

1ST INTERNAL EXAMINATION

Diploma 4Th Semester (Civil)

Subject: Hydraulics & Irrigation Engineering

Time:1 hr 30 minutes

Total Marks:20

(Figures to the right hand side indicates marks)

PART-A

Q1. Answer any five questions: (2x5=10marks)

- (a) Distinguish between compressible and incompressible fluid flow?
- (b) Define the term 'catchment area' and 'runoff'?
- (c) Write down Dicken's and Ryve's formula for estimation of flood discharge?
- (d) What are the types of irrigation followed in India?
- (e) What are the methods adopted to calculate the average depth of precipitation?
- (f) Write down the ill-effects of irrigation?

PART-B

Q2. Answer the following questions:

- (a) An oil of specific gravity 0.9 is flowing through a venturimeter having inlet dia 20cm of throat dia 10cm. The oil-mercury differential manometer shows a reading of 20 cm. Calculate the discharge of oil through the horizontal venturimeter. Take $C_d = 0.98$. (3 marks)
- (b) Name the different forces present in a fluid flow for the Euler's equation of motion, which forces are taken into consideration. (2 marks)

or

Describe the different types of rain gauges used for measurement of rainfall with suitable labelled diagram? (5 marks)

Q3. Answer the following questions:

- (a) A body of dimensions 0.5m X 0.5m X 1m of specific gravity 3 is immersed in water. Determine the least force required to lift the body. (2 marks)
- (b) A simple manometer (U-tube) containing mercury is connected to a pipe in which an oil of sp.gr. 0.8 is flowing. The pressure in the pipe is vaccum. The other end of the manometer is opened to the atmosphere. Find the vaccum pressure in pipe if the difference of mercury level in the two limbs is 20cm and the height of oil on the left limb from the centre of pipe is 15cm below.

(3 marks)

No. AB/ 4065



**SAMANTA CHANDRASEKHAR INSTITUTE
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SEMILIGUDA - 764 036

Internal - 1 Examination 4th Semester/Class
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Roll No. 1004 Registration No. A20030001004
Subject H-IF Date 25-05-22

No. of Addl. Sheets used _____

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20/05/22
25/05/22

Signature of the Invigilator:
Manisha Mishra
25/5/2022

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MARKS OBTAINED

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Date _____

11)
12)

compressible

It is that type of flow in which the density of the fluid is change

$\rho \neq \text{constant}$

incompressible

It is that type of flow in which the density of the fluid is doesn't change

(b) catchment area

The catchment area of the river means the area from where the surface run of flow through that river, through tributants & stream etc

Run off

when it rain some portion of rainwater which flow over the ground surface is known as surface Run off or Run off

(d) There are two types of irrigation

- (1) surface irrigation
- (2) sub surface irrigation

(c) Dickers formula

$Q = C \times A^{3/4}$

where Q = discharge in cumec

A = catchment area sq.km

C = A constant depending upon the factor affecting the flow

(2)

discharge

② III effect of irrigation

① (i) Raising of water table

(ii) formation of marshy land.

(iii) dampness in weather.

(iv) loss of valuable land.

②



Different type of Rain gauge

Rain gauge is 3 type

(i) weighing bucket Rain gauge

This type of Rain gauge consist of a recording bucket which is place on pan. The pan is again added with some weighing mechanism. A pencil arm is pivoted with the weighing mechanism in such way that the movement of the bucket can be traced by pencil by a moving recording drum. When the water collected in the bucket in increasing weight of water is transmitted through a pencil which traced a curve on the recording drum.

