Indra Ganesan
COLLEGE OF ENGINEERING

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai
Accredited by NAAC with 'B+' Grade, 2(f) & 12B Status Institution by UGC
IG Valley, Madurai Main Road, Manikandam, Tiruchirappalli - 620012

NAAC DOCUMENTS

QUALITY INDICATOR FRAME WORK

CRITERION – 1

CURRICULAR ASPECTS

SUBMITTED BY

IQAC

INTERNAL QUALITY ASSURANCE CELL

INDRA GANESAN COLLEGE OF ENGINEERING

Criteria 1	Curricular Aspects	100

1.1 Curricular Planning and Implementation (20)

1.1.1 The Institution ensures effective curriculum planning and delivery through a well-planned and documented process including Academic calendar and conduct of continuous internal Assessment

Table of Content

INDRA GANESAN COLLEGE OF ENGINEERING

IG Valley, Manikandam, Tiruchirappalli, Tamil Nadu – 620 012, India
(Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai-25)

DEPARTMENT OF CIVIL ENGINEERING

PREFACE OF THE COURSE FILE

Batch	: **2017-2021**
Academic Year	: **2019-2020 /EVEN**
Program	: **CIVIL ENGINEERING**
Year & Semester	: **3rd Year / 6th Semester / 'A' Section**
Course Code	: **CE8603** NBA Course Code: **C303**
Name of the Course	: **IRRIGATION ENGINEERING**
Faculty in-charge	: **Ms.G. BHARANI (AP)**

Dr. G. Balakrishnan, M.E., Ph.D.,
Principal
Indra Ganesan College of Engineering
IG Valley, Main Road
Manikandam, Trichy-620 012.

Signature of the Faculty in-charge

HoD / CIVIL

INDRA GANESAN COLLEGE OF ENGINEERING

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DEPARTMENT OF CIVIL ENGINEERING

REVIEW OF COURSE FILE

(to be pasted on the inner side of the file-backside).(#-State Yes/No.)

S.N	Details Date:	R-I-*	R-II-*&	R-III-*&	R-IV-*&$	R-V-*&$@
1.	Preface of the course file	Y				
2.	Vision, Mission, PEOs, POs, PSOs, Blooms taxonomy	Y				
3.	Subject handlers of yesteryears	Y				
4.	Timetable/Workload of the staff – Distribution of teaching load – Roles and Responsibilities	Y				
5.	Syllabus signed by staff & HoD	Y				
6.	Lecture Schedule signed by staff & HoD	Y				
7.	Course Committee meeting circular and minutes	Y				
8.	Identification of Curricular gap and Content Beyond the syllabus	Y				
9.	Self-study topics	Y				
10.	Previous AU Question papers	Y				
11.	Unit wise Q&A and Objective type questions	Y				
12.	Unit wise course material		Y	Y	Y	
13.	Assignment question paper with sample answer sheets and mark entry		Y	Y	Y	
14.	Tutorial question paper with key and mark entry		Y	Y	Y	
15.	Class test/IA test Q Paper with Key, sample answer papers and mark entry		Y	Y	Y	
16.	IA Test- result analysis-CAP-evidence-root cause analysis.		Y	Y	Y	
17.	Retest –Q paper-Attendance-marks		Y	Y	Y	
18.	AU Web portal entry sheet		Y	Y	Y	
19.	Very poor performance in first two tests-action taken.-communication to parents-evidence			Y	Y	
20.	Absence for two tests-action taken-communication to parents-evidence.			Y	Y	
21.	Indiscipline of student reported, if any					
22.	Special class/coaching class/remedial class/attendance-CAP		Y	Y	Y	
23.	Conduct of Seminar, Quizzes - proof					
24.	Content beyond the syllabus - proof					Y
25.	Student feedback on faculty					Y
26.	Course end survey					Y
27.	Internal Assessment sheet					Y
28.	AU question paper with students feedback					Y
29.	Discrepancy of the question paper and correspondence, if any					Y
30.	AU result analysis-Details of arrear students.					Y
31.	AU grade sheet					Y
32.	CO – PO & PSO attainment sheet					Y
	Signature of Course handling faculty	Kaling	Kaling	Kaling	Kaling	Kaling
	Signature of HoD	Bairavy	Bairavy	Bairavy	Bairavy	Bairavy

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INDRA GANESAN COLLEGE OF ENGINEERING

Department of Civil Engineering

Work Load - EVEN Semester 2019-20

S.NO.	Teacher's Name	Course Code	Course Name	Semester	Lecture / week
1	Mr.S.Ramalingam	CE8601	Design of Steel Structural Elements	VI	5
2	Mr.R.Sivasankar	EN8592	Waste Water Engineering	VI	4
3	Mr.K.Sengottian	CE8602	Structural Analysis II	VI	4
		CE6811	Project Work	VIII	4
4	Ms.E.Vinodha	CE8404	Concrete Technology	IV	4
		CE6021	Repair and Rehabilitation of Structures	VIII	4
5	Ms.G.Bharani	CE6461	Hydraulic Engineering Laboratory	IV	4
		CE8402	Strength of Materials-II	IV	4
		CE8603	Irrigation Engineering	VI	4
		CE8612	Irrigation and Environmental Engineering Drawing	VI	4
6	Mr.K.Saravanan	CE8491	Soil Mechanics	IV	4
		MG6851	Principles of Management	VIII	4
		MG6851	Highway Engineering Lab	VI	4
7	Mr.M.Kaliraj	CE8403	Applied Hydraulic Engineering	IV	4
		CE8604	Highway Engineering	VI	4
		CE8481	Strength of Materials Lab	III	4
8	Mrs.K.Gaythri	GCE8001	Ground Improvement Techniques	VI	4
		CE6016	Prefabricated Structures	VIII	4
9	Mr.S.Dinesh Kumar	BE8252	Basic Civil and Mechanical Engineering	II	4
		CE8401	Construction Techniques and Practices	IV	4
		CE8211	Computer Aided Building Drawing	III	4

Time Table Co-ordinator

HoD

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CE8603 **IRRIGATION ENGINEERING** **L T P C**
3 0 0 3

OBJECTIVE:

- The student is exposed to different phases in irrigation practices and Planning and management of irrigation. Further they will be imparted required knowledge on Irrigation storage and distribution canal system and Irrigation management.

UNIT I CROP WATER REQUIREMENT **9**

Need and classification of irrigation- historical development and merits and demerits of irrigation-types of crops-crop season-duty, delta and base period- consumptive use of crops- estimation of Evapotranspiration using experimental and theoretical methods

UNIT II IRRIGATION METHODS **9**

Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub-Surface and Micro Irrigation – design of drip and sprinkler irrigation – ridge and furrow irrigation-Irrigation scheduling – Water distribution system- Irrigation efficiencies.

