Surface Hydrology

(GR18A4005)

IV-B.Tech – I Semester

(2021-22)

by

Ms. Manisha G

Assistant Professor

Department of Civil Engineering

Gokaraju Rangaraju Institute of Engineering and Technology

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

Gokaraju Rangaraju Institute of Engineering and Technology

<div align="center">

(Autonomous)
Surface Hydrology
Course File Check List

</div>

S. No.	Name of the Format	Page No.
1	Syllabus	
2	Time Table	
3	Program Educational Objectives	
4	Program Objectives	
5	Course Objectives	
6	Course Outcomes	
7	Students Roll List	
8	Guide lines to study the course books & references, course design & delivery	
9	Course Schedule	
10	Unit Plan/Course Plan	
11	Evaluation Strategy	
12	Assessment in relation to COB's and CO's	
13	Tutorial Sheets	
14	Assignment Sheets	
15	Rubric for course	
16	Mappings of CO's and PO's	
17	Model question papers	
18	Mid-I and Mid-II question papers	
19	Mid-I marks	
20	Mid-II marks	
21	Sample answer scripts and Assignments	
22	Course materials like Notes, PPT's, Videos, etc,	

Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous)
Bachupally, Kukatpally, Hyderabad – 500 090, India

Course Code: GR18A4005   **L T P C   3 0 0 3**

IV Year I Semester

Course Objectives: The objectives of this course is to make the student to

1. Introduction to surface water hydrology

2. Skill of solving problems on infiltration and evaporation

3. Visualization and calculate stream flow and run off

4. Recognize calculate the type of hydrographs

5. Knowledge to forecast the flood estimation

Course Outcomes: After completion of this course, students will be able to

1. Express the different types of hydrology definitions

2. Evaluate the consumptive use , infiltration and evaporation

3. Compute the discharge in the streams

4. Apply the hydrographs for the computing rain fall and run off

5. Apply the knowledge of computing flood estimation by various methods

UNIT I

Introduction: Hydrology- definition, Surface and ground water hydrology, Hydrologic cyclePrecipitation, Evaporation, Infiltration, Rain-gauges, Mass rainfall curve, characteristics, Mean rainfall on a basin-Arithmetic, Theissen and Isohytol Methods, Intensity-duration analysis, Intensity-frequency-duration analysis, depth-area- duration curves, estimation of missing rainfall data, consistency of rainfall records- double mass curves, rain-gauge network analysis.

UNIT II.

Evaporation & Infiltration: Evaporation process, Factors affecting, estimation, measurement of Evaporation, Evaporation pans, Transpiration, Evapotranspiration, PET, Consumptive use Lysimeter, formulae for estimating PET. Infiltration process, factors affecting, measurement of infiltration, infiltrometers, infiltration capacity curve, Horton's Relation, Infiltration Indices.

UNIT III

Stream flow and Runoff: Measurement of stage, measurement of velocities-surface floats, velocity rods and current meter, measurement of discharge in a river, stage- discharge relation, extension of stage- discharge curves, selection of sito for stream- discharge gauging. Components of Runoff, factors affecting and estimation of runoff, basin yield, flow duration curves, mass curve of a runoff analysis, estimation of reservoir capacity for a given demand, estimation of safe yield from a reservoir of a given capacity.

UNIT IV

Hydrographs: Hydrograph-components, separation of hydrograph into base flow, and DRO methods, Unit Hydrograph-principles, derivation of UH of Isolated unit storms, UH for various durations, S-curve technique. Estimation of runoff from UH, limitations of UH theory, Synthetic UH, IUH.

UNIT V

Design Flood: Maximum flood and design flood, estimation of flood- different methods, flood frequency analysis- probability table, different plotting positions, Gumble's extreme value theory, Log Pearson type-III analysis, selection of design flood. Flood routing: Flood Routing through reservoirs- Puls method and modification puls method. Channel routing-Muskinghum method, derivation of routing equations, Goodrich method. Flood Control: Flood control measures, flood control through reservoirs, channel improvements, Bank protection measures, Flood fighting, flood proofing, flood forecasting and flood warning.

TEXT BOOKS:

1. Hydrology by Subramanya K

2. Hydrology by P. Jayaram Reddy

REFERENCE BOOKS:

1. Hydrology by, Rangaraju..

2. Engineering Hydrology by EM Wilson . The Mac million press limited

3. Hydrology H M Raghunath

4. Introduction to Hydrology by W.Viessman Jr. & G L Lewis

Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous)
Bachupally, Kukatpally, Hyderabad – 500 090, India
TIME TABLE

IV BTech (GR18) – Isemester
Sec-A

DAY/ HOUR	1	2	3	4	5	6
Monday						SH (A)(3:20-4:10)
Tuesday						
Wednesday		SH(A)(11:15-01:05)				
Thursday	SH(A)(10:20-11:15)					
Friday						
Saturday						

Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous)

Programme Educational Objectives (PEO's)

1. Graduates of the programme will be successful career in technical and professional career.

2. Graduates of the programme will have proficiency in solving real time Civil Engineering projects.

3. Graduates of the programme will continue to engage in lifelong learning with ethical and social responsibility.

Program Outcomes (PO's)

Graduates of the Civil Engineering programme will be able to
   a. apply knowledge of mathematics, science and fundamentals of Civil Engineering.
   b. analyse problem and interpret the data.
   c. design a system component, or process to meet desired needs in Civil Engineering within realistic constraints.
   d. identify, formulate, analyse and interpret data to solve Civil Engineering problems.
   e. use modern engineering tools such as CAD and GIS for the Civil Engineering practice.
   f. understand the impact of engineering solutions in a global, economic and societal context.
   g. understand the effect of Civil Engineering solutions on environment and to demonstrate the need for sustainable development.
   h. understanding of professional and ethical responsibility.
   i. work effectively as an individual or in a team and to function on multi-disciplinary context.
   j. communicate effectively with engineering community and society.
   k. demonstrate the management principles in Civil Engineering projects.
   l. recognize the need for and an ability to engage in life-long learning.

Program Specific Outcomes (PSO's)

PSO1: Recognize the need for a sustainable environment and design smart infrastructure considering the global challenges.

PSO2: Create and develop innovative designs with new era materials through research and development.

Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous)
Bachupally, Kukatpally, Hyderabad – 500 090, India
COURSE OBJECTIVES

Academic Year : **2021-22**   **Semester** : **I**

Name of the Program: B.Tech   **Year: IV Year**

Course/Subject : Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty : Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

S. No	Course Objectives
1	Introduction to surface water hydrology
2	Skill of solving problems on infiltration and evaporation
3	Visualization and calculate stream flow and run off
4	Recognize calculate the type of hydrographs
5.	Knowledge to forecast the flood estimation

Signature of HOD   Signature of faculty

Date: Date:

Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous)
Bachupally, Kukatpally, Hyderabad – 500 090, India
COURSE OUTCOMES

Academic Year : **2021-22**   **Semester** : **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject : Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

On completion of this Subject/Course the student shall be able to:

S. No	Course Outcomes
1	Express the different types of hydrology definitions
2	Evaluate the consumptive use , infiltration and evaporation
3	Compute the discharge in the streams
4	Apply the hydrographs for the computing rain fall and run off
5	Apply the knowledge of computing flood estimation by various methods

Signature of HOD   Signature of faculty

Date: Date:

Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous)
Bachupally, Kukatpally, Hyderabad – 500 090, India
2021-22 BATCH STUDENT ROLL LIST

SL NO	REG NO	NAME OF THE STUDENT
1	17241A0153	Sujith Kumar Shinde
2	17241A0157	Vuppula Mithunkumar Reddy
3	18241A0101	Ajmeera Ganesh
4	18241A0102	Anabotula Sravani
5	18241A0103	Anumatla Manoj
6	18241A0104	Byna Rishitha
7	18241A0105	Bura Tharasri
8	18241A0106	Pudari Badrinath Goud
9	18241A0107	Balasani Rohith
10	18241A0108	Bandari Veeraswamy
11	18241A0109	Bandi Varun Kumar
12	18241A0110	Bashipaka Pradeep
13	18241A0111	Bathula Nikhil
14	18241A0112	Batikiri Veerendra Swamy
15	18241A0113	Bhukya Soujanya
16	18241A0114	Bhukya Varun Naik
17	18241A0115	Boddu Pavan
18	18241A0116	Byagari Rangaraju
19	18241A0117	Chada Ruchita
20	18241A0118	Chinthakuntla Thriveen
21	18241A0119	Cv Jaswanth Surya
22	18241A0120	Dosapati Nishu
23	18241A0121	G Prashanth

24	18241A0122	Gaddipati Lohitha	
25	18241A0123	Gangam Rohit Reddy	
26	18241A0124	Gottemukkala Govardhan	
27	18241A0125	Hrishikesh Bansal	
28	18241A0126	Janapati Raju	
29	18241A0127	Jyothika Mannava	
30	18241A0128	K Harshitha Reddy	
31	18241A0129	Kolan Reshikesh Reddy	
32	18241A0130	Karri Bharath Chandra Reddy	
33	18241A0131	Kuppala Nihar	
34	18241A0132	Kurva Lavanya	
35	18241A0133	Maddimsetty Sri Charan	
36	18241A0134	MagaPor Manaswini	
37	18241A0135	Maloth Bhavsingh	
38	18241A0136	Malothu Naveena	
39	18241A0137	Manda Ithihas	
40	18241A0138	Mohammad Ashfaq Ahmed	
41	18241A0139	Mohammed Omer Shareef	
42	18241A0140	Mukundu Naveen	
43	18241A0141	Nalumasu Sahithi	
44	18241A0142	Nampelly Ravi Kumar	
45	18241A0143	Narra Shashidhar Reddy	
46	18241A0144	Patlola Vinay Reddy	
47	18241A0145	Pattambetty Pavankumar	
48	18241A0146	Pola Tharun	
49	18241A0147	Posani S V A Kalyan	
50	18241A0148	Pulle Manichadra	
51	18241A0149	Rajulapati Rohit Naga Sai	
52	18241A0150	Sura Subbaram Reddy	

53	18241A0153	Sunkari Vikas	
54	18241A0154	Thirupathi Rao Salla	
55	18241A0155	Trivikram Reddy	
56	18241A0156	Thrupti Shreya	
57	18241A0157	Vakamalla Bhavya Sree	
58	18241A0158	Vemula Manisha	
59	18241A0159	Vuppula Keerthana	
60	18241A0160	Yalla Anitha	
61	19245A0101	KANCHERLA BHARATH	
62	19245A0102	ELUPULA KUMARASWAMY	
63	19245A0103	BRAHMADEVARA BHAVITHA	
64	19245A0104	DASARI NAMRATHA	
65	19245A0105	T CHANDANA	
66	19245A0106	KOLA HARITHA	

Signature of HOD   Signature of faculty

Date: Date:

Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous)
Bachupally, Kukatpally, Hyderabad – 500 090, India

GUIDELINES TO STUDY THE COURSE SUBJECT

Academic Year : **2021-2022**   **Semester** **: I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   : Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Guide line to study the course/subject: Surface Hydrology

This course helps the students to learn and understand about water sources on earth surface, hydrological cycle, computation of runoff, infiltration, flood routing and channel routing, measures and precautions during floods.   .

prerequisites:

Nil

Where will this subject help?

