THE ASSAM
ROYAL GLOBAL UNIVERSITY
GUWAHATI

DEPARTMENT OF
MATHEMATICS

COURSE FILE
FOR
Operations Research-I
(MAT014D103)
2022-2023

GUWAHATI, ASSAM INDIA

Vision of the Department

To offer a integrated teaching and research opportunities to create global citizens.

Mission of the Department

- To achieve academic excellence through innovatively designed, research intensive, industry-oriented course curriculum;
- To incorporate community service to install ethical conduct and compassion amongst the students.
- To nurture student creativity, critical thinking, communication, and management skills.
- To give back responsible leaders to society who are capable of enriching the future by bringing positive transformation to the world.

Program Specific Outcomes (PSO)

PSO 1: Enable a student to be better and effective communicator of mathematics by written, computational and graphical means.

PSO 2: Ability to illustrate mathematical ideas from basic theorems and \ axioms.

PSO 3: Ability to apply mathematics to solve, analyze theoretical problems of mathematics.

PSO-4: Enable a student to identify applications of mathematics in other disciplines and in the real-world, leading to enhancement of career prospects in a relevant fields.

Program Outcomes (PO)

PO1: Disciplinary Knowledge:

Acquire knowledge and coherent understanding of different topic of Mathematics and its applications to different fields.

PO2: Ability to solve complex problems solving:

Capacity to use the earned knowledge to solve different non-familiar problems and apply the learning to real world situations; capability to solve problems in computer graphics using concepts of linear algebra; Capability to apply the acquired knowledge in differential equations to solve specific problems in other disciplines.

PO3: Develop analytical & critical thinking:

Able to apply analytical methods to solve various problems appearing in different branches of mathematics and analyze the results and think critically to understand the involved rules or principles of mathematics.

PO4: Develop the ability to creativity:

Able to think 'out of the box' and find solutions to complex problems of mathematics by adopting innovative and imaginative ideas.

PO5: Develop effective communications skills:

Capability to express various concepts of mathematics in effective and coherent manner using examples and visualizing their geometrical meaning both in writing and speaking; ability to present the complex mathematical ideas in clear, precise and confident way; ability to explain the development and importance of mathematics in various scientific developments; capability to communicate thoughts and views in mathematically or logically correct statements.

PO6: Develop research-related skills:

i) Potentiality to think and inquire about relevant/appropriate questions, ability to define problems, formulate and test hypotheses, formulate mathematical arguments and proofs, draw conclusions; ability to write the obtained results clearly.

ii) To know about the developments in various branches of mathematics.

PO7: Develop ability for collaboration/team work:

Able to work effectively and respectfully with diverse teams in the interests of a common cause and work efficiently as a member of a team in group project work.

PO8: Develop leadership qualities:

Able to develop leadership qualities by enhancing problem-solving skills, decision-making abilities, critical thinking, communication skills, strategic thinking, resilience, perseverance, collaboration, and teamwork.

PO9: Develop digital and technological skills:

Ability to use ICT and other online tools in solving problems or earning knowledge. Capacity to use appropriate software and programming skills to solve problems in mathematics.

PO10: Create environmental awareness and develop ability to address the problems:

Provides the tools and techniques necessary for analyzing data, modeling complex systems, optimizing resource allocation, assessing risks, and making informed decisions in the field of environmental awareness and action.

Course Objectives & Outcomes

Course Objective:

Study, understand, formulate and solve specified real life problems of Operations Research.

Course Outcome (CO):

The student will be able to:

CO1   Recognize and distinguish different real life problems of operations Research their different components , advantages and limitations. (BT1).

CO2   Determine mathematical model of specific problem of OR (BT2).

CO3   Implement and demonstrate the methods of solution of linear and dynamic programming problems of Operations research (BT3).