UNIT III DIVERSION AND IMPOUNDING STRUCTURES **9**

Types of Impounding structures - Gravity dam – Forces on a dam -Design of Gravity dams; Earth dams, Arch dams- Diversion Head works - Weirs and Barrages-

UNIT IV CANAL IRRIGATION **9**

Canal regulations – direct sluice - Canal drop – Cross drainage works-Canal outlets – Design of prismatic canal-canal alignments-Canal lining - Kennedy's and Lacey's Regime theory-Design of unlined canal

UNIT V WATER MANAGEMENT IN IRRIGATION **9**

Modernization techniques- Rehabilitation – Optimization of water use-Minimizing water losses- On form development works-Participatory irrigation management- Water resources associations-Changing paradigms in water management-Performance evaluation-Economic aspects of irrigation

TOTAL :45 PERIODS

OUTCOMES:

Students will be able to

- Have knowledge and skills on crop water requirements.
- Understand the methods and management of irrigation.
- Gain knowledge on types of Impounding structures
- Understand methods of irrigation including canal irrigation.
- Get knowledge on water management on optimization of water use.

TEXTBOOKS:

1. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
2. Punmia B.C., et. al; Irrigation and water power Engineering, Laxmi Publications, 16th Edition, New Delhi, 2009
3. Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009

Revised Edition, New Delhi, 2005

REFERENCES:

1. Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers, 2005
2. Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc, 2000
3. Chaturvedi M.C., "Water Resources Systems Planning and Management", Tata McGraw-Hill Inc., New Delhi, 1997.

4. Sharma R.K.. "Irrigation Engineering", S.Chand & Co. 2007.
5. Michael A.M., Irrigation Theory and Practice, 2nd Edition, Vikas Publishing House Pvt. Ltd., Noida, Up, 2008
6. Asawa, G.L., "Irrigation Engineering", NewAge International Publishers, New Delhi, 2000.
7. Basak, N.N, "Irrigation Engineering", Tata McGraw Hill Publishing Co. New Delhi,1999

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DEPARTMENT OF CIVIL ENGINEERING

Lecture Schedule

Degree/Program: **B. E.CIVIL ENG ENGINEERING**
Duration: **Jan 2020-June 2020**

Course code &Name: **CE8603** –IRRIGATION

Semester: **VI** Section: **A** Faculty: G.Bharani

OBJECTIVES:

- The student is exposed to different phases in irrigation practices and Planning and management of irrigation.
- To be required knowledge on Irrigation storage and distribution canal system and Irrigation management.

PREREQUISITES: Crop water requirement theory, Kennedy's and Lacey's Regime theory

COURSE OUTCOMES:

After the course, the student should be able to:

CO	Course Outcomes	Pos	PSOs
C303.1	Have knowledge and skills on crop water requirements	1,2,3,4,5,7,9,11,12	1,2,3
C303.2	Illustrate the methods and management of irrigation	1,2,4,7,9,11,12	1,2,3
C303.3	Gain knowledge on types of Impounding structures	1,2,4,5,7,9,11,12	1,2,3
C303.4	Derive the methods of irrigation including canal irrigation	1,2,4,7,9,11,12	1,2,3
C303.5	Get knowledge on water management on optimization of water use.	1,2,4,5,7,9,11,12	1,2,3
C303.6	The student will possess knowledge about irrigation and canals	1,2,4,7,9,11,12	1,2,3

S.NO	Period	Topics to be covered	Reference/ Teaching aids and methods	Planned date
UNIT I CROP WATER REQUIREMENT				
1	1	Definition – Classifications – Basic requirements	T1, R2/BB	02/01/2020
2	1	Cropping pattern and irrigation	T1, R2/BB	03/01/2020
3	5	Need and classification of irrigation	T1, R2/BB	04/01/2020
4	6	Historical development of irrigation	T1, R2/BB	06/01/2020
5	3	Merits and demerits of irrigation	T1, R2/BB	07/01/2020

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6	1	Types of crops in various season	T1, R2/BB	08/01/20
7	1	Crop season-duty, delta and base period	T1, R2/BB	09/01/20
8	5	Consumptive use of crops	T1, R2/BB	10/01/20
9	5,6	Estimation of Evapotranspiration using experimental and theoretical methods	T1, R2/BB	11/01/20
10	6	QUIZ		20/01/20
UNIT-II IRRIGATION METHODS				
11	1	Irrigation and its methods	T2, R4/BB	21/01/20
12	1	Tank and well irrigation	T2, R4/BB	22/01/20
13	3	Irrigation methods: Surface and Sub-Surface and Micro Irrigation	T2, R4/BB	22/01/20
14	5	Design of drip	T2, R4/BB	23/01/20
15	1	Design of sprinkler irrigation	T2, R4/BB	24/01/20
16	1	Ridge and furrow irrigation	T2, R4/BB	25/01/20
17	5	Irrigation scheduling	T2, R4/BB	25/01/20
18	5	Water distribution system	T2, R4/BB	27/01/20
19	6	Irrigation efficiencies	T2, R4/BB	28/01/20
20	6	QUIZ		
UNIT-III DIVERSION AND IMPOUNDING STRUCTURES				
21	1	Knowing about diversion	T3, R3/BB	29/01/20
22	5	Detailed on impounding structures	T3, R3/BB	30/01/20
23	6	Types on impounding Structures	T3, R3/BB	30/01/20
24	1	Gravity dam	T3, R3/BB	31/01/20
25	1	Forces on a dam	T3, R3/BB	01/02/20
26	5	Design of Gravity dams	T3, R3/BB	01/02/20
27	6	Design of Earth dams Arch dams	T3, R3/BB	03/02/20
28	5	Design of Arch dams	T3, R3/BB	04/02/20
29	5	Diversion Head works	T3, R3/BB	05/02/20
30	1	Weirs and Barrages	T3, R3/BB	05/02/20
UNIT IV CANAL IRRIGATION				
31	1	Canal regulations	T2, R6/BB	13/02/20

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32	1	Direct sluice	T2, R6/BB	14/02/20
33	3	Canal drop	T2, R6/BB	15/02/20
34	5	Cross drainage works-Canal outlets	T2, R6/BB	17/02/20
35	5	Design of prismatic canal	T2, R6/BB	18/02/20
36	6	Canal alignments	T2, R6/BB	19/02/20
37	3	Canal lining	T2, R6/BB	20/02/20
38	3	Kennedy's and Lacey's Regime theory	T2, R6/BB	21/02/20
39	1	Design of unlined canal	T2, R6/BB	22/02/20
40	1	QUIZ		24/02/20