(ii) Tipping bucket Rain gauge

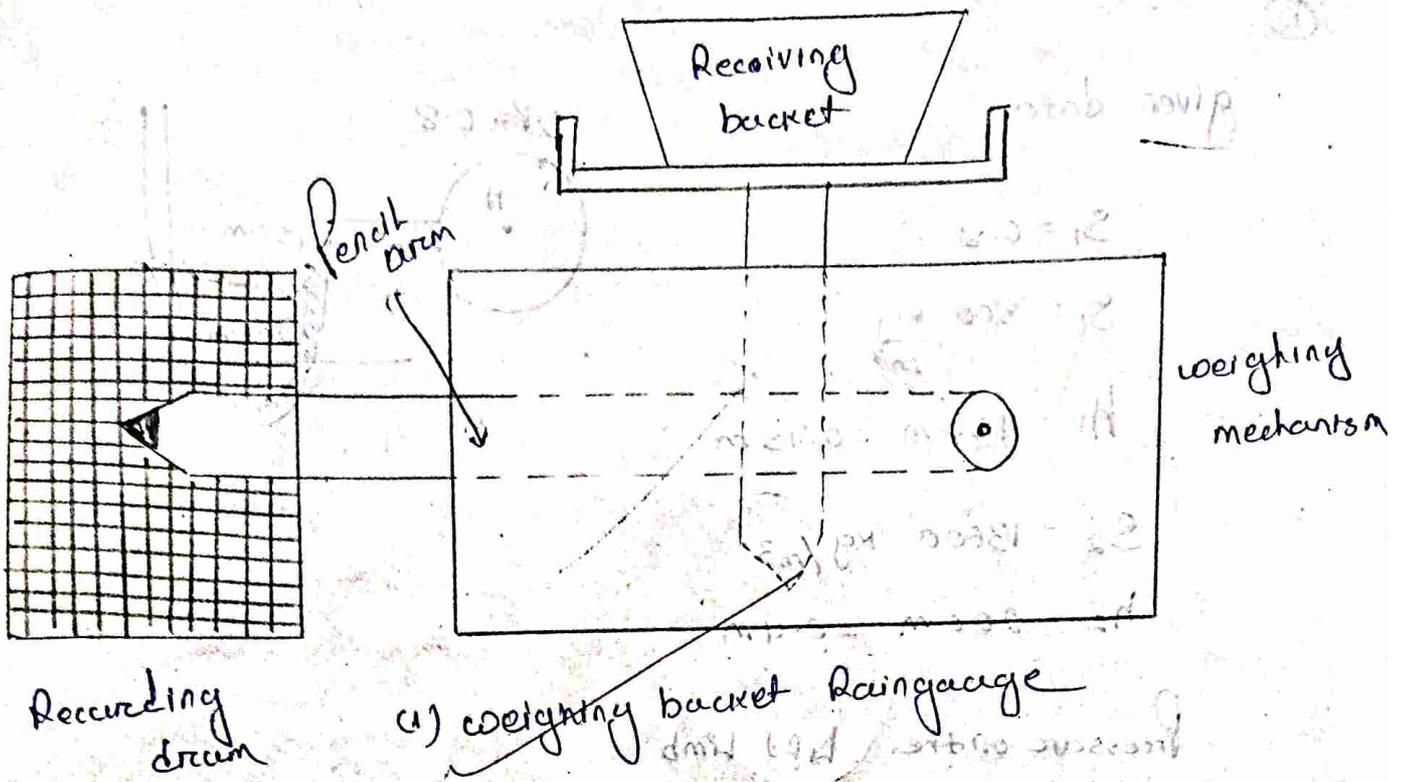
It consist of a circular collector of diameter 30 cm in which the rain water is initially collected to the circular collector and get collected in two compartment tipping bucket pivoted below to the funnel.

When 0.25 mm rain water is collected in one bucket then it tips and discharge the water in a reservoir kept below the bucket. At the same time the other bucket come below the funnel and the rain water goes on collecting in it when the requested amount of rain water is collected it also tips and discharge the water in the reservoir in this way a circular motion is generated by the buckets the circular motion is transmitted to a pencil which traces a wave like curve on the sheet mounted on a ~~Reservoir~~ Resolving drum. The total Rain Fall may be drawn in the graph.