CO4   Resolve the issues arise in solution such as degeneracy , unboundedness and infeasibility, in solving a problems of OR. (BT4)

CO5   Interpret the use of solution method and compare the methods. (BT5)

Mapping of COs with POs and PSOs

Course Outcomes	Program Outcomes (POs)										PSOs			
	1	2	3	4	5	6	7	8	9	10	1	2	3	4
CO1	3	-	-	-		-	-	-	-	-	1	-	-	
CO2	3	2	1	-	-	-	-	-	-	-	1	3	3	-
CO3	3	3	2	1	-	-	-	-	-	-	2	3	2	-
CO4	3	3	2	2	1	-	-	-	-	-	2	3	2	-
CO5	3	3	3	2	2	1	-	-	-	-	2	2	1	-
Overall	3	3	2	2	1	1	-	-	-	-	2	2	1	-

CO-PO Scale	3	**Strongly Related**	
	2	**Moderately Related**	
	1	**Weekly Related**	

Syllabus of Operations Research-I (MAT014D103)

Modules	Topics / Course content
I	(a) **Basics of Operations Research:** definition of OR, Characteristics, Scope of OR, Phases and Models in OR, Characteristics of a good model, Advantage and limitation of a model, Difficulties of OR , Limitation of OR. (b) **Linear Programming**: Formulationof LPP, Graphical Method of solution,General LPP, Cannonical and standard form of LPP, Simplex Method, Artificial variable Techniques, Big M method, Two Phase method. Application of Simplex method
II	. (a)**Transportation model**: Introduction to the model, Definition of transportation model, Matrix terminology, Formulation and solution of Transportation model, Variations In Transportation model, Post optimality analysis, dual of the transportation problem. (b) **Assignment model**: Definition of Assignment Problem, mathematical representation of the assignment problem, Comparison of assignment problem with transportation problem, The Hungarian method for solution of Assignment problem, Variation of assignment problem, The travelling Salesman problem.
III	**Game theory**: Basic Concept and Terminologies, Two-person Zero-sum Game, and Game with Pure and Mixed Strategies, Dominance Principle, Arithmetic Method, and Graphical Method for Solving ($2\times$ n) Game ,Graphical Method for Solving (m$\times$2) Game and Solution of Game by Simplex Method
IV	**Dynamic Programming**: Introduction, Optimal Subdivision problem, System reliability, Solution of LPP by Dynamic programming

Text book:

1. *Problems in Operations research (Principles and Solutions)*, Gupta P.K. and Hira D.S., Revised Edition, 2015, Sultan Chand and Sons New Delhi.

Reference books:

1. Swarup Kanti, Gupta P.K. and Mohan M., *Operations Research*, 2014, Sultan Chand and Sons New Delhi.
2. Hadley G., *Linear programming*, 2002, Narosa Publishing House.
3. Hillier F.S. and.Lieberman G.J, *Introduction to operations Research*, 9th Edition, 2011, Mc Graw Hill International Edition.
4. Taha H.A, *Operations Research – In Introduction*, 9th Edition, 2014, Pearson Education India.

Weekly Lesson Plan for M.SC   Semester-I
Subject: Operations Research -I (MAT014D103)

Week	Topic/Course content	Tutorial	Hours			Planning
			Th	T	CP	
1	Basics of Operations Research: definition of OR, Characteristics, Scope of OR, Phases and Models in OR. Characteristics of a good model, Advantage and limitation of a model, Difficulties of OR , Limitation of OR. Definition of linear programing, practical situations where Linear Programming problems arise. Formulation of LPP. Definition of Feasibility Solution of LPP. Basic definition of basic Feasible solution, optimal solution. Solution of LPP using Graphical Method, Limitation of Graphical method	PPT on OR Examples Problems and solutions	3	1	4	Worksheet 1 Worksheet 2 Worksheet 3•
2	General LPP, Canonical and standard form of LPP. Algebraic method, Simplex Method. Definition of Slack and surplus Variables. Procedure to make simplex table and process of solution with examples Application of Simplex method Artificial variable Techniques Big M method problems on Big M method Two Phase method. Examples on Two phase Method.	Examples Problems and solutions	3	1	4	Worksheet 4
3	Some special Cases in simplex method: Initialization and defining objective function. Degeneracy in LPP and method to overcome Degeneracy.Aspects of Termination in Simplex method. Discussion on Aspects of Simplex method	Examples Problems and solutions	3	1	4	Worksheet 5
4	Transportation Problem: Definition and formulation of Transportation problem. Types of transportation problem. Definition of Mathematical terms. Mathematical Formulation of a transportation problem.Finding Basic feasible solution of a transportation problem using North West Corner method. Examples	Examples Problems and solutions	3	1	4	Worksheet 6
5	Finding Basic feasible solution of a transportation problem using Row Minima method and Column Minima method. Finding Basic feasible solution of a transportation problem using Matrix Minima method. Finding Basic feasible solution of a transportation problem using Penalty cost or Vogel's Approximation method. Importance of finding optimal solution of Transportation Problem	Examples Problems and solutions	3	1	4	CA -I Class Test -1