UNIT V WATER MANAGEMENT IN IRRIGATION

41		Modernization techniques	T3, R2/BB	29/02/20
42	1	Rehabilitation	T3, R2/BB	02/03/20
43	1	Optimization of water use-Minimizing water losses	T3, R2/BB	03/03/20
44	3	On form development works	T3, R2/BB	04/03/20
45	5	Participatory irrigation management	T3, R2/BB	05/03/20
46	6	Water resources associations	T3, R2/BB	06/03/20
47	1	Changing paradigms in water management	T3, R2/BB	07/03/20
48	1	Performance evaluation	T3, R2/BB	09/03/20
49	3	Economic aspects of irrigation	T3, R2/BB	10/03/20
50	3	QUIZ		10/03/20

Book Reference - Text Books

Sl.	Title of the Book	Author	Publisher	Year
1.	Irrigation Water Management	Dilip Kumar Majumdar	Prentice-Hall of India, New Delhi	2008
2.	Irrigation and water power Engineering	Punmia B.C., et. al	Laxmi Publications, 16th Edition, New Delhi	2009
3.	Irrigation Engineering and Hydraulic structures	Garg S. K.,	Khanna Publishers, 23rd Revised Edition, New Delhi	2009

Book Reference – References

Sl	Title of the Book	Author	Publisher	Year
1.	Elements of Water Resources Engineering, Water Resources Engineering	Duggal, K.N. Soni, J.P Linsley R.K. Franzini J.B.	New Age International Publishers McGraw-Hill Inc	2000 and 2005

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2.	Irrigation Engineering	Sharma R.	S.Chand & Co	2007
3.	Irrigation Theory and Practice	Michael A.M	Vikas Publishing House Pvt. Ltd., Noida, Up, 2nd edition	2008
4	Irrigation Engineering	Asawa, G.L Basak, N.N	NewAge International Publishers, New Delhi&Tata McGraw Hill Publishing Co. New Delhi	1999, 2000

Signature of the Faculty in-charge

HoD / Civil

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DEPARTMENT OF CIVIL ENGINEERING

Identification of Curricular Gap & Content Beyond Syllabus(CBS)

Name of the Faculty : G.Bharani **Course Code & Name: CE8603/Irrigation Engineering**
Degree & Program: B.E.CIVIL ENG Semester & Section: VI/ A **Academic Year: 2019 -2020 /EVEN**

I. Mapping of Course Outcomes with POs & PSOs. (before CBS)

Table.1 Mapping of COs, C, PSOs with POs - before CBS.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C303.1	3	3	-	3	2	-	2	-	2	-	3	2	3	3	1
C303.2	3	3	-	3	-	-	2	-	2	-	3	2	3	3	1
C303.3	3	3	-	3	2	-	1	-	2	-	3	2	3	3	1
C303.4	3	3	-	3	-	-	2	-	1	-	3	2	3	3	1
C303.5	3	3	-	3	2	-	2	-	2	-	3	2	3	3	1
C303.6	3	3	-	3	-	-	1	-	1	-	3	2	3	3	1
Cos,Pos	3	3	-	3	2	-	2	-	2	-	3	2	3	3	1

II. Identification of content beyond syllabus.

Table.2 Identification of content beyond syllabus

Details of Content Beyond Syllabus (CBS) added	POs strengthened/ vacant filled	CO/Unit
Vertical (hydroponics)	PO8(2)&PO10(1) Vacant filled	C303.3 & C303.4/ III & IV

III. Mapping of Course Outcomes with POs & PSOs. (After CBS)

Table.3 Mapping of COs, C, PSOs with POs- after CBS.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C206.1	3	3	-	3	2	-	2	-	2	-	3	2	3	3	1
C206.2	3	3	-	3	-	-	2	-	2	-	3	2	3	3	1
C206.3	3	3	-	3	2	-	1	2	2	-	3	2	3	3	1
C206.4	3	3	-	3	-	-	2	-	1	1	3	2	3	3	1
C206.5	3	3	-	3	2	-	2	-	2	-	3	2	3	3	1
C206.6	3	3	-	3	-	-	1	-	1	-	3	2	3	3	1
Cos,POs	3	3	-	3	2	-	2	-	2	-	3	2	3	3	1

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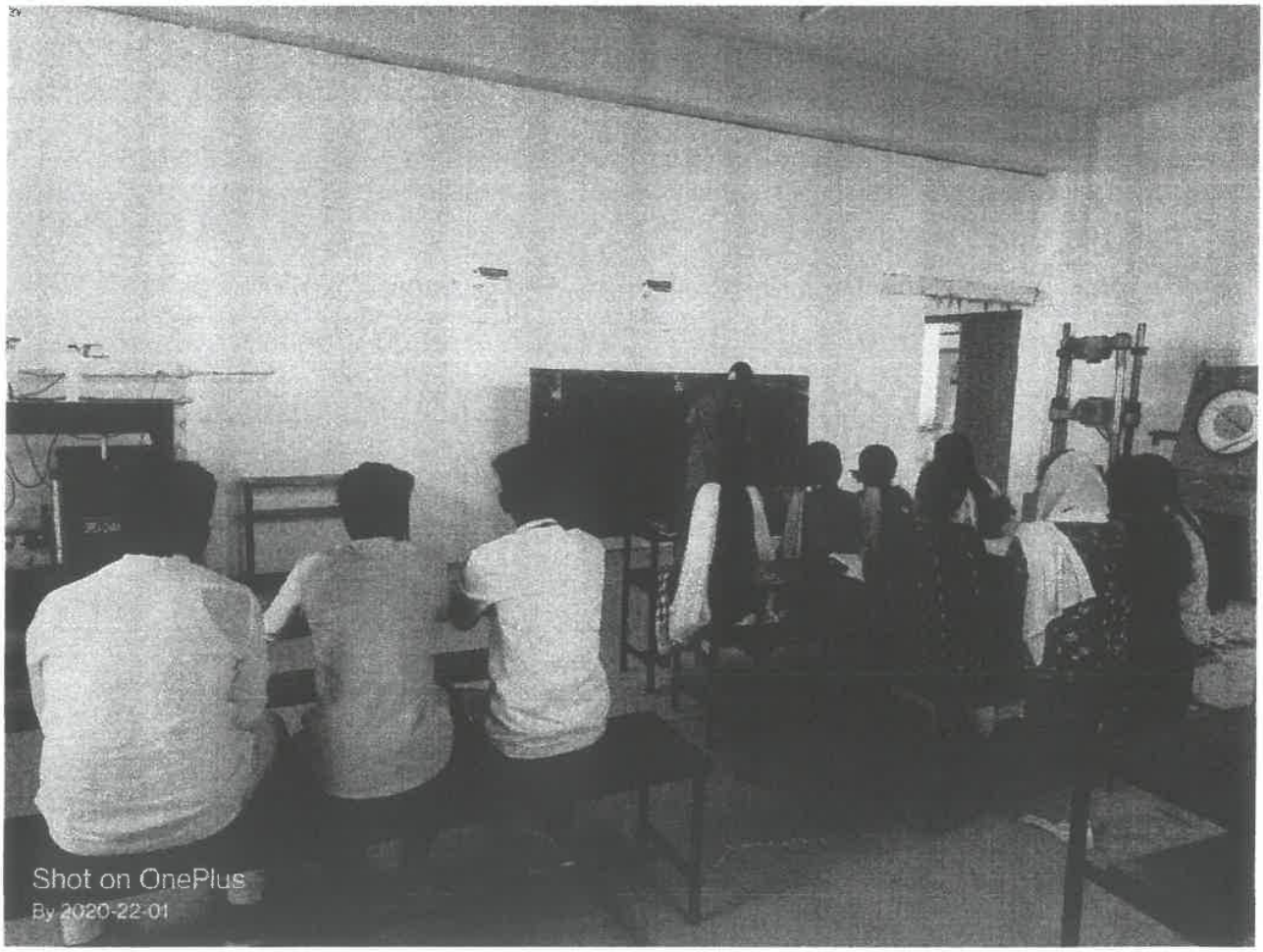
DEPARTMENT OF CIVILENGINEERING