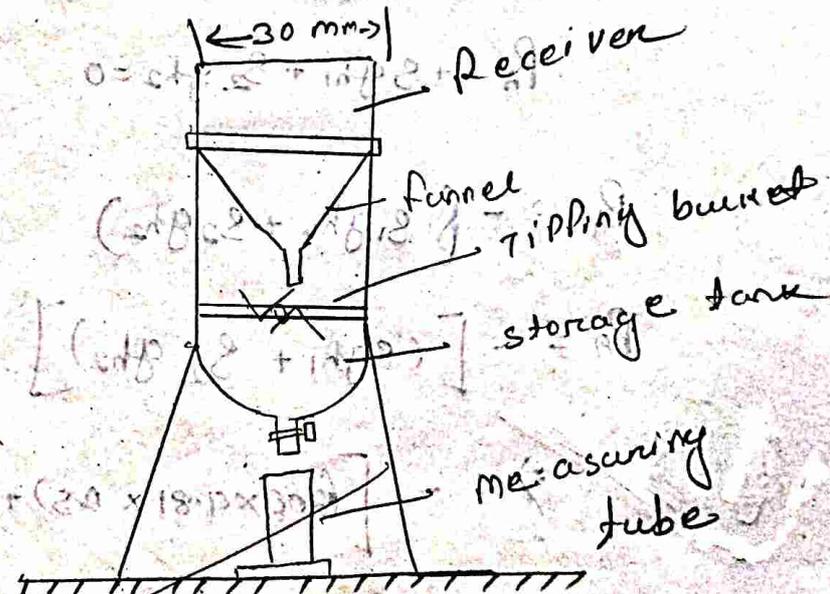
(iii) Float type Rain gauge!

In this type a funnel is provided at one end of a rectangular container and a rotating recording to is provided at a other end.

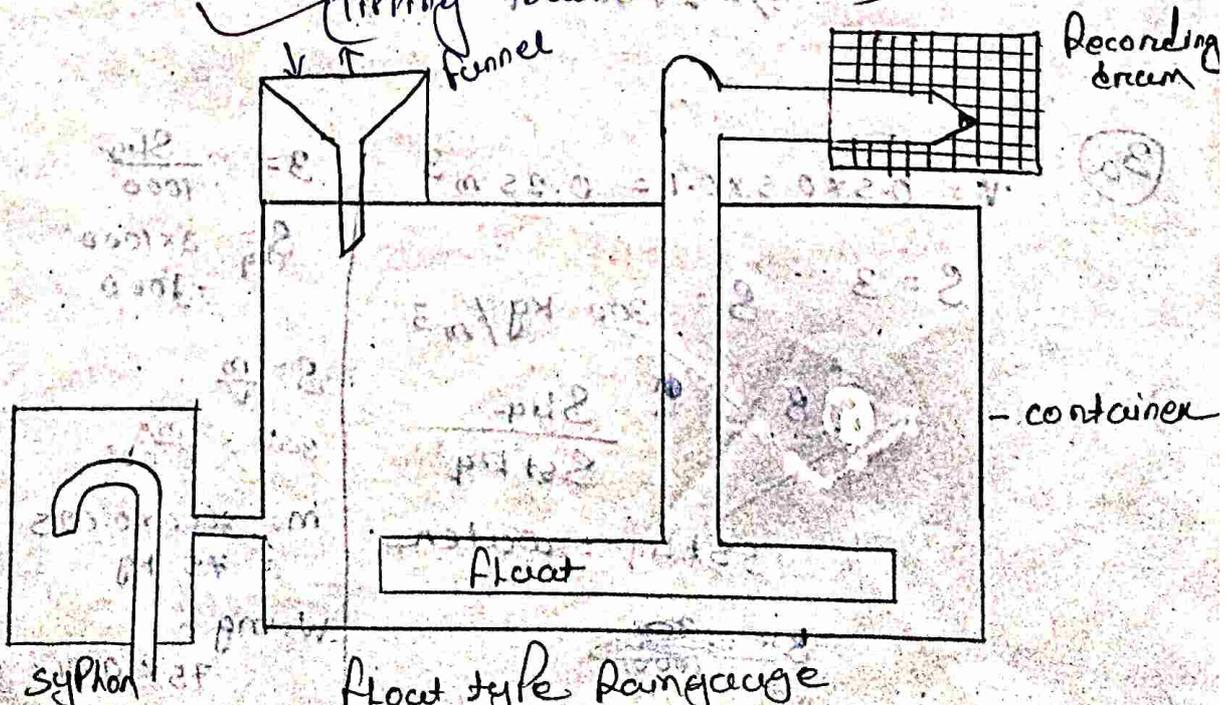
The float consist of a rod which contain a pen arm for recording the amount of Rain Fall on the graph. It consist of a syphon which start functioning when the float rises to some definite head height. The container gauge goes on empty gradually.