6	Finding optimal solution of Transportation problem using Stepping Stone method and MODI method Assignment Problem: Definition of Assignment Problem, mathematical representation of the assignment problem, Comparison of assignment problem with transportation problem. The Hungarian method for solution of Assignment problem Variations of assignment problem and solution process Game theory: Definition of a game. Examples of games Characteristics of Games.	Examples Problems and solutions	3	1	4	Worksheet -7 CA -II Assessment on Assignment
7	Some important definitions with respect to theory of games. Look for pure strategy (Saddle point) -Two person –zero sum game. Reduce games by Dominance. Mixed strategies (2 x 2 Games). Algebraic method to find optimal strategy	Examples Problems and solutions	3	1	4	Worksheet -8
8	Mixed strategies (2 x n Games),Graphical method for 2 x n or m x 2 games.Defining n-person zero sum games and solution methods	Examples Problems and solutions	3	1	4	Worksheet -9
9	Introduction of Dynamic Programming. Definition of state and stage of DP, Bellman's Principle of optimality Working Principle for solution of OR problem by DP. Stage Coach Problem.Problem with Linear Objective function with linear constraint DPP with objective function in Linear form and constraint with product form	Examples Problems and solutions	3	1	4	Worksheet -10 CA -III Class test II
10	DPP with objective function in product form and constraint with linear form.DPP with objective function in nonlinear additive form and constraint with product form	Examples Problems and solutions	3	1	4	CA – IV Quiz https://docs.google.com/forms/d/1kqNLlM757RsDI4linhCwojKSLN8QoxLV7waCMfYu3BQ/edit

Daily Lesson Plan for M.SC Semester-I
Subject: Operations Research -I (MAT014D103)

Sl. No	Day	Topic/Course content	Planning
1	Lecture1	Basics of Operations Research: definition of OR, Characteristics, Scope of OR, Phases and Models in OR. Examples of real life situations where OR is applied. Characteristics of a good model, Advantage and limitation of a model, Difficulties of OR , Limitation of OR.	23.09.2022
2	Lecture 2	Definition of linear programing, practical situations where Linear Programming problems arise. Formulation of LPP	23.09.2022
3	Lecture 3	Definition of Feasibility Solution of LPP. Basic definition of basic Feasible solution, optimal solution.	27.09.2022
4	**T1**	**Discussion on solution of few problems of L1-L3 . CA-1 Worksheet 1**	**27.09.2022**
5	Lecture 4	Solution of LPP using Graphical Method, Limitation of Graphical method	28.09.2022
6	Lecture 5	General LPP, Canonical and standard form of LPP.	28.09.2022
7	Lecture 6	Algebraic method, Simplex Method. Definition of Slack and surplus Variables. Procedure to make simplex table and process of solution with examples Application of Simplex method	11.10.2022
8	T2	**Discussion on solution of few problems of L4- L6 . CA -2**	11.10.2022