CBS-PROOF

ACADEMIC YEAR: 2019-2020 (EVEN) **SEM:** 06 **REGULATION:** 2017

PROGRAM: CIVIL **NAME OF THE FACULTY: G.BHARANI(AP) (AP)**

TOPIC: VERTICAL (HYDROPONICS)



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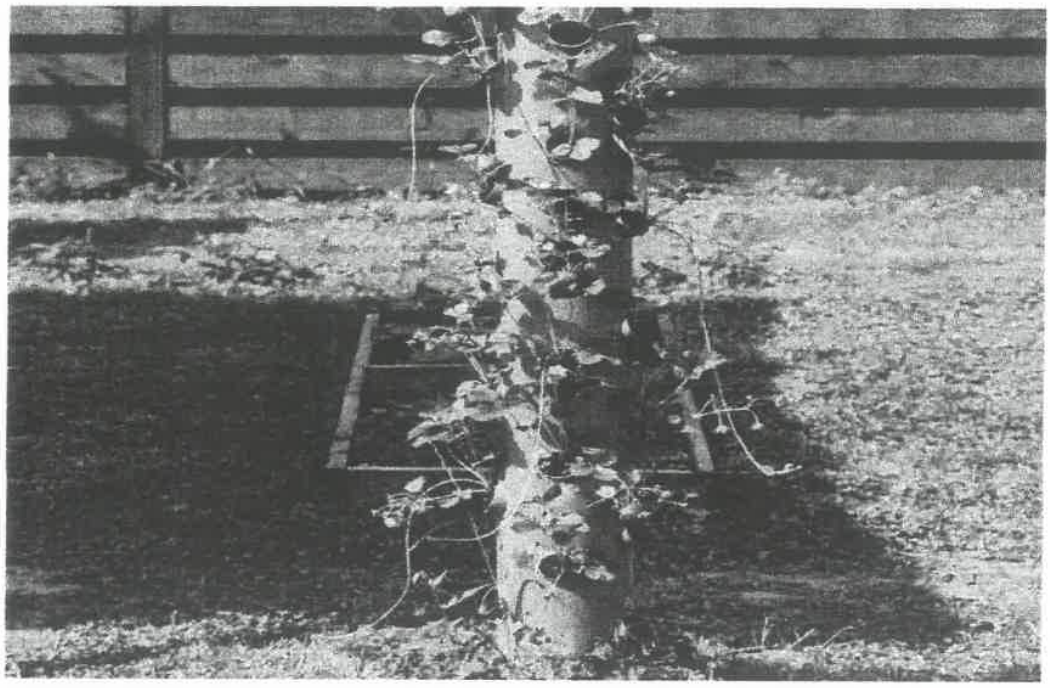
MATERIALS (PROOF)



Vertical farming is the growing of crops in vertically stacked layers. Vertical hydroponics is the combination of hydroponics and vertical farming.
Tower hydroponics, tower gardens, vertical grow systems
In modern times, hydroponics and vertical gardening seem made for each other. Using soil as growing medium increases the weight of a vertical garden system. Hydroponics on other hand can reduce the overall weight of the upper layers by atleast 30%, if not more.

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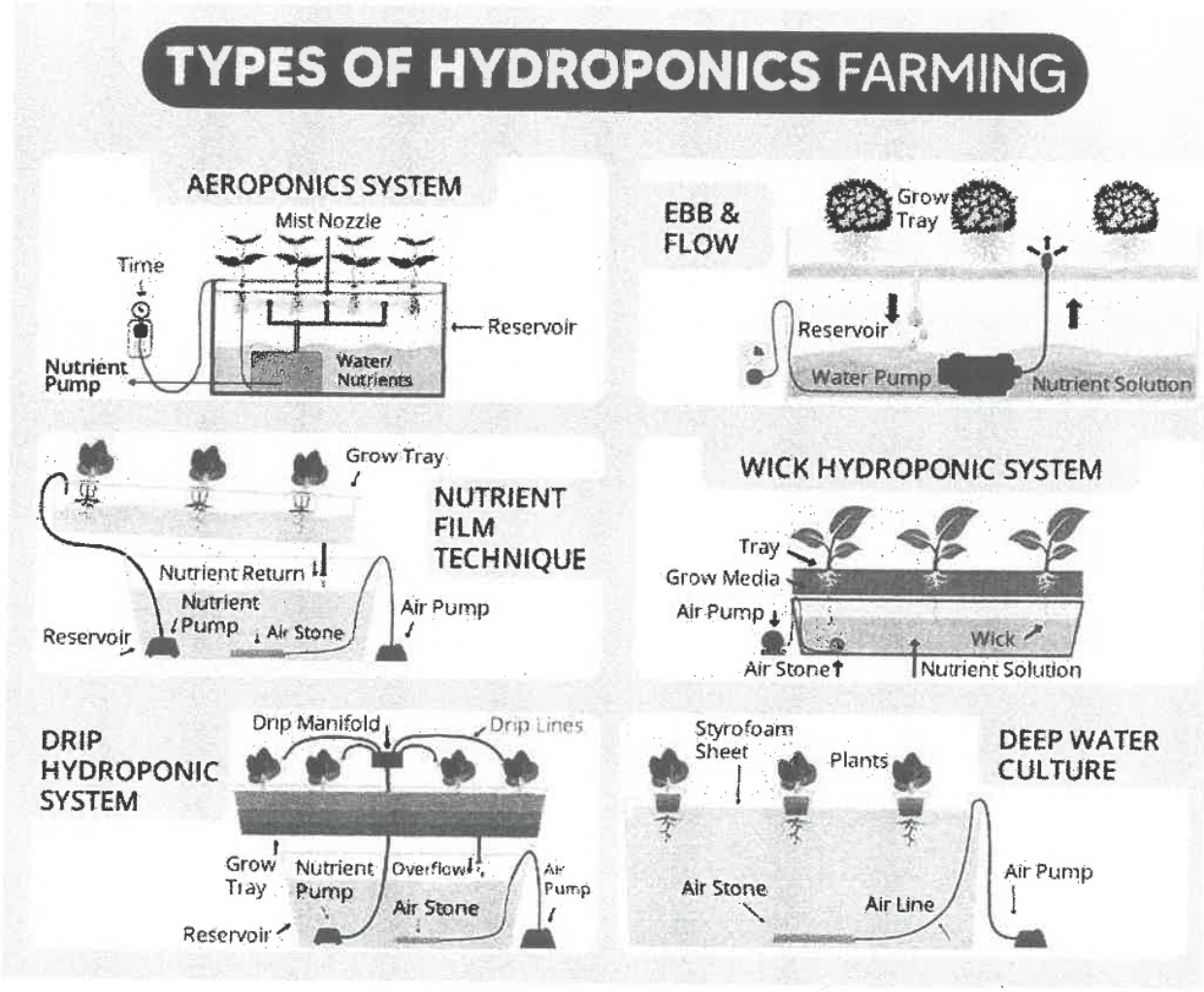