(5)



(Tipping bucket method)



3
D

given data

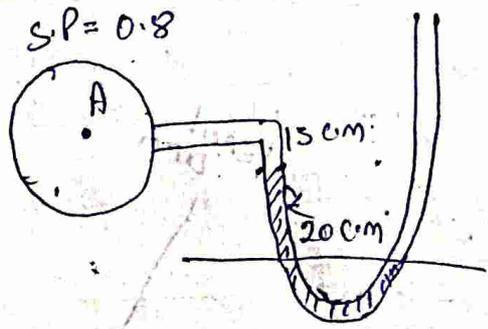
$$S_1 = 0.8$$

$$S_1 = 800 \frac{\text{kg}}{\text{m}^3}$$

$$h_1 = 15 \text{ cm} = 0.15 \text{ m}$$

$$S_2 = 13600 \text{ kg/m}^3$$

$$h_2 = 20 \text{ cm} = 0.2 \text{ m}$$



Pressure on the lift limb

$$P_A + S_1 g h_1 + S_2 g h_2 = 0$$

$$P_A = - (S_1 g h_1 + S_2 g h_2)$$

$$P_A = - [S_1 g h_1 + S_2 g h_2]$$

$$\Rightarrow - [(800 \times 9.81 \times 0.15) + (13600 \times 9.81 \times 0.2)]$$

$$\Rightarrow - 27860.4 \text{ N/m}^2$$

3a

$$V = 0.5 \times 0.5 \times 0.1 = 0.25 \text{ m}^3$$

$$S = 3 \quad S = 300 \text{ kg/m}^3$$

$$S = \frac{S_{\text{liq}}}{S_{\text{st liq}}}$$

$$S_{\text{st liq}} = \text{water}$$

$$S = \frac{300}{1000}$$

$$3 = \frac{S_{\text{liq}}}{1000}$$

$$S_{\text{liq}} = 3 \times 1000 = 3000$$

$$3 = \frac{m}{0.25}$$

$$3000 = \frac{m}{0.25}$$

$$m = 3000 \times 0.25 = 75 \text{ kg}$$

$$W = mg$$

$$75 \times 9.81 = 735.75 \text{ N}$$



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SEMILIGUDA - 764 036

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Subject HSE Date 25-5-22

No. of Addl. Sheets used 1

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MARKS OBTAINED

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③
① Given data

$$S_1 = 0.8 = \frac{800 \text{ kg/m}^3}{1000}$$

$$S_2 = 13.6 = \frac{13600 \text{ kg/m}^3}{1000}$$

$$\rho_1 = 800$$

$$\rho_2 = 13.6 \times 1000 = 13600$$

Difference in mercury level $h_2 = 20 \text{ cm} = 0.2 \text{ m}$

height in left limb $h_1 = 15 \text{ cm} = 0.15 \text{ m}$

Let the pressure in pipe be P

$$\rho_2 g h_2 + \rho_1 g h_1 + P = 0$$

$$P = -(\rho_2 g h_2 + \rho_1 g h_1)$$

$$= -\{(13.6 \times 1000 \times 9.81 \times 0.2) + (800 \times 9.81 \times 0.15)\}$$

$$= -(26,683.2 + 1,177.2)$$

$$= -27860.4 \text{ N/m}^2$$

3(a) Volume of the block $= 0.5 \text{ m} \times 0.5 \text{ m} \times 1.0 \text{ m} = 0.25 \text{ m}^3$

weight of the body = ~~buoyant force~~

$$\text{weight of the body} = \rho g V = 9.81 \times 3000 \times 0.25 = 7357.5$$

$$\text{Buoyant force} = F_b = 9.81 \times 1000 \times 0.25$$

$$= 2452.5$$

Least force = weight of the body - buoyant force

$$= 7357.5 - 2452.5$$

$$= 4905$$

**SAMANTA CHANDRASEKHAR INSTITUTE OF TECHNOLOGY & MANAGEMENT,
SEMILIGUDA**

**2nd INTERNAL EXAMINATION
Diploma 4th Semester (Civil)
Subject: H&IE**

Time: 1 hr 30 minutes

Total Marks: 20

(Figures to the right-hand side indicates marks)

PART-A

Q1. Answer the following questions.

(2X5=10)

- a) Define notch and weirs ?
- b) Define the term hydraulic gradient line and total energy line?
- c) How will you determine the loss of head due to friction in pipes by using
 - i. Darcy's formula
 - ii. Chezy's formula
- d) What are the different method of distribution of water ?
- e) What are the factors effecting duty?