- Hydrology is an extremely important field of study, dealing with one of the most valuable resources on Earth: water. All aspects of the Earth's available water are studied by experts from many disciplines, from geologists to engineers, to obtain the information needed to manage this vital resource.
- Working out the best use of water supplies for cities or for irrigation, controlling river flooding or soil erosion, protecting or cleaning up pollution, planning long-term water storage reservoirs, flood risk assessment and flood/drought warning.

BOOKS AND MATERIALS

Books and Codes	
1.	Hydrology by Subramanya K
2.	Hydrology by P. Jayaram Reddy
3.	Engineering Hydrology by EM Wilson . The Mac million press limited

Additional resources	
4.	**https://nptel.ac.in/courses/105/105/105105214/**
5	**https://nptel.ac.in/courses/105/103/105103213/**
6.	**https://nptel.ac.in/courses/105/104/105104029/**

Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous)
Bachupally, Kukatpally, Hyderabad – 500 090, India

Department of Civil Engineering

COURSE DESIGN AND DELIVERY SYSTEM (CDD)

- The Course syllabus is written into number of learning objectives and outcomes.

- These learning objectives and outcomes will be achieved through lectures, assessments, assignments, experiments in the laboratory, projects, seminars, presentations, etc.

- Every student will be given an assessment plan, criteria for assessment, scheme of evaluation and grading method.

- The Learning Process will be carried out through assessments of Knowledge, Skills and Attitude by various methods and the students will be given guidance to refer to the text books, reference books, journals, etc.

The faculty be able to –

- Understand the principles of Learning

- Understand the psychology of students

- Develop instructional objectives for a given topic

- Prepare course, unit and lesson plans

- Understand different methods of teaching and learning

- Use appropriate teaching and learning aids

- Plan and deliver lectures effectively

- Provide feedback to students using various methods of Assessments and tools of Evaluation

- Act as a guide, advisor, counselor, facilitator, motivator and not just as a teacher alone

Signature of HOD   Signature of faculty

Date:

Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous)
Bachupally, Kukatpally, Hyderabad – 500 090, India

COURSE SCHEDULE

Academic Year **:** **2021-22**   **Semester** **: I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject : Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty : Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

The Schedule for the whole Course / Subject is:

1	Commencement of First Semester class work		16-08-2021
2	I Spell of Instructions	16-08-2021 to 16-10-2021	9 Weeks
3	I Mid-term Examinations	18-10-2021 to 20-10-2021	3 Days
4	II Spell of Instructions	21-10-2021 to 08-12-2021	7 Weeks
5	II Mid-term Examinations	09-12-2021 to 11-12-2021	3 Days
6	Preparation	13-12-2021 to 18-12-2021	1 Week
7	**End Semester Examinations** (Theory/ Practical) Regular/ Supplementary	20-12-2021 to 08-01-2021	3 Weeks
8	Commencement of Second Semester, AY 2020-21		10-01-2021

1. Total No. of Instructional periods available for the course: **64** Hours / Periods

Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous)
Bachupally, Kukatpally, Hyderabad – 500 090, India

Department of Civil Engineering

SCHEDULE OF INSTRUCTIONS
COURSE PLAN

Academic Year: 2021– 22   **Branch:** B. Tech Civil Engineering

Subject: Surface Hydrology   **Class:** IV Year A Section   **Sem:** I

Faculty Name: Manisha G(1647)

S.No.	Date	Topic
1	16-8-2021	Introduction: Hydrology- definition, Surface and ground water hydrology
2	17-8-2021	Hydrologic cycle: Precipitation
3	18-8-2021	Evaporation, Infiltration
4	23-8-2021	Rain-gauges – Installation and types
5	24-8-2021	Mass rainfall curve
6	30-8-2021	Mean rainfall on a basin-Arithmetic, Theissen and Isohytol Methods
7	31-8-2021	Problems on Arithmetic, Theissen and Isohytol Methods
8	1-9-2021	Intensity-duration analysis, Intensity-frequency-duration analysis
9	01-09-2021	depth-area- duration curves, estimation of missing rainfall data
10	02-09-2021	Problems on estimation of missing rainfall data
11	06-09-2021	consistency of rainfall records- double mass curves, rain-gauge network
12	08-09-2021	Evaporation & Infiltration: Evaporation process, Factors affecting
13	08-09-2021	Estimation, measurement of Evaporation
14	09-09-2021	Evaporation pans, Transpiration, Evapotranspiration
15	13-09-2021	PET, Consumptive use Lysimeter

16	15-09-2021	Formulae for estimating PET
17	15-09-2021	Infiltration process, factors affecting
18	16-09-2021	measurement of infiltration
19	20-09-2021	Infiltrometers, infiltration capacity curve, Horton's Relation
20	22-09-2021	Infiltration capacity curve, Horton's Relation, Infiltration Indices
21	22-09-2021	Stream flow and Runoff: Measurement of stage
22	23-09-2021	Measurement of velocities-surface floats
23	27-09-2021	Velocity rods and current meter, measurement of discharge in a river.
24	29-09-2021	Stage- discharge relation, measurement of discharge in a river.
25	29-09-2021	extension of stage- discharge curves
26	30-09-2021	Selection of site for stream- discharge gauging.
27	4-10-2021	Components of Runoff, factors affecting
28	07-10-2021	Basin yield and estimation of runoff.
29	11-10-2021	flow duration curves
30	13-10-2021	mass curve of a runoff analysis.
31	13-10-2021	Estimation of reservoir capacity for a given demand.
32	14-10-2021	Estimation of safe yield from a reservoir of a given capacity
33	18-10-2021	Hydrographs: Hydrograph-components.
34	20-10-2021	Separation of hydrograph into base flow,
35	20-10-2021	Direct Runoff methods.
36	21-10-2021	Unit Hydrograph-principles
37	25-10-2021	derivation of UH of Isolated unit storms.
38	27-10-2021	UH for various durations, S-curve technique.
39	27-10-2021	Estimation of runoff from UH,
40	28-10-2021	Instantaneous Unit Hydrograph
41	1-11-2021	limitations of UH theory.
42	3-11-2021	Synthetic UH.
43	3-11-2021	Design Flood: Maximum flood and design flood

44	8-11-2021	estimation of flood- different methods.
45	10-11-2021	estimation of flood- different methods.
46	10-11-2021	Flood frequency analysis- probability table
47	11-11-2021	different plotting positions for flood routing
48	15-11-2021	Gumble's extreme value theory,
49	17-11-2021	Log Pearson type-III analysis, selection of design flood.
50	17-11-2021	Flood routing: Flood Routing through reservoirs
51	18-11-2021	Puls method and modification puls method.
52	22-11-2021	Channel routing-Muskinghum method; Goodrich method.
53	24-11-2021	derivation of routing equations
54	24-11-2021	Introduction to flood control
55	25-11-2021	Flood Control: Flood control measures
56	29-11-2021	flood control through reservoirs
57	1-12-2021	channel improvements,
58	1-12-2021	Bank protection measures
59	2-12-2021	Flood fighting, flood proofing,
60	6-12-2021	flood forecasting and flood warning
61	8-12-2021	Revision
62	8-12-2021	Revision

Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous)
Bachupally, Kukatpally, Hyderabad – 500 090, India

UNIT PLAN

Academic Year   :   **2021-22**   **Semester**   **: I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   : Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty   :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

S.no	Unit No	Name of the unit	Date
1	UNIT-I	Introduction: Hydrology	16-8-2021to 6-9-2021
2	UNIT-II	Evaporation & Infiltration	8-09-21 to 22-09-21
3	UNIT-III	Stream flow and Runoff:	22-09-2021to 14-10-2021
4	UNIT-IV	Hydrographs:	18-10-2021to 03-11-2021
5	UNIT-V	Design Flood:	08-11-21 to 6-12-21

Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous)
Bachupally, Kukatpally, Hyderabad – 500 090, India

LESSON PLAN

Academic Year   :   2021-22   **Date:** 16-8-2021
Semester   :   I
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty   :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   1   Duration of Lesson: 60 min

Lesson Title   : Introduction: Hydrology
INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1.   Learn about Hydrology basics

TEACHING AIDS   :   Newton software, Google classroom
TEACHING POINTS   :

Definitions, Surface and ground water hydrology

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

LESSON PLAN

Academic Year	**:**	**2021-22**	**Date:**	17-8-2021
Semester	**:**	**I**		
Name of the Program:		B.Tech	**Year:**	**IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   2   Duration of Lesson: <u>60min</u>

Lesson Title   :   Hydrologic cycle: Precipitation

<u>INSTRUCTIONAL/LESSON OBJECTIVES:</u>

On completion of this lesson the student shall be able to:

1.   about the Hydrologic cycle: Precipitation

   TEACHING AIDS   :   Newton software, Google classroom
   TEACHING POINTS   :

   Hydrologic cycle, components –Precipitation

Assignment / Questions:

                                                    Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Academic Year   :   2021-22   **Date:** 17-8-2021

Semester   :   I

Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty   :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   3   Duration of Lesson: 60min

Lesson Title   :   Evaporation, Infiltration

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. about the processes involved in Evaporation, Infiltration

   TEACHING AIDS   :   Newton software, Google classroom
   TEACHING POINTS   :

Evaporation, Infiltration

Assignment / Questions:

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology Department of Civil Engineering

LESSON PLAN

Academic Year : **2021-22**   **Date:** 23-8-2021
Semester : **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   : 4   Duration of Lesson: 60 min

Lesson Title   : Rain-gauges – Installation and types
INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

Understand the types of Rain-gauges and their applicability – Installation and types
TEACHING AIDS   :   Newton software, Google classroom
TEACHING POINTS   :

Rain-gauges – Installation and types

Assignment / Questions:

Signature of faculty
Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year **:** **2021-22**   **Date:** 24-8-2021
Semester **:** **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   5   Duration of Lesson: 60 min

Lesson Title   :   Mass rainfall curve
INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Plotting Mass rainfall curve.

TEACHING AIDS   :   Newton software, Google classroom
TEACHING POINTS   :

Mass rainfall curve

Assignment / Questions:

                                Signature of faculty
Note: Mention for each question the relevant Objectives and Outcomes Nos.