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Signature of the Faculty

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DEPARTMENT OF CIVIL ENGINEERING

Assignment Question Paper

Assignment – 01			Date of Issue:	07.01.2020	Marks	10
Course code	CE8603	Course Title	IRRIGATION ENGINEERING			
Year	III	Semester/Section	VI / A	Date of Submission:	23.01.2020	

Q.No	Questions	CO
1	Explain the classification of irrigation	C303.1
2	Define well irrigation?	C303.2

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Name and Signature of the Faculty Incharge

HoD/CIVIL

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DEPARTMENT OF CIVIL ENGINEERING

Assignment Answer Sheet

Name of the Student : GAYATHRI A

AU Register Number: 811217103009

Assignment – 01			Date of Issue:	07.01.2020	Marks	10
Course code	CE8603	Course Title	IRRIGATION ENGINEERING			
Year	III	Semester/Section	VI / A	Date of Submission:	23.01.2020	

Q.No	Questions	CO
1	Explain the classification of irrigation	C303.1
2	Define well irrigation?	C303.2

Mark Allocation

Rubrics	Marks Allocated	Marks obtained
Content Quality	6	5
Presentation Quality	2	2
Timely submission	2	2
Total marks	10	9

9/10

G. BHARANI G. B
Name and Signature of the Faculty Incharge

HoD/Civil

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Register Number:												

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IA Exam - I			Date/Session	21.01.20/FN	Marks	50
Course code	CE8603	Course Title	IRRIGATION ENGINEERING			
Regulation	2017	Duration	90 min	Academic Year	2019-20	
Year	III	Semester	VI	Department	CIVIL	

COURSE OUTCOMES	
C303.1	Have knowledge and skills on crop water requirements
C303.2	Illustrate the methods and management of irrigation
C303.3	Gain knowledge on types of Impounding structures
C303.4	Derive the methods of irrigation including canal irrigation
C303.5	Get knowledge on water management on optimization of water use
C303.6	The student will possess knowledge about irrigation and canals

Q.No.	Question	CO	BTS
	PART A (Answer all the Questions 10 x 2 = 20 Marks)		
1	Define irrigation.	CO1	K1
2	List the advantages of irrigation.	CO1	K1
3	Name the types of irrigation	CO1	K2
4	Classify sprinkler systems	CO1	K1
5	What are the advantages of sprinkler irrigation	CO1	K2
6	Define tank irrigation	CO2	K1
7	What is Micro irrigation?	CO2	K2
8	Classify the types of canals.	CO2	K1
9	Define Net irrigation.	CO2	K1
10	Discuss the disadvantages of sub surface irrigation	CO2	K1
	PART B (Answer all the Questions 2 x 10 = 20 Marks)		
11a	Define Irrigation? What are the merits and demerits of irrigation?	CO1	K2
	OR		
11b	Define consumptive use of water. Explain the Factors affecting consumptive use of Water	CO1	K2
12a	List the merits and demerits of tank irrigation.	CO2	K4
	OR		
12b	Infer the advantages and disadvantages of drip irrigation system.	CO2	K4
	PART C (Answer all the Questions 1 x 10 = 10 Marks)		
13a	List and write a detailed note on the Experimental methods to calculate the Evapotranspiration.	CO1	K1
	OR		
13b	Explain the following terms: (i) Soil water (ii) Soil available water (iii) Water holding capacity (iv) Soil-water-plant relationship	CO1	K3

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ANSWER KEY

Q.No.	Question	CO	BTS
	PART A **(Answer all the Questions 10 x 2 = 20 Marks)**		
1	Define irrigation. Irrigation is defined as the science of artificial applications of water to the land in accordance with the crop requirement.	CO1	K1
2	List the advantages of irrigation. • Increase in food production • Optimum benefits • General prosperity • Afforestation	CO1	K1
3	Name the types of irrigation • surface irrigation • sub-surface irrigation	CO1	K2
4	Classify the types of sprinkler systems? • Permanent system • Semi-permeable system • Portable system	CO1	K1
5	What are the advantages of sprinkler irrigation? • Land leveling is not required • Fertilizers can be uniformly applied • It is less labour oriented	CO1	K2
6	Define tank irrigation An irrigation tank is an artificial reservoir of any size. It utilizes tanks and connected to direct water to the crops. This surface irrigation method can be used to grow crop like rice.	CO2	K1
7	What is Micro irrigation? Micro irrigation is a modern method of irrigation by this methods water is irrigated through drippers, sprinklers, foggers and by other emitters on surface or subsurface of the land.	CO2	K2
8	Classify the types of canals? • Permanent canal • Irrigation canal • Feeder canal • Navigation canal	CO2	K1
9	Define tank irrigation An irrigation tank is an artificial reservoir of any size. It utilizes tanks and connected to direct water to the crops. This surface irrigation method can be used to grow crop like rice.	CO2	K1
10	What is Micro irrigation? Micro irrigation is a modern method of irrigation by this methods water is irrigated through drippers, sprinklers, foggers and by other emitters on surface or subsurface of the land.	CO2	K1
	PART B **(Answer all the Questions 2 x 10 = 20 Marks)**		
11a	Define Irrigation? What are the merits and demerits of irrigation? Irrigation is defined as the science of artificial applications of water to the land in	CO1	K2