PART-B

Q2. Answer the following question.

- a) Determine the height of rectangular area of length 5m to be built area of a rectangular channel the maximum depth of water on the off stream side of the weir is 1.5 m and discharge is $1.5 \text{ m}^3/\text{sec}$? Take $C_d=0.6$. **(3)**
- b) Find the head loss due to friction in a pipe of diameter 250 m and length 60m ,through which water is flowing at a velocity of 3 m/sec using –
 - i. Darcy's formula
 - ii. Chezy's formula for which $C=55$,
Take ν for water =0.01 stroke **(3)**
- c) Derive the relationship between base, delta and duty **(2)**
- d) A channel is to be designed for irrigating 5000 hectares in kharif crop and 4500 hectares in rabi crops. The water requirement of kharif and rabi are 60 cm and 25 cm respectively. The kor period for kharif is 3 weeks and rabi is 4 weeks. Determine the discharge for which it is to be designed. **(2)**

No. AB/ 4205



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Manisha
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(a) Notch
A notch is an opening in the side of a measuring tank or reservoir extending above the free surface.

Weir

A weir is a notch on a large scale, used, for example to measure the flow of a river and may be sharp edged or have a substantial breadth in the direction of flow.

(b) Total energy line

The line which gives the sum of pressure head datum head & kinetic head, of a flowing fluid in a pipe with respect to some reference line.

$$\frac{P}{\rho g} + \frac{v^2}{2g} = \text{Liquid flowing in a pipe.}$$

Hydraulic gradient

due to the resistance of the soil the water table line forms a sloping line which may pass through the opposite side of the bank.

(c) Darcy formula loss of head friction. $h_f = \frac{4fLV^2}{2gd}$

In a fluid dynamic, the Darcy-Weisbach equation is an empirical equation that relates the head loss or pressure loss due to friction along a given length of pipe average velocity of the fluid flow for an incompressible fluid.

* Chezy formula for loss of head due to friction.

It is denoted by m : $h_f/L = 1$ i.e. loss of head per unit length of pipe. This is known as Chezy formula.

(2)

(a) Notch
A notch is an opening in the side of a measuring tank or reservoir extending above the free surface.

Weir

A weir is a notch on a large scale, used, for example to measure the flow of a river and may be sharp edged or have a substantial breadth in the direction of flow. (2)

(b) Total energy line

The line which gives the sum of pressure head datum head & kinetic head, of a flowing fluid in a pipe with respect to same reference line.

$$\frac{P}{\rho g} + \frac{v^2}{2g} = \text{Liquid flowing in a pipe}$$

Hydraulic gradient

due to the resistance of the soil in the saturated line from a sloping line which may pass through contryside of the bank. (2)