Academic Year   :   **2021-22**   **Date:** 30-8-2021
Semester   :   **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   6   Duration of Lesson: <u>60min</u>

Lesson Title   : Mean rainfall on a basin-Arithmetic, Theissen and Isohytel Methods
<u>INSTRUCTIONAL/LESSON OBJECTIVES:</u>

On completion of this lesson the student shall be able to:

1. Know principles and applicability of Mean rainfall on a basin-Arithmetic, Theissen and Isohytol Methods

TEACHING AIDS   :   Newton software, Google classroom
TEACHING POINTS   :

Mean rainfall on a basin-Arithmetic, Theissen and Isohytel Methods

Assignment / Questions:

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year **:** **2021-22** **Date:** 31-8-2021

Semester **:** **I**

Name of the Program: B.Tech **Year: IV Year**

Course/Subject Surface Hydrology **Course Code** : GR18A4005

Name of the Faculty : Ms. Manisha G

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No : 7 Duration of Lesson: 60 min

Lesson Title : Problems on Arithmetic, Theissen and Isohytel Methods INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Problems on Arithmetic, Theissen and Isohytel Methods

TEACHING AIDS : Newton software, Google classroom

TEACHING POINTS :

Problems on Arithmetic, Theissen and Isohytel Methods

Assignment / Questions:

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year **:** **2021-22**   **Date:** 1-9-2021
Semester **:** **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   : 8   Duration of Lesson: 60min

Lesson Title   :   Intensity-duration analysis, Intensity-frequency-duration analysis

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

Understand the concept of Intensity-duration analysis, Intensity-frequency-duration analysis.

TEACHING AIDS   :   Projector, White board, demonstration
TEACHING POINTS   :

Intensity-duration analysis, Intensity-frequency-duration analysis

Assignment / Questions:

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos..

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year   **:**   **2021-22**   **Date:** 1-9-2021
Semester   **:**   **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   9   Duration of Lesson: <u>60 min</u>

Lesson Title   :   Intensity-duration analysis, Intensity-frequency-duration analysis
<u>INSTRUCTIONAL/LESSON OBJECTIVES:</u>
On completion of this lesson the student shall be able to:
- analyse depth-area- duration curves, estimation of missing rainfall data

TEACHING AIDS   :   Projector, White board, demonstration
TEACHING POINTS   :

analyse depth-area- duration curves, estimation of missing rainfall data

Assignment / Questions:

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos..

LESSON PLAN

Academic Year   :   2021-22   **Date:** 2-9-2021
Semester   :   I
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   10   Duration of Lesson: 60 min

Lesson Title   :   Problems on estimation of missing rainfall data
INSTRUCTIONAL/LESSON OBJECTIVES:
On completion of this lesson the student shall be able to:
Problems on estimation of missing rainfall data
TEACHING AIDS   :   Projector, White board, demonstration
TEACHING POINTS   :

Problems on estimation of missing rainfall data

Assignment / Questions:

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year   :   **2021-22**   **Date:** 06-09-2021
Semester   :   **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   11   Duration of Lesson: <u>60 min</u>

Lesson Title   :   consistency of rainfall records- double mass curves, rain-gauge network
<u>INSTRUCTIONAL/LESSON OBJECTIVES:</u>

On completion of this lesson the student shall be able to:
- Understand the concept and applications of consistency of rainfall records- double mass curves, rain-gauge network

TEACHING AIDS   :   Projector, White board, demonstration
TEACHING POINTS   :

consistency of rainfall records- double mass curves, rain-gauge network

Assignment / Questions:

                                   Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos..

Academic Year   **:**   **2021-22**   **Date:** 08-09-2021

Semester   **:**   **I**

Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   12   Duration of Lesson: <u>60 min</u>

Lesson Title   :   Evaporation & Infiltration: Evaporation process, Factors affecting

<u>INSTRUCTIONAL/LESSON OBJECTIVES:</u>

On completion of this lesson the student shall be able to:

- Understand the concept and uses of estimating Evaporation & Infiltration: Evaporation process, Factors affecting.

TEACHING AIDS   :   Projector, White board, demonstration

TEACHING POINTS   :

Applications, Uses and importance of estimating Evaporation & Infiltration: Evaporation process, Factors affecting.

Assignment / Questions:

                                            Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos..

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year   :   **2021-22**   **Date:** 08-09-2021

Semester   :   **I**

Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   13   Duration of Lesson: <u>60 min</u>

Lesson Title   :   Estimation, measurement of Evaporation

<u>INSTRUCTIONAL/LESSON OBJECTIVES:</u>

On completion of this lesson the student shall be able to:

- Estimation, measurement of Evaporation.

TEACHING AIDS   :   Projector, White board, demonstration

TEACHING POINTS   :

Estimation, measurement of Evaporation

Assignment / Questions:

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos..

Gokaraju Rangaraju Institute of Engineering and Technology Department of Civil Engineering

LESSON PLAN

Academic Year : **2021-22**   **Date:** 09-09-2021

Semester : **I**

Name of the Program: B.Tech   **Year: IV Year**

Course/Subject Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty : Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No : 13   Duration of Lesson: <u>60 min</u>

Lesson Title : Evaporation pans, Transpiration, Evapotranspiration

<u>INSTRUCTIONAL/LESSON OBJECTIVES:</u>

On completion of this lesson the student shall be able to:

- Classify various types of Evaporation pans, Transpiration, Evapotranspiration

TEACHING AIDS : Projector, White board, demonstration

TEACHING POINTS :

Evaporation pans, Transpiration, Evapotranspiration

Assignment / Questions:

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos..

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : **2021-22**   **Date:** 13-09-2021

Semester : **I**

Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   14   Duration of Lesson: 60 min

Lesson Title   :   PET, Consumptive use Lysimeter INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

Analyze about PET, Consumptive use Lysimeter

TEACHING AIDS   :   Projector, White board, demonstration

TEACHING POINTS   :

PET, Consumptive use Lysimeter

Assignment / Questions:

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : **2021-22**   **Date:** 15-09-2021
Semester : **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty : Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   : 15   Duration of Lesson: 60 min

Lesson Title   :   Formulae for estimating PET

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

 Solve various problem based on PET estimation.

TEACHING AIDS   :   Projector, White board, demonstration
TEACHING POINTS   :

Formulae for estimating PET

Assignment / Questions:

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : **2021-22**   **Date:** 15-09-2021

Semester : **I**

Name of the Program: B.Tech   **Year: IV Year**

Course/Subject Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty : Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No : 16   Duration of Lesson: <u>60 min</u>

Lesson Title : Infiltration process, factors affecting

<u>INSTRUCTIONAL/LESSON OBJECTIVES:</u>

On completion of this lesson the student shall be able to:

    Understand Infiltration process, factors affecting

TEACHING AIDS : Projector, White board, demonstration

TEACHING POINTS :

Infiltration process, factors affecting

Assignment / Questions:

Signature of faculty

Academic Year : **2021-22**   **Date:** 16-09-2021
Semester : **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   17   Duration of Lesson: 50 min

Lesson Title   :   measurement of infiltration.

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

- Identify various methods of measurement of infiltration

TEACHING AIDS   :   Projector, White board, demonstration
TEACHING POINTS   :

measurement of infiltration

Assignment / Questions:

Signature of faculty

Academic Year : **2021-22**   **Date:** 20-09-2021

Semester : **I**

Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty : Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   : 18   Duration of Lesson: <u>60 min</u>

Lesson Title   :   Infiltrometers, infiltration capacity curve, Horton's Relation materials

<u>INSTRUCTIONAL/LESSON OBJECTIVES:</u>

On completion of this lesson the student shall be able to:

- Recognize various Infiltrometers, infiltration capacity curve, Horton's Relation

TEACHING AIDS   :   Projector, White board, demonstration

TEACHING POINTS   :

Infiltrometers, infiltration capacity curve, Horton's Relation

Assignment / Questions:

Signature of faculty

LESSON PLAN

Academic Year   :   2021-22   **Date:** 22-09-2021

Semester   :   I

Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   19   Duration of Lesson: 60 min

Lesson Title   :   Infiltration capacity curve, Horton's Relation, Infiltration Indices

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

- Plot Infiltration capacity curve, Horton's Relation, Infiltration Indices.

TEACHING AIDS   :   Projector, White board, demonstration

TEACHING POINTS   :

Infiltration capacity curve, Horton's Relation, Infiltration Indices

---

Assignment / Questions:

Signature of faculty

Academic Year **:** **2021-22** **Date:** 22-09-2021

Semester **:** **I**

Name of the Program: B.Tech **Year: IV Year**

Course/Subject Surface Hydrology **Course Code** : GR18A4005

Name of the Faculty : Ms. Manisha G

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No : 20 Duration of Lesson: 60 min

Lesson Title : Stream flow and Runoff: Measurement of stage

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

Understand the concept of Stream flow and Runoff: Measurement of stage

TEACHING AIDS : Projector, White board, demonstration

TEACHING POINTS :

Stream flow and Runoff: Measurement of stage

Assignment / Questions:

Signature of faculty

Academic Year **:** **2021-22**   **Date:** 23-09-2021
Semester **:** **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   21   Duration of Lesson: <u>60 min</u>

Lesson Title   :   Measurement of velocities-surface floats
<u>INSTRUCTIONAL/LESSON OBJECTIVES:</u>
On completion of this lesson the student shall be able to:

Solve problems related to the measurement of velocities-surface floats
TEACHING AIDS   :   Projector, White board, demonstration
TEACHING POINTS   :

Measurement of velocities-surface floats

Assignment / Questions:

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : **2021-22**   **Date:** 27-09-2021

Semester : **I**

Name of the Program: B.Tech   **Year: IV Year**

Course/Subject Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty : Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No : 22   Duration of Lesson: 60 min

Lesson Title : measurement of discharge

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

- Identify and compare various methods to estimate discharge in a river. Velocity rods and current meter, measurement of discharge in a river.

TEACHING AIDS : Projector, White board, demonstration

TEACHING POINTS :

Velocity rods and current meter, measurement of discharge in a river.

Assignment / Questions:

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : **2021-22** **Date:** 29-09-2021
Semester : **I**
Name of the Program: B.Tech **Year: IV Year**

Course/Subject Surface Hydrology **Course Code** : GR18A4005

Name of the Faculty : Ms. Manisha G

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No : 23 Duration of Lesson: 60 min

Lesson Title : Stage- discharge relation, measurement of discharge in a river..
INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

- Derive stage discharge relations.

TEACHING AIDS : Projector, White board, demonstration
TEACHING POINTS :

Stage- discharge relation, measurement of discharge in a river.

Assignment / Questions:

Signature of faculty

Academic Year **:** **2021-22**   **Date:** 29-09-2021

Semester **:** **I**

Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   24   Duration of Lesson: <u>60 min</u>

Lesson Title   :   extension of stage- discharge curves.

<u>INSTRUCTIONAL/LESSON OBJECTIVES:</u>

On completion of this lesson the student shall be able to:

- Draw stage- discharge curves.

TEACHING AIDS   :   Projector, White board, demonstration

TEACHING POINTS   :

extension of stage- discharge curves

Assignment / Questions:

Signature of faculty

Academic Year **:** **2021-22**   **Date:** 30-09-2021
Semester **:** **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   25   Duration of Lesson: 60 min

Lesson Title   :   Selection of site for stream- discharge gauging INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:
       Determine various factors influencing selection of site for stream- discharge gauging

.TEACHING AIDS   :   Projector, White board, demonstration
TEACHING POINTS   :

Selection of site for stream- discharge gauging

Assignment / Questions:

Signature of faculty

Academic Year : **2021-22**   **Date:** 04-10-2021
Semester : **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   : 26   Duration of Lesson: 50 min

Lesson Title   : Components of Runoff, factors affecting
INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

- Recognize the componenet of a runoff curve.
- Understand the various factors affecting runoff in a given area.