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	accordance with the crop requirement. **Merits of irrigation:** o Insufficient rainfall will make it challenging to meet the need for water. The shortfall brought on by inadequate rainfall is attempted to be overcome via irrigation. In drought years, irrigation therefore helps. o Crop yields are increased, and irrigation increases local livelihoods. Thus, the people's quality of life is raised. o Additionally, irrigation increases the nation's wealth in two ways. Irrigation firstly makes the country self-sufficient in food needs by producing abundant harvests. Second, the revenue increases because irrigation is taxed when provided to the producers. o With irrigation, farmers may plant cash crops that yield higher returns than the regular crops they could have produced without irrigation. The cash crops include potatoes, tobacco, sugarcane, and fruit gardens. o Large irrigation channels may occasionally be utilized for communication. o A hydroelectric power plant might be built using the falls that intersect irrigation channels. o It is essential to consider the domestic benefits. Improved freshwater circulation and easier access to it are two benefits of irrigation. o As water lost through seepage increases groundwater storage, irrigation increases it. o Planting may be done effectively along the banks of substantial irrigation channels, which not only aids in introducing social forestry but also enhances the environmental condition of the area. o When there are natural disasters, new irrigation projects are developed to give big population jobs. These projects are referred to as relief or disaster works. The value of dry land increases when irrigation facilities are made available		
	OR		
11b	Define consumptive use of water. Explain the Factors affecting consumptive use of Water Define consumptive use of water. Explain the Factors affecting consumptive use of Water **Consumptive water use** is water removed from available supplies without return to a water resource system (e.g., water used in manufacturing, agriculture, and food preparationn that is not returned to a stream, river, or water treatment plant). Evaporation from the surface of the earth into clouds of water in the air which then falls to the ground as "rain" is excluded from this model. Crop consumptive water use is the amount of water transpired during plant growth plus what evaporates from the soil surface and foliage in the crop area. The portion of water consumed in crop production depends on many factors, especially the irrigation technology. Factors affecting the consumptive use of water: 1. Evaporation which depends on humidity 2. Mean Monthly temperature 3. Growing season of crops and cropping pattern 4. Monthly precipitation in area 5. Wind velocity in locality 6. Soil and topography 7. Irrigation practices and method of irrigation 8. Sunlight hours	CO1	K2
12a	List the merits and demerits of tank irrigation. Merits of tank irrigation: • **Water conservation** – Tank irrigation systems collect and store rainwater, allowing	CO2	K4

	farmers to conserve water and use it during dry periods. • **Flexibility** – Tank irrigation systems can be used for irrigation at any time, making it suitable for a wide range of crops. • **Cost-effective** – Tank irrigation systems can be a cost-effective solution as it reduces the dependence on municipal water supply, thus reducing water bills. • **Suitable for small scale farming** – Tank irrigation systems are suitable for small scale farming as it can be easily installed and maintained. • **Enhancing soil moisture** – Tank irrigation systems can help to maintain soil moisture and improve the overall health of the crops. Demerits of tank irrigation: • **Limited water supply** – Tank irrigation systems rely on rainwater or other sources of water, which may not be sufficient during dry periods or droughts. • **High maintenance** – Tank irrigation systems require regular cleaning and maintenance to prevent the growth of algae or bacteria. • **Limited to small scale** – Tank irrigation systems may not be suitable for large scale farming as it may require a large number of tanks to irrigate a large area. • **Risk of contamination** – Tank irrigation systems may be at risk of contamination if not properly cleaned and maintained. **Space requirement** – Tank irrigation systems require a significant amount of space to store water, which may not be feasible for some farmers who have limited space on their property.		
	OR		
12b	Infer the advantages and disadvantages of drip irrigation system. Advantages: Saving Water and Costs: Drip irrigation reduces operating costs, which is a fundamental issue in this new method. Drip systems require less water than other common irrigation systems. For example, in orchards of young trees, drip irrigation uses only half of the water needed for sprinkler or surface irrigation. As trees grow older, water savings using drip systems decrease, however, due to the scarcity and high cost of water, effective drip irrigation is still important to many gardeners. The labor cost for irrigation can be reduced because, in the drip system, it is enough to the water distribution and start the system. These settings are done by automatic devices that do not require many workers. Use of Salt Water: Frequent watering keeps the soil moisture at a level where it does not fluctuate between very dry and very wet states, and most parts of the soil have enough air. Keeping the soil wet between irrigations causes the salts in the solution to be more diluted. For this reason, in the drip system, water with more salinity can be used than other irrigation methods. Used in rocky soils and steep slopes: drip irrigation systems can be designed in such a way that in every topography can be used effectively. In rocky lands, even if the distance between the trees is irregular, and their sizes are different, drip irrigation can be used effectively because the water is distributed very close to each tree. Disadvantages: Soil Conditions: Some soils do not have enough final infiltration speed to receive the discharge of drippers which leads to runoff or waterlogging conditions. Given a discharge rate of 1 gallon per hour, the soil must have a final infiltration rate of 0.5 inches per hour so that the diameter of the wetted circle around the dripper does not exceed 2 feet. Hazards: If uncontrolled events stop irrigation, the plant is quickly damaged, because the ability of the roots to take up water and nutrients is limited to a relatively small part of the wetted soil. Rodents chew polyethylene sub-pipes; to solve this problem and control rodents, you should use PVC sub-pipes. Salt Accumulation: Salts accumulate on the soil surface, and cause a potential risk for the plant, as light rains transmit minerals to the root of the plant. Therefore, when it rains after the salt accumulation, the irrigation should continue as planned, to enter the soil as much as 5 cm, and remove the salts from the root of the plant	CO2	K4
	PART C **(Answer all the Questions 1 x 10 = 10 Marks)**		
13a	List and write a detailed note on the Experimental methods to calculate the Evapotranspiration. Evapotranspiration (ET): The combination of two separate processes whereby water is lost on the one hand from the soil surface by evaporation and on the other hand from the crop by transpiration is referred to as evapotranspiration (ET)	CO1	K1

