ \%$$

Head Duty @ ~~head~~ distributary = 207.37 - 31.10
= 176.26 ha/cumec

15% losses it means 85% of wates is utilized out of 100% @ distributary

Duty @ distributary = 207.37 × 0.85
= 176.54 ha/cumec



Ex-3.27 Garg (94) A water course commands an irrigated area 1000h The intensity of irrigation of rice in this area is The transplantation of rice crop takes 15-days & dur transplantation period, total depth of water required b the crop on the field is 500 mm. During the transpla ation period, the useful rain falling on the field is 120 mm. Find the duty of irrigation water for crop o the field during transplantation at the head of the field & also at the head of the water course, assu ng loss of water to be 20% in the water cours Also, Calculate the discharge requires in the water cours

Soln.: Given data;

C.C.A. = 1000 ha

I.I. = 70% = 0.7

Base Period (B) = 15-days

Irrigable area (A) = C.C.A. × I.I. = 1000 × 0.7 = 700 ha

Depth of water required (Δ) = Total requirement − Effective rainf

= 500 − 120

= 380 mm

= 38 cm

$$\text{Duty}(D) = \frac{864 \times B}{\Delta} = \frac{864 \times 15}{38} = \cancel{344}\ 341 \text{ ha/cumec}$$

Duty @ water-course = 341 × 0.8 = 272.8 ha/cumec

20% losses means 80% utilizable at the outlet of water-course so, the duty will be more at water-course outlet because there is more discharg

$$\text{Discharge } (Q) = \frac{\text{Irrigable Area (ha)}}{\text{Duty (ha/cumec)}} = \frac{700}{272.8} = 2.57 \text{ cumec}$$

Ex - 3.28 The base period, intensity of irrigation & duty of water for various crops under the canal system are given. Determine the reservoir capacity if the cultivable commands area is 4000 ha, canal losses are 25% reservoir losses are 15%.

Crop	Base period (days)	Intensity of Irrigation (%)	Duty @ field (ha/cumec)
Wheat	120	20	1800
Sugar-Cane	360	20	1700
Cotton	180	10	1400
Rice	120	15	800
Vegetable	120	15	700

DO as self As per example of 3.17 (Punam) as we solved earlier/previous

Babar Dude B., CAET, Godhra

1 hp = 746 watt = 0.746 kW

Baba Duda B. CAET, Bordhsa

Ex-3.7 A pump is installed on a well to lift water & to irrigate rice crop, sown over 3 ha of land.
Garg If duty for rice is 864 ha/cumec on the field &
(83) pump efficiency is 48%, determine the minimum required input (H.P.) of the pump, if the lowest well water level is 8-meters below the highest portion of the field. Assume negligible field channel los

Note:- This numerical is used for 5th sem. (3rd year) of "Ground water wells & pumps" subject & also for "Drip & sprinkler irrigation system" (4th sem)

Formula to find H.P.

$$\text{H.P. (Horse Power)} = \frac{\text{Discharge, Q (lps)} \times \text{Head, H (m)}}{75 \times \eta_p \times \eta_m}$$

where, H.P. = Horsepower (hp)
Q = Discharge of pump (lps, lit/sec)
H = Head/Height (m)
η_p = Pump efficiency (decimal)
η_m = Motor efficiency (decimal)

Soln:- Given data;

Irrigable area (A) = 3 ha
Duty (D) = 864 ha/cumec
η_p = 48% = 0.48
η_m = not given -
H.P. = ?
Head/Height (H) = 8-m

- We need to find the discharge (Q)

So,

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

$$= \frac{3}{864} \frac{h}{(\text{ha/cume})}$$

$$= 0.003472 \text{ cumec}$$
$$= 0.003472 \text{ m}^3/\text{s}$$
$$= 3.472 \text{ lit/sec (lps)}$$

Now,

$$\text{H.P.} = \frac{Q\,(\text{lps}) \times H\,(\text{m})}{75 \times \eta_p}$$

$$= \frac{3.472 \times 8}{75 \times 0.48}$$

$$= 0.77 \text{ hp}$$

$$\simeq 0.8 \text{ hp}$$

Or

1 hp — 746 watt / 0.746 kw

0.8 hp — ?

$$= 746 \times 0.8$$
$$= 596.8 \text{ watt}$$
$$= 0.596 \text{ kw} \quad (\text{kw} = \text{Kilo watt})$$

Irrigation Efficiencies

* what is the irrigation efficiency & explained all in details

Irrigation efficiency

- It is the ratio of output of wat to the input of wates

$$\eta = \frac{\text{output}}{\text{Input}} = \frac{\text{Utilized wates}}{\text{Input wates}}$$

- It is expressed in persentage.
- when losses are more then output wil be less so, the efficiency will be less therefore we can say that the efficiency is inversely proportional to the losses.

- Following six irrigation efficiencies are counted or noticed in the irrigation supply

1.) Wates- Conveyance efficiency (η_c)
2.) wates application efficiency (η_a)
3.) wates use efficiency (η_u)
4.) Wates storage efficiency (η_s)
5.) Wates distribution efficiency (η_d)
6.) Consumptive use efficiency (η_{cu})

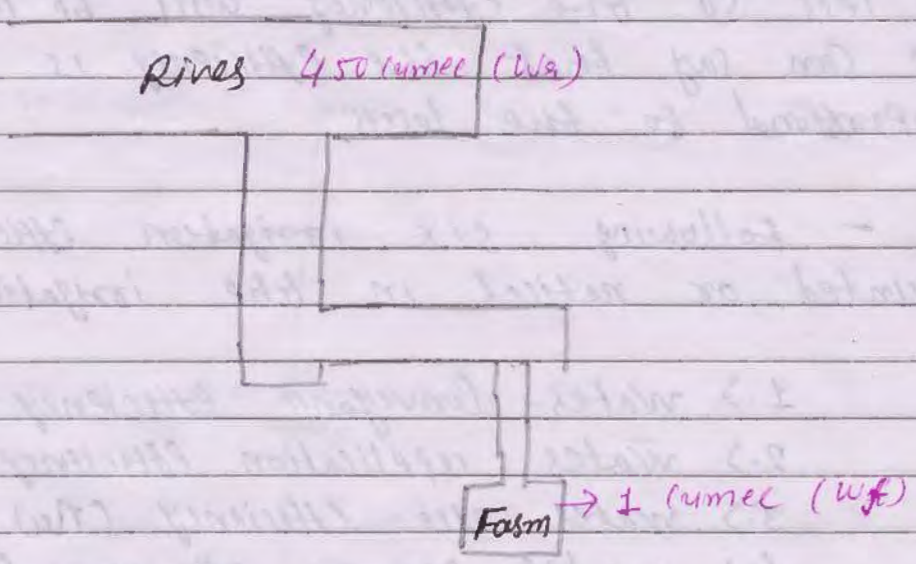
1.) Water Conveyance efficiency (η_c)

- It is depends on conveyance or transit losses of water in Canals.

- It is the ratio of water delivered into the farm to the water supplied from the river or reservoir

$$\eta_c = \frac{\text{Water delivered into the farm}}{\text{Water supplied from river}} \times 100$$

$$\eta_c = \frac{W_f}{W_r} \times 100 \quad \begin{pmatrix} f = \text{farm} \\ r = \text{river} \end{pmatrix}$$



$$\eta_c = \frac{1}{450} \times 100 = 0.22\ \%$$