TEACHING AIDS   :   Projector, White board, demonstration
TEACHING POINTS   :

Components of Runoff, factors affecting

Assignment / Questions:

Signature of faculty

Academic Year : **2021-22**   **Date:** 07-10-2021
Semester : **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty : Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No : 27   Duration of Lesson: 60 min

Lesson Title : Basin yield and estimation of runoff

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

- Recognize Basin yield and know the methods of estimation of runoff
-
TEACHING AIDS : Projector, White board, demonstration
TEACHING POINTS :

Basin yield and estimation of runoff

Assignment / Questions:

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : **2021-22** **Date:** 11-10-2021
Semester : **I**
Name of the Program: B.Tech **Year: IV Year**

Course/Subject Surface Hydrology **Course Code** : GR18A4005

Name of the Faculty : Ms. Manisha G

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No : 28 Duration of Lesson: 60 min

Lesson Title : flow duration curves

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

- Identify and compare flow duration curves.

TEACHING AIDS : Projector, White board, demonstration
TEACHING POINTS :

flow duration curves

Assignment / Questions:

Signature of faculty

Academic Year : **2021-22**   **Date:** 13-10-2021
Semester : **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty : Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   : 29   Duration of Lesson: 50 min

Lesson Title   : mass curve of a runoff analysis

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

- Plot and understand components of a mass curve of a runoff analysis

TEACHING AIDS   : Projector, White board, demonstration
TEACHING POINTS   :

mass curve of a runoff analysis

Assignment / Questions:

Signature of faculty

LESSON PLAN

Academic Year	**:**	**2021-22**	**Date:** 13-10-2021	
Semester	**:**	**I**		
Name of the Program:		B.Tech	**Year: IV Year**	

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   30   Duration of Lesson: <u>50 min</u>

Lesson Title   :   Estimation of reservoir capacity for a given demand

<u>INSTRUCTIONAL/LESSON OBJECTIVES:</u>

On completion of this lesson the student shall be able to:

   Estimation of reservoir capacity for a given demand

TEACHING AIDS   :   Projector, Demonstration

TEACHING POINTS   :

Estimation of reservoir capacity for a given demand

Assignment / Questions:

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year **:** **2021-22**   **Date:** 14-10-2021
Semester **:** **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty : Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   31   Duration of Lesson: 60 min

Lesson Title   :   safe yield from a reservoir of a given capacity

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

- Recognize safe yield from a reservoir of a given capacity
- Estimation of safe yield from a reservoir of a given capacity
-

TEACHING AIDS   :   Projector, Demonstration
TEACHING POINTS   :

safe yield from a reservoir of a given capacity

Assignment / Questions:

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology Department

of Civil Engineering

LESSON PLAN

Lesson Title : Hydrographs: Hydrograph-components.

 INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

- Read data from hydrographs.
- Plot hydrographs for given flood data.

TEACHING AIDS   :   Projector, White board, demonstration

TEACHING POINTS   :

Hydrographs: Hydrograph-components

Assignment / Questions:

Signature of faculty

Academic Year	**:**	**2021-22**	**Date:** 20-10-2021
Semester	**:**	**I**	
Name of the Program:		B.Tech	**Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   33   Duration of Lesson: <u>60 min</u>

Lesson Title   :   Separation of hydrograph into base flow

<u>INSTRUCTIONAL/LESSON OBJECTIVES:</u>

On completion of this lesson the student shall be able to:

- Explain the various methods used for Separation of hydrograph into base flow.

TEACHING AIDS   :   Projector, White board, demonstration
TEACHING POINTS   :

Separation of hydrograph into base flow

Assignment / Questions:

Signature of faculty

Academic Year : **2021-22** **Date:** 20-10-2021

Semester : **I**

Name of the Program: B.Tech **Year: IV Year**

Course/Subject Surface Hydrology **Course Code** : GR18A4005

Name of the Faculty : Ms. Manisha G

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No : 35 Duration of Lesson: 60 min

Lesson Title : Direct Runoff methods

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

- Summarize Direct Runoff methods

TEACHING AIDS : Projector, White board, demonstration

TEACHING POINTS :

Direct Runoff methods

Assignment / Questions:

Signature of faculty

LESSON PLAN

Academic Year : **2021-22** **Date:** 21-10-2021

Semester : **I**

Name of the Program: B.Tech **Year: IV Year**

Course/Subject Surface Hydrology **Course Code** : GR18A4005

Name of the Faculty : Ms. Manisha G

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No : 36 Duration of Lesson: <u>60 min</u>

Lesson Title : Unit Hydrograph-principles.

<u>INSTRUCTIONAL/LESSON OBJECTIVES:</u>

On completion of this lesson the student shall be able to:

Understand Unit Hydrograph-principles

TEACHING AIDS : Projector, White board, demonstration

Unit Hydrograph-principles

Assignment / Questions:

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : **2021-22**   **Date:** 25-10-2021
Semester : **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   37   Duration of Lesson: <u>60 min</u>

Lesson Title   :   derivation of UH of Isolated unit storms.

<u>INSTRUCTIONAL/LESSON OBJECTIVES:</u>

On completion of this lesson the student shall be able to:

- derive of UH of Isolated unit storms.
 TEACHING AIDS   :   Projector, White board, demonstration
TEACHING POINTS   :

derivation of UH of Isolated unit storms.

Assignment / Questions:

Signature of faculty

Academic Year   :   **2021-22**   **Date:** 27-10-2021

Semester   :   **I**

Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   38   Duration of Lesson: <u>60 min</u>

Lesson Title: UH for various durations, S-curve technique

<u>INSTRUCTIONAL/LESSON OBJECTIVES:</u>

On completion of this lesson the student shall be able to:

- Derive UH for various durations, S-curve technique.

TEACHING AIDS   :   Projector, White board, demonstration

TEACHING POINTS   :

UH for various durations, S-curve technique

Assignment / Questions:

Signature of faculty

Academic Year : **2021-22**   **Date:** 27-10-2021
Semester : **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   39   Duration of Lesson: 60 min

Lesson Title: Estimation of runoff from UH

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

- Estimation of runoff from UH.

TEACHING AIDS   :   Projector, White board, demonstration
TEACHING POINTS   :

Estimation of runoff from UH

Assignment / Questions:

Signature of faculty

Academic Year **:** **2021-22**   **Date:** 28-10-2021
Semester **:** **I**
Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty   :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Lesson No   :   40   Duration of Lesson: 60 min

Lesson Title: Instantaneous Unit Hydrograph

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

- Plot and read Instantaneous Unit Hydrograph.

TEACHING AIDS   :   Projector, White board, demonstration
TEACHING POINTS   :

Instantaneous Unit Hydrograph

Assignment / Questions:

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

COURSE COMPLETION STATUS

Academic Year : **2021-22**   **Date:** 28-10-2021

Semester : **I**

Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Ms. Manisha G

Designation: Assistant Professor   **Department:** Civil Engineering

Actual Date of Completion & Remarks, if any

Units	Remarks	No. of Objectives Achieved	No. of Outcomes Achieved
UNIT - I	Covered on time	1	1
UNIT - II	Covered on time	2	2
UNIT - III	Covered on time	3	3
UNIT – IV	Covered on time	4	4
UNIT - V	Covered on time	5	5

Signature of HOD   Signature of faculty

Date: Date:

Note: After the completion of each unit mention the number of Objectives & Outcomes Achieved.

.

Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous)
Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

EVALUATION STRATEGY

Academic Year   : **2021-22**

Semester   :   I

Name of the Program: B.Tech Civil Engineering   Year: IV   Section: A

Course/Subject: Surface Hydrologyogy   Course Code: GR18A4005
Name of the Faculty: Manisha Gunturi   Dept.: Civil Engineering

Designation: Assistant Professor.

1. TARGET:

A) Percentage for pass: 100%

b) Percentage of class:

Total Strength: 133

S. No.	Class / Division	No. of Students
1	First Class with distinction	5
2	First Class	16
3	Pass Class	100

2. COURSE PLAN & CONTENT DELIVERY

S.No	Plan	Brief Description
1	Practice classes	62 Theory classes for Section A
2	Assignments	Assignments for the related concepts

3. METHOD OF EVALUATION

3.1 ☐ Continuous Assessment Examinations (CAE-I, CAE-II)

3.2 ☐ Assignments/Seminars

3.3 ☐ Mini Projects

3.4 ☐ Quiz

3.5 ☐ Semester/End Examination

3.6 ☐   Others

4. List out any new topic(s) or any innovation you would like to introduce in teaching the subjects in this Semester.

Signature of HOD   Signature of faculty
Date: Date:

Assessment in relation to CO's and COB's
MAPPING

Assessment:
1. Assignment
2. Internal Examination
3. External examinations
4. practicalprojects
5. Viva

GR18A4005/ Surface Hydrology	Course objectives				
Assessments	1	2	3	4	5
1	X	X	X	X	X
2	X	X	X	X	X
3	X	X	X	X	X
4					
5					

1	2	3	4	5
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X

GR18A4005/ Surface Hydrology					
Course Objectives	1	2	3	4	5
1	X				
2		X			
3			X		
4				X	
5					X

Assignment 1

1. The annual rainfalls in cm at a station for a period of 21 years from 1960 to 1980 are 97, 125, 103, 81, 101, 119, 103, 79, 102, 118, 98, 83, 105, 123, 100, 86, 99, 114, 91, 83 and 106. Determine the 75% dependable rainfall from frequency analysis.
2. The average annual rainfalls of 5 rain gauges in a basin are 89,54,45,41 and 55 cm. If the error in the estimation of basin mean rainfall should not exceed 10%, how many additional gauges should be installed in the basin?
3. Estimate the total volume of rainfall received in m3 in a basin consisting of 5 rain gauges. The polygon area of each station in hectare are 518,777, 906, 1495 and 748. The corresponding rainfalls in mm at each rain gauge station in the same order are 267, 198, 142, 114 and 81.
4. Rain gauge station X did not function for a part of a month during which a storm occurred. The storm produced rainfalls of 84,70 and 96 mm at three surrounding stations A, B and C respectively. The normal annual rainfalls at the stations X,A,B and C are respectively 770, 882, 736 and 944 mm. Estimate the missing storm rainfall at station X.

Assignment-2

1. Describe how evaporation measurement is done using IMD land pan. With the help of a neat sketch.
2. Describe briefly the various measures to reduce loss of water due to evaporation in reservoir.
3. What do you mean by PET?
4. What are the various factors effecting rate of evaporation?
5. How will you compare the evaporation obtained by the empirical formulas and that of the evaporation losses determined by the evaporimeters?