	Pan Evaporation Method Evaporation pans provide a measurement of the combined effect of temperature, humidity, wind speed and sunshine on the reference crop evapotranspiration ETo The principle of the evaporation pan is the following: the pan is installed in the field the pan is filled with a known quantity of water (the surface area of the pan is known and the water depth is measured) the water is allowed to evaporate during a certain period of time (usually 24 hours). For example, each morning at 7 o'clock a measurement is taken. The rainfall, if any, is measured simultaneously after 24 hours, the remaining quantity of water (i.e. water depth) is measured the amount of evaporation per time unit (the difference between the two measured water depths) is calculated; this is the pan evaporation: E pan (in mm/24 hours). **Lysimeters** A lysimeter is a measuring device which can be used to measure the amount of actual evapotranspiration which is released by plants, usually crops or trees. By recording the amount of precipitation that an area receives and the amount lost through the soil, the amount of water lost to evapotranspiration can be calculated. Lysimeters are of two types: Weighing and non-weighing. A lysimeter is most accurate when vegetation is grown in a large soil tank which allows the rainfall input and water lost through the soil to be easily calculated. The amount of water lost by evapotranspiration can be worked out by calculating the difference between the weight before and after the precipitation input. **Factors affecting evapotranspiration**: Weather parameters, crop characteristics, management and environmental aspects are factors affecting evaporation and transpiration. The related ET concepts presented in Figure 3 are discussed in the section on evapotranspiration concepts. 1. Weather parameters: The principal weather parameters affecting evapotranspiration are radiation, air temperature, humidity and wind speed. The evaporation power of the atmosphere is expressed by the reference crop evapotranspiration (ETo). The reference crop evapotranspiration represents the evapotranspiration from a standardized vegetated surface. 2. Crop factors: The crop type, variety and development stage should be considered when assessing the evapotranspiration from crops grown in large, well-managed fields. Differences in resistance to transpiration, crop height, crop roughness, reflection, ground cover and crop rooting characteristics result in different ET levels in different types of crops under identical environmental conditions. 3. Management and environmental conditions: Factors such as soil salinity, poor land fertility, limited application of fertilizers, the presence of hard or impenetrable soil horizons, the absence of control of diseases and pests and poor soil management may limit the crop development and reduce the evapotranspiration. Other factors to be considered when assessing ET are ground cover, plant density and the soil water content. The effect of soil water content on ET is conditioned primarily by the magnitude of the water deficit and the type of soil. On the other hand, too much water will result in water logging which might damage the root and limit root water uptake by inhibiting respiration.		
	OR		
13b	Explain the following terms: (i) Soil water (ii) Soil available water (iii) Water holding capacity (iv) Soil-water-plant relationship (i). solid water: Water exists in all three forms of matter solid, liquid and gas. The solid form of water is ice. Ice is less dense than water as when water freezes, its molecules move farther apart. The intermolecular forces in a solid are stronger than that of liquids.eg. on earth , water is found in solid form as ice caps etc a very small quantity of water is present in the form of solid water on earth. (ii). Soil available water: Available water is the difference between field capacity which is the maximum amount of water the soil can hold and wilting point water the plant can no longer extract water from the soil. Water holding capacity is the total amount of water a soil can hold at field capacity. (iii).water holding capacity: Water holding capacity is the ability of a certain soil texture to physically hold water against the force of gravity. It does this by soil particles holding water molecules by the force of cohesion (iv). Soil water plant relationship: Soil acts as a medium for plant roots, a plant receives its food, water and air, all from the soil. Water is required by plants to carry out metabolic activities like photosynthesis, respiration, and the synthesis and degradation of organic compounds. Water is an important constituent of the plant cells; it is absorbed by the roots and travels through the stems to the chloroplast in the leaves. Water also carries large amount of nutrients from the soil to the plant. ***Soil Forming Elements*** Soil is a four phase system based on the elements it is comprised of, the phases of soil are:	CO1	K3

- Solid Elements (made of minerals, organic matter & various chemical compounds)
- Liquid Elements (Soil moisture)
- Gaseous Elements (Soil Air)
- Biological Elements (Living organisms)

Physical Particles forming the Soil are:

- Sand (0.02 – 2.00 mm)
- Silt (0.002 – 0.02 mm)
- Clay (< 0.002 mm)

Soil Structure

- The volume that is not occupied by solid particles forms the soil pore space.
- The total pore space comprises of micro (Capillary pores) and macro pores.
- The ratio between them depends on the soil structure and texture.
- Fine textured soils (Heavy) contain high percentage of micro pores (Capillary Pores).
- Coarse textured soils (Light) contain high percentage of macro pores.
- The micro pores (Capillary Pores) make a soil -water reservoir.
- It is in these pores that water is retained under surface tension to later be used by the plants.
- From the macro pores, water drains downwards, under gravity, leaving behind air that is essential for proper plant growth.
- The Density of Heavy soil is less (approx. 1.2 gm/cm3), compared to the Medium Soil (1.4 gm/cm3) & Light Soil (1.55 gm/cm3)

Soil Conditions Based On The Moisture Content Are:

- Saturated Condition- All soil pores are full of water, soil air is absent.
- Field Capacity- There is water only in Micro or Capillary Pores & the air is in Macro Pores after the water is drained.

Wilting Point- Water is stuck in the soil particles forming micro (capillary) Pores, not useful for plants.

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Course Faculty

HoD

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(Approved by AICTE, New Delhi and affiliated to Anna University, Chennai)

Internal Assessment Test Answer Book

Name	A. Gayathri			Year/ Semester/Section	III/VI/A
Batch No.	8112171 03009	Date/Session		Department	CIVIL
Course code	CE8603	Course Title	Irrigation Engineering		
Internal Assessment Test		IAT 1 ☑	IAT 2 ☐	IAT 3 ☐	Model ☐
Name and Signature of the Invigilator with date					

Instruction to the Student: Put tick mark to the question attended in the column against question

Part A			Part B / Part C						Total Marks
Q. No.	✓	Marks	Q. NO.	✓	a Marks	✓	b Marks		
1		1	11		10		-		10
2		2	12		-		10		10
3		-	13		-		10		10
4		2	14						
5		2	15						
6		2	16						
7		2						Total	30
8		2	Grand Total			Name and Signature of the Examiner with date			
9		2	47/50						
10		2							
Total		17							

To be filled by the examiner							
Course Outcomes	1	2	3	4	5	6	Total
Marks allotted	30	20	-	-	-	-	50
Marks Obtained	30	17	-	-	-	-	47
IQAC Audit - Remarks						Name and Signature of the IQAC member	

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INDRA GANESAN COLLEGE OF ENGINEERING

IG VALLEY, MANIDANDAM, TIRUCHIRAPPALLI – 620 012

DEPARTMENT OF CIVIL ENGINEERING

ACADEMIC YEAR 2019– 2020 (EVEN SEMESTER)