		Worksheet 2	
9	Lecture 7	Artificial variable Techniques Big M method problems on Big M method	12.10.2022
10	Lecture 8	Two Phase method. Examples on Two phase Method	12.10.2022
11	Lecture 9	Some special Cases in simplex method: Initialization and defining objective function	18.10.2022
12	T3	**Discussion on solution of few problems of L-7 -L9. CA-3 Worksheet 3**	18.10.2022
13	Lecture 10	Degeneracy in LPP and method to overcome Degeneracy	19.10.2022
14	Lecture 11	Aspects of Termination in Simplex method.	19.10.2022
15	Lecture 12	Discussion on Aspects of Simplex method	26.10.2022
16	T4	**Discussion on solution of few problems of L-10 -L12. CA-4 Worksheet 4.**	26.10.2022
17	Lecture 13	Transportation Problem: Definition and formulation of Transportation problem, Examples of real life situation. Types of transportation problem	01.11.2022
18	Lecture 14	Definition of Mathematical terms. Mathematical Formulation of a transportation problem	01.11.2022
19	Lecture 15	Finding Basic feasible solution of a transportation problem using North West Corner method. Examples	08.11.2022
20	**T 5**	**Discussion on solution of few problems of L-13 -L15. CA-5 Worksheet 5.**	08.11.2022
21	Lecture 16	Finding Basic feasible solution of a transportation problem using Row Minima method and Column Minima method. Examples	09.11.2022
22	Lecture 17	Finding Basic feasible solution of a transportation problem using Matrix Minima method. Examples	09.11.2022
23	Lecture 18	Finding Basic feasible solution of a transportation problem using Penalty cost or Vogel's Approximation method	15.11.2022
24	**T6**	**Discussion on solution of few problems of L-16 -18 CA-6 Worksheet 6.**	15.11.2022
25	Lecture 19	Importance of finding optimal solution of Transportation Problem	16.11.2022
26	Lecture 20	Finding optimal solution of Transportation problem using Stepping Stone method and MODI method	16.11.2022
27	Lecture21	Assignment Problem: Definition of Assignment Problem, mathematical representation of the assignment problem, Comparison of assignment problem with transportation problem, The Hungarian method for solution of Assignment problem	22.11.2022
28	**T7**	**Discussion on solution of few problems of L-19 -21 CA-7 Worksheet 7.**	22.11.2022
29	Lecture 22	Variations of assignment problem and solution process	23.11.2022
30	Lecture 23	Game theory: Definition of a game. Examples of games Characteristics of Games.	23.11.2022
31	Lecture 24	Some important definitions with respect to theory of games.	29.11.2022
32	**T8**	**Discussion on solution of few problems of L-22 -24 CA-8 Worksheet 8.**	29.11.2022
33	Lecture 25	Look for pure strategy (Saddle point) -Two person –zero sum game Example	30.11.2022
34	Lecture 26	Reduce games by Dominance. Mixed strategies (2 x 2 Games), Examples	30.11.2022
35	Lecture 27	Algebraic method to find optimal strategy	06.12.2022
36	**T9**	Discussion on solution of few problems of L-25 -27 CA-9 Worksheet 9.	06.12.2022
37	Lecture 28	Mixed strategies (2 x n Games), examples	14.12.2022
38	Lecture 29	Graphical method for 2 x n or m x 2 games Examples	14.12.2022
39	Lecture 30	Defining n-person zero sum games and solution methods	20.12.2022

40	**T10**	Discussion on solution of few problems of Worksheet 10.	L-28 -30 CA-10	20.12.2022
41	Lecture 31	Dynamic Programming: Introduction of Dynamic Programming. Use of Dynamic Programming in Linear and nonlinear Problems		21.12.2022
42	Lecture 32	Definition of state and stage of DP, Bellman's Principle of Optimality Working Principle for solution of OR problem by DP. Stage Coach Problem		21.12.2022
43	Lecture 33	Problem with Linear Objective function with linear constraint		21.12.2022
44	**T 11**	Discussion on solution of few problems of Worksheet 11.	L-31 -33 CA-11	27.12.2022
45	Lecture 34	DPP with objective function in Linear form and constraint with product form		27.12.2022
46	Lecture 35	DPP with objective function in product form and constraint with linear form		27.12.2022
47	Lecture 36	DPP with objective function in nonlinear additive form and constraint with product form		30.12.2022
48	T12	Discussion on solution of few problems of Worksheet 11.	L-34 -36 CA-11	30.12.2022

Evaluation Scheme

Theory			
Evaluation Criteria	**Actual Marks**	**Marks after Scaling**	**Full Marks**
Continuous Assessment -I (Class Test -I)	25	25	25
Continuous Assessment -II (Class Test -II)	25	25	25
Continuous Assessment – III (on Worksheets 1- Worksheet -10)	25	25	25
Continuous Assessment - IV (Quiz on all Modules)	25	25	25
Attendance	5	5	5
University Exam	70	70	70
Total			100

Course Outcome and PO alignment

Course Outcomes aligned to the PO		Skills/Competencies the student will be able to demonstrate	Level of Bloom's Taxonomy to be met	Target for Achievement	
PO1, PO2,	CO1	Recognize and distinguish different real life problems of operations Research their different components , advantages and limitations	BT1	70% of student will achieve	70%
PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	CO2	Determine mathematical model of specific problem of OR .	BT2	70% of student will achieve	70%