Assignment 3

1. Explain moving boat method of measuring discharge in large streams
2. How average velocity is determined using single point and two point methods?
3. Define stage in a river. How will you determine stage with the help of a vertical staff
4. Describe principle involved in the measurement of stream flow by the dilution method.
5. What are the factors to be considered in locating a stream xgauging sites?

Assignment 4

1. List any four factors which affect the hydrograph
2. List out the uses of unit hydrograph
3. What are the physiographic factors affecting the flood hydrograph. Discuss the role of these factors.
4. Explain a procedure of deriving a synthetic unit hydrograph for a catchment
5. The effective rainfall hyetograph of a complex storm has duration of 12hours, with rainfall intensities of 1.5.0.5 and 5 cm/ hr respectively in successive 4hour period. The ordinates of the corresponding direct runoff hydrograph read at 4 hour intervals are 150,250,520,313,394,212,102and 45 m3/sec respectively. Determine the ordinates of the 4-hour unit hydrograph

Assignment 5

1. Explain the different structural methods used for flood mitigation.

2. Describe the various empirical methods used for the estimation of peak flood
3. What are the methods of estimating design flood? What are their limitations?
4. Determination the design flood discharge(allowing an increase of one third) for a bridge site with the following data:

   Catchment area =2x105 hectares

   Duration of storm =8hours

   Storm precipitation =3m

   Time of concentration +2hours

   Gauged discharge for a part flood with average maximum daily rainfall of 18cm was 3400 cumec.

5. Explain the different methods of estimating deign floods with their limitation
6. Write short note on (i) Flood control methods (ii) Flood routing methods
7. Discuss the modified plus method of reservoir flood routing.

RUBRIC TEMPLATE

Academic Year : **2021-22**   **Semester** : **I**

Name of the Program: B.Tech   **Year: IV Year**

Course/Subject   : Surface Hydrology   **Course Code** : GR18A4005

Name of the Faculty :   Manisha Gunturi

Designation: Assistant Professor   **Department:** Civil Engineering

Objective: To learn basics and concepts of Surface Hydrology.

Student Outcome:
1. Express the different types of hydrology definitions
2. Evaluate the consumptive use, infiltration and evaporation

Name of the Student	Performance Criteria	Beginning	Developing	Reflecting Development	Accomplished	Exemplary	Score
		1	**2**	**3**	**4**	**5**	
	Identify various building materials and their structural requirements.	Low level	Able to understand	Ability to explain	Full knowledge	Thoroughly analyzing & applying	4
	Explain the significance of cement and lime in construction.	Low level	Able to understand	Ability to explain	Full knowledge	Thoroughly analyzing & applying	4
18241A0134	Identify the suitable material for construction and various building components.	Low level	Able to understand	Ability to explain	Full knowledge	Thoroughly analyzing & applying	4
	Review different types of masonry construction.	Low level	Able to understand	Ability to explain	Full knowledge	Thoroughly analyzing & applying	4
	Discuss about various building services and planning and their characteristics	Low level	Able to understand	Ability to explain	Full knowledge	Thoroughly analyzing & applying	4

CO-PO MAPPING

Course	Program Outcomes											
	A	b	c	d	e	f	g	h	i	j	k	L
Surface Hydrology			X	X	X	X	X	X	X	X		X

GR18A4005/ Surface Hydrology	Program Outcomes												PSO 1	PSO 2
Course Outcomes	a	B	C	d	E	f	g	h	i	j	k	L	1	2
1	M		M	M		H	H	H		H		H	H	M
2	M				H	H	H	H		M		M	H	
3	H	H		M		H	H		M	M		M		H
4	H			M		M	M					M	H	M
5	H			M		M						M		M

GR18A4005/ Surface Hydrology	Program Outcomes											
Course Outcomes	a	b	C	d	e	f	g	h	i	j	k	L
1. Express the different types of hydrology definitions	M		M	M		H	H	H		H		H
2. Evaluate the consumptive use, infiltration and evaporation	M				H	H	H	H		M		M
3. Compute the discharge in the streams	H	H		M		H	H		M	M		M
4. Apply the hydrographs for the computing rain fall and run off	M		H	M		H	H	M	H			H
5. Apply the knowledge of computing flood estimation by various methods			M	M		H	H		M	H		H

Time: 10 min   Max. Marks: 5
Name: **Roll No.**

I Multiple choice Questions

1. A hydrograph is a plot of   [   ]
   (a) rainfall intensity against time   (c) Cumulative rainfall against time
   (b) Stream discharge against time   (d) Cumulative runoff against time
2. A unit hydrograph has   [   ]
   (a) one unit of peak discharge   (d) one unit of the time base of direct
   (b) one unit of rainfall duration   runoff
   (c) one unit of direct runoff
3. Choose the correct sentence about information available from hydrograph among the following options?   [ ]
   a) The mean annual runoff or mean runoff   c) Rate of flow at any particular time
   each week of the year   during the duration period
   b) Total volume at that instant, as the area d) Mean runoff for each month
   under hydrograph indicates the force of
   water during the duration
4. Hydrographs of similar rainfalls will be similar in shape.   [   ]
   a) True
   b) False
5. Infiltration rate is always   [   ]
   (a) more than the infiltration capacity   (d) equal to or more than the infiltration
   (b) less than the infiltration capacity   capacity
   (c) equal to or less than the infiltration
   capacity
6. Infiltration is   [   ]
   (a) movement of water through soil   (c) both a and b
   (b) absorption of water by soil   (d) none of these
7. If the intensity of rainfall is more than the infiltration capacity of soil, then the infiltration rate will be   [ ]
   (a) equal to rainfall intensity   (c) more than rainfall intensity
   (b) equal to infiltration capacity   (d) more than infiltration capacity
8. S hydrograph is used to obtain   [   ]
   (a) shorter duration from longer duration   (c) both a and b
   (b) longer duration from shorter duration   (d) none of these
9. Infiltration capacity of soil depends upon   [   ]
   (a) shape and size of soil particles   (c) arrangement of soil particles
   (b) compaction of the soil particles   (d) all of these
10. Pick up the correct statement from the following :   [   ]
    (a) When rainfall exceeds the interception
    rainfall, water reaches the ground and
    infiltration starts
    (b) The difference between the total
       rainfall and intercepted rainfall, is
       generally called ground rainfall
    (c) The maximum rate of absorbing water
       by the soil in any given condition, is
       known as infiltration capacity
    (d) all of these

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
IV B.Tech, I Sem, I MID-Term Examinations, September 2021
SURFACE HYDROLOGY (GR18A4005)
Department of Civil Engineering

Duration: 90min   MAX Marks: 20

SUBJECTIVE

Answer any three Out of Four   **3*5 = 15 Marks**

1. (a) As per the BIS recommendations, the minimum density of rain gauge stations for a given (3)
   catchment varies based on the topographical features of the catchment area. State the
   criteria.[BL2]
   (b) In case of a 2m diameter circular pan, following observations were taken from 8:00 am to 6:00 (2)
   pm.[BL2]
        (i)   Quantity of water added to keep the water level in the pan constant is 4 lit.
        (ii) Precipitation during the observation period is 15mm.
        (iii) Leakage from the pan is 1.5 lit.
   Find the rate of evaporation from the pan.

2. (a) The normal annual rainfall at stations A, B, C and D in a basin are 80.97, 67.59, 76.28, and 92.01 (3)
   cm, respectively. In the year 2010, the station D was inoperative and the stations A, B, and C
   recorded annual rainfall of 91.11, 72.23, and 79.89 cm, respectively. Estimate the rainfall at
   station D in that year.[BL4]
   (b) Differentiate between land pan, Sunken pan and floating pan.[BL4]   (2)

3   To facilitate remote recording of rainfall, a pair of rotating buckets is placed below a funnel. (5)
    Explain with neat sketch the construction and its use.[BL2]

4   The rain fall recorded at the various rain gauge stations are as follows.   (5)

Rain gauge station number	1	2	3	4	5	6	7	8
Precipitation in mm	35	38	41	45	47	50	52	55

    Determine the average rainfall over the catchment by different methods[BL3]

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
IV B.Tech, I Sem, II MID-Term Examinations, December 2021
SURFACE HYDROLOGY (GR18A4005)   Roll.No.--------------------
Department of Civil Engineering

Duration: 90min   MAX Marks: 20

SUBJECTIVE

Answer any three Out of Four   **3*5 = 15 Marks**

1. (c) How do you measure the stage Discharge using the velocity rods, surface floats ,   5 M Co3
        velocity rods and current meters [BL2]

    (d) Discuss the stage Discharge relation   using permanent control and Extrapolation curve
        2 methods   [BL2]

2. (c) Write short note about the Different types of Hydrographs with neat sketch [BL3]   5M
                                                                                                  Co4

    b) The peak flood hydrograph due to a 3hr from a given rain in a catchment is
    270km^2 , The total depth of rain is 5.9 cm .Take average inflitration loss is 0.3cm/h
    at constant base flow of 20m^3/s. Estimate peak unit hydrograph of the catchment
    [BL3]

                                                                                                  5M
                                                                                                  Co5
3   a) Explain the flood estimation studies using gumble method[BL2]

        b) write short note on the muskinghum method   and Flood control measures [BL2]

4   An auxillary gauge is used to measure to prevent from back water affect . The main   5M
        gauge[BL4]   C03

        Reading has given in the follwing Table.

Main gauge m above datum	86.00	86.00
Auxillary Gauge m Above datum	85.5	84.8
Discharge m^3/s	275	600

        Determine the Discharge in the River . Take 86.00 m and 85.3m as main gauge,
        auxillary gauge reading still.