STUDENTS MARK STATEMENT- CO BASED

AIE-I

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SUBJECT CODE &TITLE: CE8603-IRRIGATION ENGINEERING

YEAR/SEM: III/VI **MONTH & YEAR: APR/2020**

S.NO	REG NO	STUDENT NAME	CO1	CO2	TOTAL (50)	TOTAL (100)
1.	811217103001	Aishwarya P	24	17	41	82
2.	811217103002	Akash	20	13	33	66
3.	811217103003	Arockiya Renaldo J	23	12	35	70
4.	811217103004	Avinash Kumar R	22	10	32	64
5.	811217103007	Balasubramani R	21	17	38	76
6.	811217103008	Deepan S.K	25	12	37	74
7.	811217103009	Gayathri A	29	18	47	94
8.	811217103010	Kokila P	24	17	41	82
9.	811217103011	Manikandan G	19	18	37	74
10.	811217103012	Monika M	12	10	22	44
11.	811217103014	Navaneetha Krishnan K	26	18	44	88
12.	811217103015	Saleem Khan S			AB	AB
13.	811217103016	Sathish Kumar S	25	17	42	82
14.	811217103301	Thamarai Selvi K			AB	AB
15	811217103302	Arun Prasath R	21	13	34	68
16	811217103303	Joel Fernandez R	20	10	30	60
17	811217103303	Sumithra R	25	16	41	82
18	811217103304	Thirupathi G	24	16	40	80

MARKS RANGE:

<20	20-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
0	0	0	1	1	4	5	5	1

Total No.of Candidates Present	**16**
Total No.of Candidates Absent	**02**
Total No.of Students Pass	**15**
Total No. of Students Fail	**1**
Percentage of Pass	**90%**

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STAFF INCHARGE **HoD/CIVIL** **PRINCIPAL**

Register Number:												

INDRA GANESAN COLLEGE OF ENGINEERING

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(Approved by AICTE, New Delhi and affiliated to Anna University, Chennai)

RETEST – I			Date/Session	31.01.20/FN	Marks	50
Course code	CE8603	Course Title	IRRIGATION ENGINEERING			
Regulation	2017	Duration	90 minutes	Academic Year	2019-2020	
Year	III	Semester	VI	Department	CIVIL	

COURSE OUTCOMES

C303.1	Have knowledge and skills on crop water requirements
C303.2	Illustrate the methods and management of irrigation
C303.3	Gain knowledge on types of Impounding structures
C303.4	Derive the methods of irrigation including canal irrigation
C303.5	Get knowledge on water management on optimization of water use
C303.6	The student will possess knowledge about irrigation and canals

Q.No.	Question	CO	BTS
	PART A (Answer all the Questions 10 x 2 = 20 Marks)		
1	Define irrigation.	CO1	K1
2	List the advantages of irrigation.	CO1	K1
3	Name the types of irrigation	CO1	K2
4	Classify sprinkler systems	CO1	K1
5	What are the advantages of sprinkler irrigation	CO1	K2
6	Define tank irrigation	CO2	K1
7	What is Micro irrigation?	CO2	K2
8	Classify the types of canals.	CO2	K1
9	Define Net irrigation.	CO2	K1
10	Discuss the disadvantages of sub surface irrigation	CO2	K1
	PART B (Answer all the Questions 2 x 10 = 20 Marks)		
11a	Define Irrigation? What are the merits and demerits of irrigation?	CO1	K2
	OR-		
11b	Define consumptive use of water. Explain the Factors affecting consumptive use of Water	CO1	K2
12a	List the merits and demerits of tank irrigation.	CO2	K4
	OR		
12b	Infer the advantages and disadvantages of drip irrigation system.	CO2	K4
	PART C (Answer all the Questions 1 x 10 = 10 Marks)		
13a	List and write a detailed note on the Experimental methods to calculate the Evapotranspiration.	CO1	K1
	OR		
13b	Explain the following terms: (i) Soil water (ii) Soil available water (iii) Water holding capacity (iv) Soil-water-plant relationship	CO1	K3

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HoD/CIVIL

INDRA GANESAN COLLEGE OF ENGINEERING

IG VALLEY, MANIDANDAM, TIRUCHIRAPPALLI – 620 012

DEPARTMENT OF CIVIL ENGINEERING

ACADEMIC YEAR 2019 – 2020 (EVEN SEMESTER)

STUDENTS MARK STATEMENT- CO BASED

RETEST

SUBJECT CODE &TITLE: CE8603-IRRIGATION ENGINEERING

YEAR/SEM: III/VI **MONTH & YEAR: APR/2020**

S.NO	REG NO	STUDENT NAME	CO1	CO2	TOTAL (50)	TOTAL (100)
1.	811217103012	Monika M	27	14	41	82
2.	811217103303	Joel Fernandez R	25	15	40	80
3.	811217103004	Avinash Kumar R	20	15	35	70

MARKS RANGE:

<20	20-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
0	0	0	0	0	1	1	2	0

Total No.of Candidates Present	3
Total No.of Candidates Absent	0
Total No.of Students Pass	3
Total No. of Students Fail	0

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STAFF INCHARGE **HoD/CIVIL** **PRINCIPAL**

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IQAC Academic Audit Form

ACADEMIC YEAR 2019-2020 EVEN SEMESTER

Name of Department: CIVIL | Year / Sem / Sec: III / VI / A | No. of Students Registered: 13

Details of Examination: MODEL EXAM

S. No.	Course Code	List of Reg.No Verified	Course Log Book Verified (Y / N)	Course File Verified (Y / N)	No of students Attended	No of Absentees	No of Failures	Pass %	Remarks
1	CE8402	811217103011 811217103303	Y	Y	12	1	1	90%	–
2	MA6851	811217103001 811217103010	Y	Y	13	–	2	85%	–
3	CE8401	811217103016 811217103304	Y	Y	12	–	2	80%	
4	CE8612	811217103012 811217103302	Y	Y	13	1	1	90%	–
5	CE8211	811217103304 811217103309	Y	Y	13	–	2	90%	–
6	EN8592	811217103302 811217103303	Y	Y	12	1	1	70%	–

Verified by

External Member Name and Signature:

Internal Member Name and Signature:

Overall Remarks:

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HoD/CIVIL | IQAC Co-ordinator | Principal

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IG Valley, Manikandam, Tiruchirappalli, Tamil Nadu – 620 012, India

(Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai-25)

DEPARTMENT OF CIVIL ENGINEERING

ROOT CAUSE ANALYSIS

Name of the Faculty : G. BHARANI
Degree & Program : B.E CIVIL ENGINEERING
IA Test : IA Test / I
Target : 85 %

Course Code & Name : CE8603 / Irrigation Engineering
Semester & Section : VI / A
University Exam/Month & Year: Apr / 2020
Achieved : 90.1

S.NO	BATCH NO	NAME OF THE STUDENT	CAUSES FOR FAILURE	CORRECTIVE ACTION TAKEN	PREVENTIVE ACTION TAKEN	FOLLOWUP STATUS	REMARKS OF THE HOD
1.	811271103012	M. Monika	Family function	Re-test conducted	Advised to care health & avoid leave	–	–
2.	811271103303	Joel fernandez R	Health Issue	Re-test conducted	Advised to care health	–	–
3.	811217103014	R. Avinash kumar	Health Issue	Re-test conducted	Advised to take care health	–	–

G. Bharani
Signature of the Faculty Member

Sivasony
Signature of the HoD/Civil

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