		Implement and demonstrate the methods of solution of linear and dynamic programming problems of Operations research	BT3	70% of student will achieve	70%
PO1, PO2, PO3, PO4, PO5, PO6, PSO1, PSO2, PSO3	CO3				
PO1, PO2, PO3, PO4, PO5, PO6, PO8, PSO1, PSO2,PSO3	CO4	Resolve the issues arise in solution such as degeneracy , unboundedness and infeasibility, in solving a problems of OR.	BT4	70% of student will achieve	70%
PO1,PO2, PO3, PO4, PO5, PO6, PO9, PSO1, PSO2,PSO3	CO5	Interpret the use of solution method and compare the methods.	BT5	70% of student will achieve	70%
70% of student will achieve					**70%**

Delivery Methodology

Outcome	Method	Supporting Tools	Supporting Materials
CO1	Classroom teaching, Self-learning, Tutorial, Assignment	Pen Board, PPT, NPTEL video	1.Text Book: 1.Problems in Operations research (Principles and Solutions), Gupta P.K. and Hira D.S., Revised Edition, 2015, Sultan Chand and Sons New Delhi. 2. Handouts of all Lectures 3. Handouts for exercise and assignments 4.https://nptel.ac.in/content/syllabus_pdf/11210613
CO2	Classroom teaching, Self-learning, Tutorial, Assignment		
CO3	Classroom teaching, Self-learning, Tutorial, Assignment		
CO4	Classroom teaching, Self-learning, Tutorial, Assignment		
CO5	Classroom teaching, Self-learning, Tutorial, Assignment		

Assessment Methodology

<table>
<tr><td colspan="4" align="center">Assessment Methodology</td></tr>
<tr><td align="center">Outcome</td><td colspan="2" align="center">Assessment Tools</td><td align="center">Specific Question/Activity aligned to the outcome</td></tr>
<tr><td>CO1-CO5</td><td rowspan="5">Direct Assessment</td><td>Class Test I</td><td>CA-I</td></tr>
<tr><td>CO1-CO5</td><td>Assignment</td><td>CA-II</td></tr>
<tr><td>CO1-CO5</td><td>Class Test II</td><td>CA- III</td></tr>
<tr><td>CO1 -CO2</td><td>Quiz</td><td>CA-IV</td></tr>
<tr><td>CO1-CO5</td><td>Semester End Examination</td><td>University Semester Examination</td></tr>
<tr><td>CO1-CO5</td><td rowspan="2">Indirect Assessment</td><td>Formative Feedback</td><td>After 15 days</td></tr>
<tr><td>CO1-CO5</td><td>Summative Feedback</td><td>After completion of the course</td></tr>
</table>

Formative Feedback Analysis form

Course Name	Operations Research- I	Course Code	MAT014D102
Semester	1st Semester	Year	1st
Department	Mathematics	Faculty Name	Prof. (Dr.) Anuradha Devi
Total Number of Students (B)	20		

Sl No.	Questions	Yes (A1) Credit 4	largely (A2) Credit 3	Partially (A3) Credit 2	Marginally (A4) Credit 1	No (A5) Credit 0	Expected Percentage	Percentage Met
1	Are the course objectives and outcome as mentioned in course description clear?	18	1	1	0	0	**75%**	95%
2	Does the lecture start in time?	19	1	0	0	0	**75%**	100%
3	Are the lectures easily understandable?	17	2	1	0	0	**75%**	95%
4	Is the lecture material well presented?	19	1	0	0	0	**75%**	100%
5	Is the class environment favourable to learning?	18	1	0	0	1	**75%**	**95%**
6	Are the interactions in the class supportive in understanding the subject?	18	2	0	0	0	**75%**	**100%**

7	Is the course Progressing as per the lesson plan?	19	1	0	0	0	75%	100%
8	is there an initiative to invite student's queries and discuss them?	15	5	0	0	0	75%	100%
9	the study materials provided to you are sufficient and according to lesson plan?	18	2	0	0	0	75%	100%
		Excellent	Very Good	Good	Average	Below Average		
10	How will you rate the overall learning experience	13	5	2	0	0	75%	90%