1	The following is not a direct stream flow determination technique: a). Dilution method b). Ultrasonic method c).Area-velocity method d) Slope-area method	[ ]
2	The unit hydrograph due to a storm may be obtained _____? a) direct runoff volume b) period of storm c)Rain fall Excess d)none of the above	[ ]
3	Pick the correct Answers a) pak flow in the river is due to Rain fall b)Hydrograph is a plot Discharge and time c) All the above d) none of the above	[ ]
4	Base flow separation is performed ( ) a) a) flood hydrograph from rain fall b) unit hydrogrpah c) All d)None	[ ]
5	Recession limb of a Hydrograph depends on a) Basin and storm charecterstic b) Basin only c) Strom only d)Base flow	[ ]
6	Design flood which of the follwing is need to note ( ) a) design flood b) spill way design flood c) project floodd d) All the above	[ ]
7	The flow mass curve is an Integral curve of a) The Hydrograph b)The Hytograph c)The flow duration curve e) The-S-curve	[ ]
8	Direct runoff is made up a) surface runoff , propt interflow b) surface runoff c) over land flow and infiltration d) rainfall and eveoparation.	[ ]
9	In Musking hum method of channel routing, The value of X is a) 0.5to 0.75 b) 0 c) 0 to 0.5 d) 1 to +1	[ ]
10	Which equation is used in flood routing a) continuity equation b) Energy equation c) Momentum equation d) None	[ ]

S.No	Reg No	Student Name	Mid I Marks	Mid 2 Marks
1	17241A0153	Sujith Kumar Shinde	10	13
2	17241A0157	Vuppula Mithunkumar Reddy	9	11
3	18241A0101	Ajmeera Ganesh	8	14
4	18241A0102	Anabotula Sravani	13	14
5	18241A0103	Anumatla Manoj	12	11
6	18241A0104	Byna Rishitha	7	9
7	18241A0105	Bura Tharasri	10	13
8	18241A0106	Pudari Badrinath Goud	6	5
9	18241A0107	Balasani Rohith	8	12
10	18241A0108	Bandari Veeraswamy	11	13
11	18241A0109	Bandi Varun Kumar	8	6
12	18241A0110	Bashipaka Pradeep	8	11
13	18241A0111	Bathula Nikhil	8	8
14	18241A0112	Batikiri Veerendra Swamy	16	4
15	18241A0113	Bhukya Soujanya	4	13
16	18241A0114	Bhukya Varun Naik	11	15
17	18241A0115	Boddu Pavan	8	11
18	18241A0116	Byagari Rangaraju	7	6
19	18241A0117	Chada Ruchita	12	15

20	18241A0118	Chinthakuntla Thriveen	8	9
21	18241A0119	Cv Jaswanth Surya	8	10
22	18241A0120	Dosapati Nishu	13	13
23	18241A0121	G Prashanth	4	8
24	18241A0122	Gaddipati Lohitha	12	11
25	18241A0123	Gangam Rohit Reddy	5	6
26	18241A0124	Gottemukkala Govardhan	8	6
27	18241A0125	Hrishikesh Bansal	6	7
28	18241A0126	Janapati Raju	10	14
29	18241A0127	Jyothika Mannava	12	14
30	18241A0128	K Harshitha Reddy	17	15
31	18241A0129	Kolan Reshikesh Reddy	8	6
32	18241A0130	Karri Bharath Chandra Reddy	11	10
33	18241A0131	Kuppala Nihar	8	8
34	18241A0132	Kurva Lavanya	6	12
35	18241A0133	Maddimsetty Sri Charan	8	12
36	18241A0134	Maganoor Manaswini	15	14
37	18241A0135	Maloth Bhavsingh	8	11
38	18241A0136	Malothu Naveena	13	14
39	18241A0137	Manda Ithihas	11	9

40	18241A0138	Mohammad Ashfaq Ahmed	11	8
41	18241A0139	Mohammed Omer Shareef	14	13
42	18241A0140	Mukundu Naveen		0
43	18241A0141	Nalumasu Sahithi	10	14
44	18241A0142	Nampelly Ravi Kumar	11	10
45	18241A0143	Narra Shashidhar Reddy	7	12
46	18241A0144	Patlola Vinay Reddy	3	9
47	18241A0145	Pattambetty Pavankumar	6	6
48	18241A0146	Pola Tharun	12	10
49	18241A0147	Posani S V A Kalyan	7	5
50	18241A0148	Pulle Manichadra	3	5
51	18241A0149	Rajulapati Rohit Naga Sai	15	11
52	18241A0150	Sura Subbaram Reddy	4	6
53	18241A0153	Sunkari Vikas	13	13
54	18241A0154	Thirupathi Rao Salla	14	12
55	18241A0155	Trivikram Reddy	7	9
56	18241A0156	Thrupti Shreya	10	10
57	18241A0157	Vakamalla Bhavya Sree	14	13
58	18241A0158	Vemula Manisha	9	11
59	18241A0159	Vuppula Keerthana	10	13

60	18241A0160	Yalla Anitha	12	14
61	19245A0101	Kancherla Bharath	14	7
62	19245A0102	Elupula Kumaraswamy	11	6
63	19245A0103	Brahmadevara Bhavitha	14	14
64	19245A0104	Dasari Namratha	13	11
65	19245A0105	T Chandana	11	12
66	19245A0106	Kola Haritha	15	12

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
IV B.Tech, I Sem, I MID-Term Examinations, September 2021
SURFACE HYDROLOGY (GR18A4005)
Department of Civil Engineering
Duration: 10min   MAX Marks: 5
Objective

10*0.5 = 5 Marks

11. Hydrology helps in   [J]
f) predicting maximum flows   i) predicting the effects on the river water level on
g) deciding the minimum reservoir capacity   completion of dams
h) forecasting the availability of quantity of water at   j) all the above.
   reservoir site
12. The surface Run-off is the quantity of water   [h]
e) absorbed by soil   g) required to fill surface depressions
f) intercepted by buildings and vegetative cover   h) that reaches the stream channels
13. Pick up the correct equation from the following :   [f] ✗
e) Run off = Surface run off + Ground water flow   g) Run off = Surface run off / Ground water flow
f) Run off = Surface run off - Ground water flow   h) Runoff = Surface run off x Ground water flow.
14. The rainfall at any place is described by   [h]
e) its intensity   g) its frequency
f) its duration   h) all the above
15. The time required by rain water to reach the outlet of drainage basin, is generally called   [e]
e) time of concentration   g) concentration time of overland flow
f) time of overland flow   h) duration of the rainfall
16. If the intensity of rainfall is more than the infiltration capacity of soil, then the infiltration rate will be [f]
   e) equal to rainfall intensity   g) more than rainfall intensity
   f) equal to infiltration capacity   h) more than infiltration capacity
17. A hydrograph is a plot of   [d] ✗
   (a) rainfall intensity against time   (c) Cumulative rainfall against time
   (b) Stream discharge against time   (d) Cumulative runoff against time
18. A unit hydrograph has   [c]
   (a) one unit of peak discharge   (c) one unit of direct runoff
   (b) one unit of rainfall duration   (d) one unit of the time base of direct runoff

19. Choose the correct sentence about information available from hydrograph among the following options?[c]
   a) The mean annual runoff or mean runoff each week of c) Rate of flow at any particular time during the duration
      the year   period
   b) Total volume at that instant, as the area under   d) Mean runoff for each month
      hydrograph indicates the force of water during the
      duration
20. Hydrographs of similar rainfalls will be similar in shape.   [b]
   a) True   . b) False

| I | II | **MID TERM EXAMINATION** |

No.

375414

| H.T. No. | 1 | 9 | 2 | 4 | 5 | A | 0 | 1 | 0 | 6 |

Name of the Examination _____ MID Examination - Surface Hydrology.

Course __ IV Btech - I Sem. __ Branch __ Civil Engineering __ Date __ 28/10/2021

Signature of the Invigilator

Q.NO.	1		2		3		4		5		6		TOTAL
	a	b	a	b	a	b	a	b	a	b	a	b	
MARKS			3		2	2	4						11

START WRITING FROM HERE

A)

Rain gauge station number.   1 2 3 4 5 6 7 8

Precipitation in mm   41 48 51 45 38 60 47 18

Area under Consideration.   10 22 18 23 31 19 24 28.
(km²)

① Annual Average rainfall.

$$= \frac{P_1 + P_2 + P_3 + P_4 + P_5 + P_6 + P_7 + P_8}{N}$$

$$= \frac{41 + 48 + 51 + 45 + 38 + 60 + 47 + 18}{8}$$

$$= 43.5 \text{ mm}$$

(ii) theissens Po-Average rainfall.

$$= \frac{P_1 A_1 + P_2 A_2 + P_3 A_3 + P_4 A_4 + P_5 A_5 + P_6 A_6 + P_7 A_7 + P_8 A_8}{A_1 + A_2 + A_3 + A_4 + A_5 + A_6 + A_7 + A_8}$$

$$= \frac{41 \times 10 + 48 \times 22 + 57 \times 18 + 45 \times 23 + 38 \times 31 + 60 \times 19 + 47 \times 24 + 18 \times 28}{10 + 22 + 18 + 23 + 31 + 19 + 24 + 28}$$

$$= 47.54 \text{ mm}$$

2A. Recording rain gauge.

~~float type rain gauge~~ a Fig.

Tipping Bucket rain gauge.

curdry
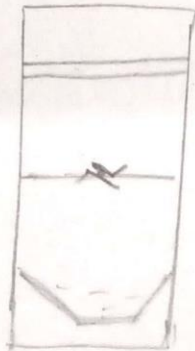
20   float type Rain gauge.
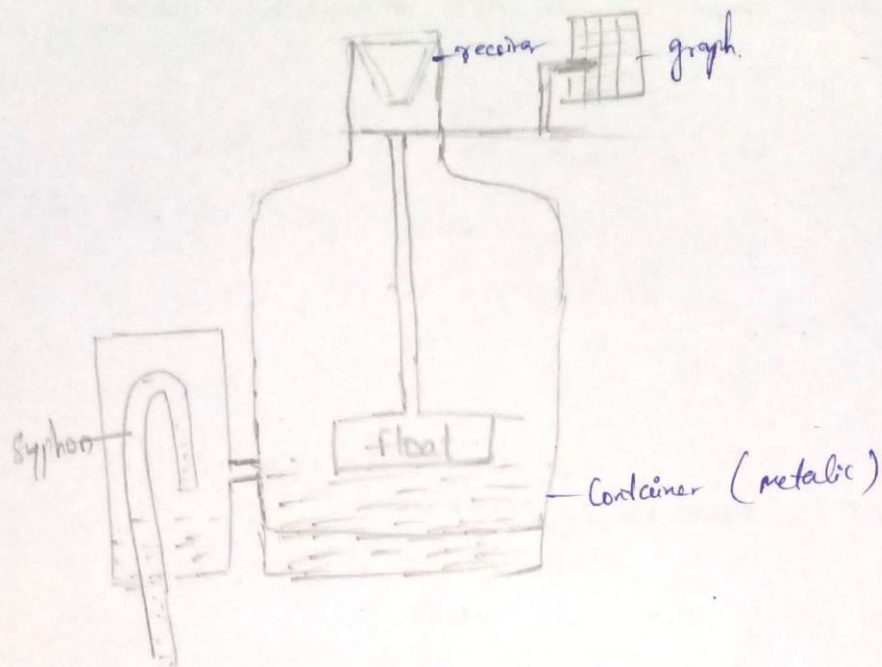
* float type rain gauge is a recording raing gauge, which automatically records the the graph.

* It consist of a receiver, which receives the rainfall.

* And with a float, graph and a mechanism called Syphonic action.

→ As the rainfall is received the container will be fill with the water, As the water (Rainfall) increases in the container the float moves up and down due to increase and decrease of water in the container.

→ As the float moves the pen which is connected to the float moves and records and automaticall draws the graph.

→ when the water in the container reaches sustain limit in the container, there is one more container which is connected to it.

→ the water will then enter into the other one.

→ Here the Syphonic action takes place and the water is sucked out.

(a)

Stations	~~annual~~ rain fall	~~Annual~~ Rainfall
A	91.11	90.97
B	72.23	76.59
C	79.89	59.28
D	?	74.01

10% of 74.01 = 7.4.