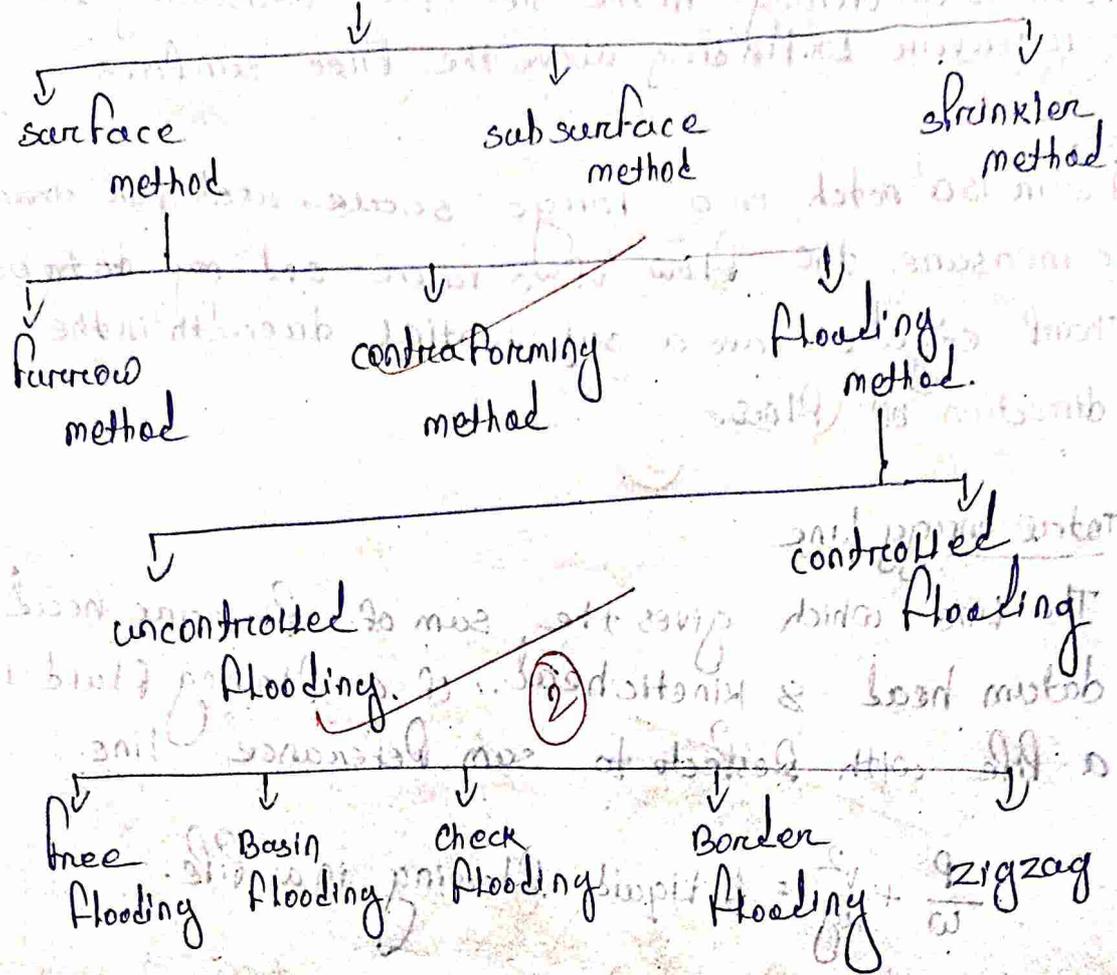
(c) Darcy formula loss of head friction $h_f = \frac{4fLV^2}{2gd}$

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* Chezy formula for loss of head due to friction
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(2)

② method of distribution water



③ factor affecting duty:

The factor affecting the duty are describe below

(1) soil character stick. The soil of the canal bed is imperious, and coarse graind soil leads to more seepage loss and consequently ~~leads to~~ more low duty.

(2) climatic condition

When the atmos pheric temperature of the command area becomes high the evaporation loss is more and duty become low and

(iii) Rainfall If the Rain fall is sufficient during the crop period, less quantity of irrigation water shall be required and therefore the duty will be low and vice versa.

(iv) Base Period
 When the base period is longer the water requirement will be more and duty will be low and vice versa.

(v) Type of crops. (2)

(vi) Tropography of Agriculture land.

(vii) method of Ploughing.

(viii) method of Irrigation.

(2)
 (a)
 (b)

Kharif crop = 5000 hectare
 Rabi crops = 4500 hectare

Delta in Kharif crops = 60 cm = 0.6 m

Delta in Rabi crops = 25 cm = 0.25 m

Base period of Kharif crops = 3 weeks = $7 \times 3 = 21$ Day

Base period of Rabi crops = 4 weeks = $7 \times 4 = 28$ Day

Ans: $8.64 \times B$

$$D_1 = \frac{8.64 \times B}{\Delta}$$

$$= \frac{8.64 \times 21}{0.6}$$

Ans: 302.4 hectare correct

Area of Kharif crops

$$A = 5000 \text{ hecton}$$

$$\text{Discharge} = \frac{\text{Area}}{\text{duty}} = \frac{5000}{302.4}$$

$$= 16.534 \text{ cumec}$$

$$D_2 = \frac{8.64 \times 28}{0.25}$$

$$= 967.68 \text{ hecton cumec}$$

Area of Rabi crops

$$= 4500 \text{ hecton}$$

$$\text{Discharge} = \frac{\text{Area of } 4500 \text{ Rabi crops}}{\text{duty } 967.68}$$

$$= 4.6502 \text{ cumec}$$

Q3

Base Relation betn base, delta, duty.

Q4

Base period

The base is defined as the period from the first to the last watering of the crop just before its maturity.