CONTINUOUS ASSESSMENT- I
OPERATIONS RESEARCH-I(MAT014D102)
CLASS TEST-1   FULL MARKS : 25

Q.No	CO	Question	Marks Assigned
1	CO1	**Recognize** and write the advantages and limitations of linear programming problem	5
2	CO2	**Determine** solution of following LPP Using Graphical method $Maximise\ z = 2x_1 + 10x_2$ Subject to, $\quad 2x_1 + x_2 \leq 6$ $\quad\quad 6x_1 \leq 30$ $\quad\quad x_1, x_2 \geq 0$	5
3	CO3	Solve the following LPP using Simplex method and **demonstrate** that the solution is bounded $\quad$ Maximize $Z = 3x + 5y + 4z$ $\quad$ Subject to $\quad 2x + 2y + z \leq 430$ $\quad 3x + 2z \leq 460$ $\quad x + 4y \leq 420$ $\quad x, y, z \geq 0.$	5
4	CO4	Given following LPP has $\quad$ Maximize, $Z = 3x_1 + 5x_2$ $\quad$ Subject to $\quad x_1 - 2x_2 \leq 6$ $\quad\quad x_1 \leq 10$ $\quad\quad x_2 \geq 1$ $\quad\quad x_1, x_2 \geq 0$ Use Big M method to **resolve** that, the solution is unbounded.	5
5	CO5	Three warehouses supply four stores. The table indicates the cost of shipment per unit between warehouses and stores, warehouse capacities and requirement of the stores. $\quad\quad$ To	5

			S_1	S_2	S_3	S_4	S_5	Supply	
	From	W_1	3	4	6	8	9	20	
		W_2	2	10	1	5	8	30	
		W_3	7	11	20	40	3	15	
		W_4	2	1	9	14	16	13	
	Demand		40	6	8	18	6		

find initial basic feasible solution by (i) North West Corner method and (ii) Vogel Approximation Method . Give your **interpretation** on which of these method is a better method to find initial basic feasible solution.

Assessment Sheet for Continuous Assessment - I

Course Name	Name of the Faculty			Prof. (Dr.) Anuradha Devi						
	Operations Research-I			Course Outcome Attainment with target in %						
		Total	CO1	CO2	CO3	CO4	CO5	Average CO	Bright or Weak?
	Distribution of Marks		50	60	70	85	95		Bright >90, Weak<40
	Set Target Level	25						70	
Sl. No	Roll Numbers		% of Marks to be Scored						
1	224011001	25	1	1	1	1	1	100	Bright
2	224011002	21	1	1	1	0	0	60	OK
3	224011003	25	1	1	1	1	1	100	Bright
4	224011004	25	1	1	1	1	1	100	Bright
5	224011005	25	1	1	1	1	1	100	Bright
6	224011006	25	1	1	1	1	1	100	Bright
7	224011007	23	1	1	1	1	0	80	Bright
8	224011008	22	1	1	1	1	0	80	Bright
9	224011009	25	1	1	1	1	1	100	Bright
10	224011010	25	1	1	1	1	1	100	Bright
11	224011011	25	1	1	1	1	1	100	Bright
12	224011012	23	1	1	1	1	0	80	Bright
13	224011013	25	1	1	1	1	1	100	Bright
14	224011014	22	1	1	1	1	0	80	Bright
15	224011015	25	1	1	1	1	1	100	Bright
16	224011016	25	1	1	1	1	1	100	Bright
17	224011017	25	1	1	1	1	1	100	Bright
18	224011018	22	1	1	1	1	0	80	Bright
19	224011019	21	1	1	1	0	0	60	OK
20	224011020	20	1	1	1	0	0	60	OK

Strategy to support weak students

Criterion for selecting weak students:

1. CO based analysis of Continuous Assessment-I and Module I and 50% of Module II.
2. Students who are unable to meet any particular CO.
3. Students scores less than 65%.

It is clear that, three students secured 60% attainment of CO4 and CO5. They are instructed to attend.
1. Remedial classes based on CO4 and CO5
2. More interactions in the classroom during the theory class.

Strategy to support Bright students

Criterion for selecting Bright students:

1. CO based analysis of Continuous Assessment-I and Module I and 50% of Module II
2. Students who secure more than 65% attainment in COs.
3. Students scores less than 65%

The bright students of the above table are instructed to

1. Do more problems given in the exercise in reference books.
2. Go through some research papers on Higher thinking problems of Linear Programming Problem and Transportation Problem.
3. Consult the numerical methods that are available to solve such problems
4. Solve questions asked in NET/SLET/Gate examinations.