∴ 74.01 + 7.4 = 81.41.

$$P_n = \frac{N_x}{n}\left[\frac{P_1}{N_p} + \frac{P_2}{N_p} + \frac{P_3}{N_p}\right]$$

$$P_n = \frac{91.11}{3}\left[\frac{91.11}{90.97} + \frac{72.23}{76.59} + \frac{79.89}{59.28}\right]$$

$$P_n = 99.986$$

Rain fall at station D = 99.986 cm

b) Given data.

circular pan = 2.5m dia.

    Time = 10 hours. (8 am to 6 pm)

Quantity of water added = 5 lit

    Precipitation = 20mm   = 20×100 cm. 0.2 m

    Leakage = 0.5 lit.

rate of evaporation = ?

Area = $\frac{\pi}{4} \times 2.5^2 = 4.908 \, m^2$ =

Δt = 10 hrs = 10×60×60 = 36000 sec.

$\longrightarrow$ Inflow - outflow = evaporation.

$$= \left(5 + \left(\frac{0.2}{4.908} \times 4.908\right)\right) - 0.5$$

$$= 5.9816 - 0.5$$

$$= 5.4816$$

4 K.Harshitha.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
IV B.Tech, I Sem, II MID-Term Examinations, December 2021
SURFACE HYDROLOGY (GR18A4005)
Department of Civil Engineering

Name of the Student **K. Harshitha**   Roll No **18241A0128**

1   The following is not a direct stream flow determination technique: [B]

a). Dilution method   b). Ultrasonic method

c).Area-velocity method   d) Slope-area method

2   The unit hydrograph due to a storm may be obtained _____   [C]

a) direct runoff volume   b) period of storm

c)Rain fall Excess   d)none of the above

3   Pick the correct Answers   [C] ✗

a) peak flow in the river is due to Rain fall

b)Hydrograph is a plot Discharge and time

c) All the above

d) none of the above

4   Base flow separation is performed   [C]

a) flood hydrograph from rain fall

b) unit hydrogrpah c) All the above d)None of the above

5   Recession limb of a Hydrograph depends on   [a]

a)   Basin and storm charecterstic b) Basin only c) Strom only d)Base flow

6   Design flood which of the follwing is need to note   [d]

a) design flood b) spill way design flood c) project flood d) All the above

7   The flow mass curve is an Integral curve of   [a]

a) The Hydrograph   b)The Hytograph

c)The flow duration curve d) The-S-curve

8   Direct runoff is made up   [a] ✗

a) surface runoff , propt interflow b) surface runoff

c) over land flow and infiltration d) rainfall and eveoparation.

9   In Musking hum method of channel routing, The value of X is   [C]

a) 0.5to 0.75 b) 0 c) 0 to 0.5 d) 1 to +1

10   Which equation is used in flood routing   [a]

a) continuity equation b) Energy equation c) Momentum equation d) None

Gokaraju Rangaraju Institute of Engineering & Technology
(Autonomous College Affiliated to JNTUH)   (12 Pages)
Bachupally, Kukatpally, Hyderabad - 500090

| I | II | **MID TERM EXAMINATION** |

No. 394553   H.T. No. | 1 | 8 | 2 | 4 | 1 | A | 0 | 1 | 2 | 8 |

Name of the Examination   IV B.tech Sem I Mid II Examination.

Course Surface Hydrology. Branch Civil Engineering Date 10/12/21.

Signature of the Invigilator   10/12/21

Q.NO.	1		2		3		4		5		6		TOTAL
	a	b	a	b	a	b	a	b	a	b	a	b	
MARKS			2	1½	1½	2	3½						10½

START WRITING FROM HERE

2)

ⓐ

Hydrographs:-

Hydrographs are the graphical representation opted
to calculate rainfall over catchment or discharge.

→ It is very important in Hydrology.

→ Hydrographs give relation between Rainfall and
time.

→ There are different Hydrographs for different purposes.

* Types of Hydrographs!

• Unit Hydrograph.
• Storm Hydrograph.
• Synder Synthetic Unit Hydrograph.
• Annual Hydrograph.
• Seasonal Hydrograph.
• Monthly Hydrograph.
• Flood Hydrograph.

* Unit Hydrograph :-

→ Unit Hydrograph reprents plot between unit rainfall over a catchment area ~~by~~ at uniform rate for a period of time.

→ It is plotted as discharge on Y-axis and time on X-axis
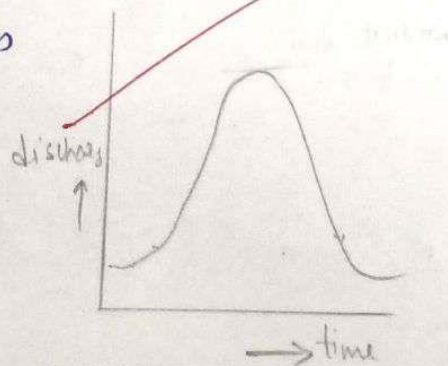
* Storm Hydrograph:

→ Storm hydrographs represents relation chip between discharge and rainfall. in one graph.

→ It shows a graph with Rainfall intensity and discharge variation with respect to time.

• Storm graph.
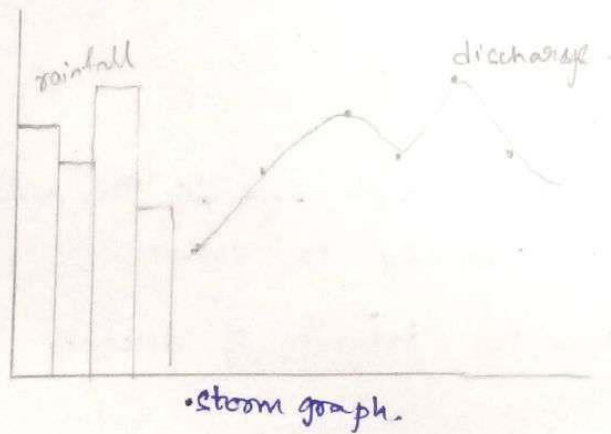
* Synder Synthetic unit Hydrograph:

→ Synth Synder synthetic unit hydrograph doesnot requires rainfall or discharge data

→ It synthesizes a curve based on previous data and produces a graph accordingly.

→ It gives a graph plot of discharge against time

* Annual Rainfall Hydrograph :-

→ Annual rainfall Hydrograph represents a plot of discharge vs time.

→ Data is considerate of weekly, daily, monthly and thus made to on annual Hydrograph.

* Seasonal Hydrograph :-

→ Seasonal Hydrograph represents the results of discharge variation according to season.

→ It shows the intensity of discharge through seasons.

* Monthly Hydrograph :

→ Monthly Hydrographs gives a plot of discharge and time monthly basis.

* Flood Hydrographs :

→ Flood Hydrographs are the important ones.

→ Its shows results according to occured floods

→ It shows the flood intensity that helps to constructing hydrological structures.

⑤. <u>Given</u> :

Flood duration = 3 hrs

Total depth = 5.9 cm

losses due to Infiltration = 0.3 cm/hrs

Base flow = 20 m³/s.

The peak of flood = 270 m³/s.

<u>Sol</u>: The peak of DRH = 250 m³/s   [270-20].

Excess Rainfall = Total depth - losses.

total loss in 3 hrs = 0.3 × 3 = 0.9 cm.

$$= 5.9 - 0.9$$
$$= 5 \, cm.$$

Peak unit Hydrograph of catchment = $\dfrac{DRH}{Excess\, rainfall}$ = $\dfrac{250}{5}$

$$= 50 \, m^2$$

3)

Flood:

→ Excess rainfall causing excess runoff results in floods.

→ Estimation of floods is very important as to develop a reliable and safe Hydraulic structure

→ flood estimation is important to record them for years

→ To design structures like bridges, dams, canals flood estimation plays an important role.

→ There are two main methods to estimate floods.

ⓐ Gumbels method
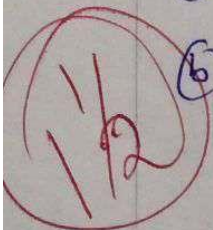
ⓑ Muskingham method.

(b) Muskingham method:

In muskingham method the channel reach is assumed to be in way of channel.

Volume of Prism storage = KQ.

Volume of Wedge storage = $Kx[I-Q]$.

Total storage = $KQ + Kx(I-Q)$.

$$\boxed{S = K\left[Ix + (1-x)Q\right]} \quad -\!\!\!\textcircled{A}$$

$\textcircled{A}$ can be written as,

$$S_2 - S_1 = K\left[x[I_2 - I_1] + (1-x)(Q_2 - Q_1)\right] \longrightarrow \textcircled{B}$$

where K = velocity of stream in channel reach

x = weightfactor $(0 \le x \le 0.5]$

But,
$$S_2 - S_1 = \left(\frac{I_2 - I_1}{2}\right)\Delta t - \left(\frac{Q_2 - Q_1}{2}\right)\Delta t \quad -\!\!\!\textcircled{C}$$

Substituting (B) in (C)

the equation obtained is

$$\therefore \boxed{Q_2 = C_0 I_2 + C_1 I_1 + C_2 Q_1}$$

where C_0, C_1, C_2 are constants

$$C_0 = \frac{\frac{\Delta t}{K} - 2x}{2(1-x) + \frac{\Delta t}{K}} \quad ; \quad C_1 = \frac{\frac{\Delta t}{K} + 2x}{2(1-x) + \frac{\Delta t}{K}}$$

$$C_2 = \frac{2(1-x) - \frac{\Delta t}{K}}{2(1-x) + \frac{\Delta t}{K}}.$$

$$\therefore \boxed{Q_n = C_0 I_n + C_1 I_{n-1} + C_2 Q_{n-1}}$$

is the Muskinham equation.

* Flood control measures:

→ Floods can be controlled by improving catchment area by plantation.

→ By building canals, dams, reservoirs floods can be controlled.

→ Floods can be controlled by proper planning by utilizing the previous data of floods.

→ Upon usage of gauges or such instruments, floods can be known coming and can be taken care of

→ drainage systems should be provided for flood control.

→ Restriction to flood prone areas should be implemented

② → Seepage and infiltration should be increased as a measure of flood control

4)

Maingauge m above datam	86.00	86.00
Auxillary gauge m above datam	85.5	84.8
Discharge m³/s	275	600

Sol.

Fall, = Main gauge data - Auxillary data

$$= 86 - 85.5$$
$$F_1 = 0.5$$

~~Fall₂ = Main~~

$$F_2 = 86 - 84.8$$
$$F_2 = 1.2$$

$Q_1 = 275$; $Q_2 = 600$

$$\frac{Q_1}{Q_2} = \left(\frac{F_1}{F_2}\right)^M$$

$$0.45833 = (0.41167)^M$$

$$\boxed{M = 0.891}$$

//

knowing $\boxed{m=0.891}$.

maingauge readings are $86m, 85.3m$.