Delta: Each crop requires certain amount of water supplied to the crop stored on the water standing on that land

Duty

The duty of water is defined as number of hectares that can be irrigated by constant supply of water at the rate of one cumec throughout the base period.

Relationship betn Base Period Δ & duty.

D = duty of water in hectare/cumec

B = Base in days.

A = Δ in meter

From definition one cumec of water flowing continuously for ' B ' day gives a depth of water A over an area ' D ' hectares

So 1 cumec for B days give A over D hectares

\therefore 1 cumec for a 1 days A over $\frac{D}{B}$ hectares

\therefore 1 cumec for 1 day = $\frac{D}{B} \times A$ hectare-meter

So 1 cumec day = $\frac{D}{B} \times A$ hectare-meter

\therefore 1 cumec day = $1 \times 24 \times 60 \times 60 = 86400 \text{ m}^3$

= 8.64 hectare-meter

So $\frac{D}{B} \times A = 8.64$

(2)

$A = \frac{8.64 \times B}{D}$ in meter

[Signature]

2a) $H = ?$

$L = 5m$

$Q = 1.5 m^3/s$

$H_1 = 1.5m$

$C_d = 0.6$

$Q = \frac{2}{3} C_d \cdot L \cdot \sqrt{2g} \cdot H^{3/2}$

$1.5 = \frac{2}{3} \times 0.6 \times 5 \times \sqrt{2 \times 9.81} \times H^{3/2}$

$1.5 = 8.8588 \times H^{3/2}$

$H^{3/2} = \frac{1.5}{8.8588}$

$= 0.1693$

$H_2 = (0.1693)^{2/3}$

$= 0.306 m$

$H_2 = H_1 - H$

$H = 1.5 - 0.306$

$= 1.194 m$

$H = 1.194 m$

$H_2 = 0.306 m$

$H_2 = A \times \frac{Q}{A}$

$H_2 = \frac{Q \times V}{A}$

303

No. AB/ 5426



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SEMILIGUDA - 764 036

2nd Internal Examination 4th Semester/Class
Name Ashutosh Dash Branch CIVIL
Roll No. _____ Registration No. F20030001004
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Signature of the Invigilator

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MARKS OBTAINED

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Signature of the Examiner

Date _____

Given data

$$\text{Diameter of a pipe} = 250 \text{ mm} = 0.25 \text{ m}$$

$$\text{Length of pipe, } L = 60 \text{ m}$$

$$\text{Velocity of flow} = V = 3 \text{ m/s}$$

$$C = 55$$

$$\nu = 0.01 \text{ stoke}$$

$$= 0.01 \text{ cm}^2/\text{s}$$

$$\Rightarrow 0.01 \times 10^{-4} \text{ m}^2/\text{s}$$

a) Darcy formula:

$$h_f = \frac{4 \cdot f \cdot L \cdot V^2}{d \cdot 2g}$$

f coefficient friction is a function of Reynolds number, Re .

$$Re = \frac{V \cdot d}{\nu} = \frac{3 \times 0.25}{0.01 \times 10^{-4}} = 75000$$

$$\text{Value of } f = \frac{0.079}{Re^{1/4}} = \frac{0.079}{(75000)^{1/4}} = 2.6844 \times 10^{-3}$$

$$\therefore \text{Head lost } h_f = \frac{4 \times 2.6844 \times 10^{-3} \times 60 \times 3^2}{0.25 \times 2 \times 9.81}$$

$$= 1.182 \text{ m}$$

(ii) Chezy's formula

$$V = C \sqrt{mi}$$

cohere $c = 60 \text{ m}$

$$m = \frac{d}{4} = \frac{0.25}{4}$$

$$= 0.0625 \text{ m}$$

$$\therefore 3 = \frac{55}{60} \sqrt{0.0625} \times i$$

$$i = \frac{3}{55} \times \frac{1}{0.0625}$$

$$= 0.047$$

$$i = \left(\frac{3}{55}\right)^2 \times \frac{1}{0.0625}$$

$$= 0.047$$

But $i = \frac{h_f}{L} = \frac{h_f}{60}$

equating the two value of i

$$\therefore \frac{h_f}{60} = 0.047$$

$$h_f = 0.047 \times 60$$

So head loss is 2.82 m

2.82 m

m. 0.017