To find Discharge $= Q$.

$$\frac{Q}{Q_1} = \left(\frac{F}{F_1}\right)^m$$

$$Q = Q_1 \left(\frac{F}{F_1}\right)^m.$$

$F = 86 - 85.3 = 0.7$

$F_1 = 86 - 84.8 = 1.2$

$M = 0.891$

$Q_1 = 600.$

$$Q = 600 \times \left(\frac{0.7}{1.2}\right)^{0.891}$$

$$\boxed{Q = 371.18 \, m^3/s}$$

$\left(3\frac{1}{2}\right)$

∴ The discharge of river $= 371.18 \, m^3/s$

Name of the Student _CV Jaswanth Surya_   Roll No _18241A0119_

1   The following is not a direct stream flow determination technique: [B]

  a). Dilution method   b). Ultrasonic method

  c).Area-velocity method   d) Slope-area method

2   The unit hydrograph due to a storm may be obtained _____   [C]

  a) direct runoff volume   b) period of storm

  c)Rain fall Excess   d)none of the above

3   Pick the correct Answers   [C]

  a) peak flow in the river is due to Rain fall

  b)Hydrograph is a plot Discharge and time

  c) All the above

  d) none of the above

4   Base flow separation is performed   [B]

   a) flood hydrograph from rain fall

  b) unit hydrogrpah c) All the above d)None of the above

5   Recession limb of a Hydrograph depends on   [A]

   a)   Basin and storm charecterstic b) Basin only c) Strom only d)Base flow

6   Design flood which of the follwing is need to note   [D]

  a) design flood b) spill way design flood c) project flood d) All the above

7   The flow mass curve is an Integral curve of   [D]

  a) The Hydrograph   b)The Hytograph

  c)The flow duration curve d) The-S-curve

8   Direct runoff is made up   [A]

  a) surface runoff , propt interflow b) surface runoff

  c) over land flow and infiltration d) rainfall and eveoparation.

9   In Musking hum method of channel routing, The value of X is   [C]

  a) 0.5to 0.75 b) 0 c) 0 to 0.5 d) 1 to +1

10   Which equation is used in flood routing   [A]

  a) continuity equation b) Energy equation c) Momentum equation d) None

Gokaraju Rangaraju Institute of Engineering & Technology
(Autonomous College Affiliated to JNTUH)
Bachupally, Kukatpally, Hyderabad – 500090

(12 Pages)

| I | II | **MID TERM EXAMINATION** |

No. 334558

H.T. No. | 1 | 8 | 2 | 4 | 1 | A | 0 | 1 | 1 | 9 |

Name of the Examination Surface hydrology

Course B.tech   Branch Civil Engin.   Date 10/12/2021

Signature of the Invigilator

Q.NO.	1		2		3		4		5		6		TOTAL
	a	b	a	b	a	b	a	b	a	b	a	b	
MARKS	1	1			1	1½	2						6½

START WRITING FROM HERE

(1)

(a) The stage discharge measure using Velocity rods in N/m^2.

The stage discharge measured using surface floats in KN/mm^2.

The stage discharge measured using Velocity rods in $Q N/m$.

The stage discharge measured using Current meters in

(b)

The stage discharge is directly propornal to the permanent Control (or) (α) and i another is inversly proposnal to the extrapo-lation Curve (or) β. The α and β are in the line of margin along the normal objective given to the principle of the following in the
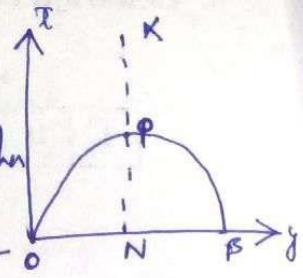
$x-y$ Curve.

③ ⓐ The Acient technige which is used to find the flood estimation using Jumble method. Firstly, the non- metalatic Mode are digging into the Surfale area towards the following ground level. The flow of the wind speed and its rainfall drop length is taken into the labatory for the Normal and flood Estimation.

(b) Muskinghum Method which is used to prevent the flooded areas to the normal stage. The water level in the flooded areas are taken out with the help of tubes and the pipes. In the Muskinghum Method the human work is included a lot. This method is very time consuming method.

The flood control measures are taken by the different methods using different groups of people in the teams. Each group of people does different methods of process for the finding to the flood control. Doing different methods helps in estimation of correct flood control.

④

Given :-

Main gauge m above datum	86.00	86.00
Auxillary Gauge m above datum	85.5	84.8
Discharge m³/s	275	600

TO find :- The Discharge in the river (D)?

Solution:-

$$M = \frac{86 + 85.5}{2} = \frac{171.5}{2} = 86.75m$$

$$X = \frac{85.5 + 275}{2} = \frac{361}{2} \Rightarrow 103.5m$$

$$Discharge = \frac{86.75 + 103.5}{2} = 190m$$

Therefore the discharge in the river is 190m³/s.

18241A0147

Name of the Student **Posani S V A Kalyan.**   Roll No __18241A0147__

1   The following is not a direct stream flow determination technique: [A] ✗

   a). Dilution method   b). Ultrasonic method

   c).Area-velocity method   d) Slope-area method

2   The unit hydrograph due to a storm may be obtained _____   [B] ✗

   a) direct runoff volume   b) period of storm

   c)Rain fall Excess   d)none of the above

3   Pick the correct Answers   [C] ✗

   a) peak flow in the river is due to Rain fall

   b)Hydrograph is a plot Discharge and time

   c) All the above

   d) none of the above

4   Base flow separation is performed   [A] ✗

   a) flood hydrograph from rain fall

   b) unit hydrogrpah c) All the above d)None of the above

5   Recession limb of a Hydrograph depends on   [A] ✓

   a) Basin and storm charecterstic b) Basin only c) Strom only d)Base flow

6   Design flood which of the follwing is need to note   [B] ✗

   a) design flood b) spill way design flood c) project flood d) All the above

7   The flow mass curve is an Integral curve of   [B] ✗

   a) The Hydrograph   b)The Hytograph

   c)The flow duration curve d) The-S-curve

8   Direct runoff is made up   [C] ✗

   a) surface runoff , propt interflow b) surface runoff

   c) over land flow and infiltration d) rainfall and eveoparation.

9   In Musking hum method of channel routing, The value of X is   [A] ✗

   a) 0.5to 0.75 b) 0 c) 0 to 0.5 d) 1 to +1

10   Which equation is used in flood routing   [B] ✗

   a) continuity equation b) Energy equation c) Momentum equation d) None

I	II	**MID TERM EXAMINATION**

No.

393690

H.T. No. | 1 | 8 | 2 | 4 | 1 | A | 0 | 1 | 4 | 7 |

Name of the Examination MID-II, IV Btech. Surface hydrology.

Course B·tech   Branch civil Engineering Date 10-12-21.

Signature of the Invigilator

Q.NO.	1		2		3		4		5		6		TOTAL
	a	b	a	b	a	b	a	b	a	b	a	b	
MARKS			2		1	1½							4½

3)

(a) gumble method :-

* this method of discharge measurement is basically used in the excess recordings of assessments and also helps the complex inductions of Measurments to be Solved and Analysied.

* in a case of river with a very high Stream velocity, the normal Procedure useage makes unsuccessfull results, the gumbles equation helps the complexity to be Solved.

3) (b) <u>Musking hum method</u> :-

=> the Method derived by Muyking hum
is intended with a Special theory
of cannel reaserch. Musking hum method
Say's the theory of how the discharge
of water take's place in a differencial
Slope degree's and allow's the angular
analysis.

wedge storage

Prizm
storage

1½
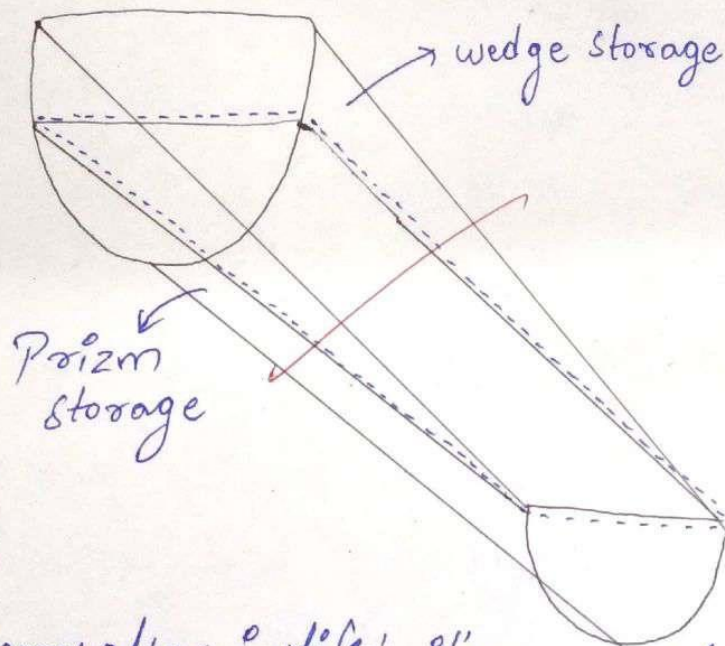
=> the theory also justifie's it's way of Subdividing
the refference cannal into 2 different
Storage Space's as Prizm and wedge
Storage.

2) (a) <u>Hydrograph's:-</u>

hydrograph's are the analytical representation of the water discharge with respect to the time duration utilized. this terminology of hydrograph water discharge measurment is having Some types of graph's :-

① unit hydrograph.

② Storm hydrograph.

③ Annual hydrograph

④ Seasonal hydrograph.

⑤ Monthly hydrograph.

⑥ flood hydrograph.

⑦ Snyder's Synthetic unit hydrograph.

☆

① <u>unit hydrograph</u> :- the hydrograph which measures the discharge with in the dimentianal centimeter, inch, and meter with respect to time duration range.

④ **Seasonal hydrograph:-** hydrograph which Provides the data of Seasonal variations and Shows the Climatic Status of the data whether it is cold, temper, and Stormly(oo) raing and breezy.

Season-x

Season-y

Season-z
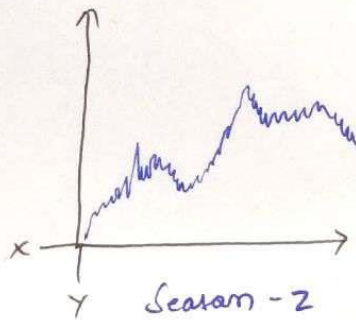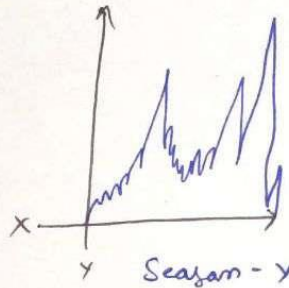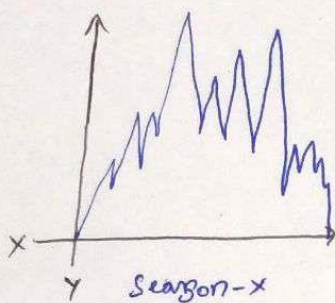
⑤ **Monthly hydrograph:-** the hydrograph which gives the discharge data about a Particular month duration.

⑥ **flood hydrograph :-** the hydrograph which gives the discharge terms of the excess flows and out of limit Status.