CONTINUOUS ASSESSMENT- II
OPERATIONS RESEARCH-I(MAT014D102)
ASSIGNMENT-I   FULL MARKS : 25

Q.No	CO	Question	Marks Assigned
1	CO1	The total supply and demand in a certain Transportation Problem is not equal. **How** do we define this type of problem? **Wha**t is the procedure to resolve the issue?	5
2	CO2	Use VAM method to **show** that the following Transportation problem undergoes degeneracy. **Demonstrate**, how to resolve the issue of degeneracy for the problem and solve it. P Q R S Supply A 10 20 5 7 10 B 13 9 12 8 20 Warehouse C 4 5 7 9 30 D 14 7 1 0 40 E 3 12 5 19 50 Demand 60 60 20 10 150	5
3	CO3	**Making use of** Hungarian Method, **Solve** the following Assignment Problem Four different jobs are to be done on four different machines. The following table indicates the cost of producing job i on machine j in rupees Machines 1 2 3 4 1 5 7 11 6 2 8 5 9 6 Jobs 3 4 7 10 7 4 10 4 8 3 Assign jobs to different machines so that the total cost is minimized.	5
4	CO4 CO5 CO2	**Distinguish** between the Transportation problem and an assignment problem. Can you **justify** that, ' Assignment Problem is a special transportation Problem'? **Explain** with the mathematical formulation of general transportation problem and Assignment problem	5
5	CO5	Three warehouses supply four stores. The table indicates the cost of shipment per unit between warehouses and stores, warehouse capacities and requirement of the stores. S1 S2 S3 S4 Supply W1 2 3 5 1 8 Warehouse W2 7 3 4 6 10 W3 4 1 7 2 20 requirement 6 8 9 15 **Compare** the initial basic feasible solution by (i) North West Corner method and (ii)Vogel Approximation method and give your **conclusion.**	5

Assessment Sheet for Continuous Assessment - II

Name of the Faculty		Prof. (Dr.) Anuradha Devi							

Course Name	Operations Research-I		Course Outcome Attainment with target in %						
		Total	CO1	CO2	CO3	CO4	CO5	Average CO	Bright or Weak?
Distribution of Marks			50	60	70	85	95		Bright >90, Week<40
Set Target Level		25						70	
Sl. No	Roll Numbers		% of Marks to be Scored						
1	224011001	25	1	1	1	1	1	100	Bright
2	224011002	23	1	1	1	1	0	80	OK
3	224011003	25	1	1	1	1	1	100	Bright
4	224011004	25	1	1	1	1	1	100	Bright
5	224011005	25	1	1	1	1	1	100	Bright
6	224011006	25	1	1	1	1	1	100	Bright
7	224011007	23	1	1	1	1	0	80	Bright
8	224011008	22	1	1	1	1	0	80	Bright
9	224011009	25	1	1	1	1	1	100	Bright
10	224011010	25	1	1	1	1	1	100	Bright
11	224011011	25	1	1	1	1	1	100	Bright
12	224011012	23	1	1	1	1	0	80	Bright
13	224011013	25	1	1	1	1	1	100	Bright
14	224011014	22	1	1	1	1	0	80	Bright
15	224011015	25	1	1	1	1	1	100	Bright
16	224011016	25	1	1	1	1	1	100	Bright
17	224011017	25	1	1	1	1	1	100	Bright
18	224011018	25	1	1	1	1	1	100	Bright
19	224011019	20	1	1	1	0	0	60	OK
20	224011020	20	1	1	1	0	0	60	OK

Strategy to support weak students

Criterion for selecting weak students:

4. CO based analysis of Continuous Assessment-I and Module I and 50% of Module II.
5. Students who are unable to meet any particular CO.
6. Students scores less than 65%.

It is clear that, three students secured 60% attainment of CO4 and CO5. They are instructed to attend.

3. Remedial classes based on CO4 and CO5
4. More interactions in the classroom during the theory class.

Strategy to support Bright students

Criterion for selecting Bright students:

4. CO based analysis of Continuous Assessment-I and Module I and 50% of Module II
5. Students who secure more than 65% attainment in COs.
6. Students scores less than 65%

The bright students of the above table are instructed to

5. Do more problems given in the exercise in reference books.
6. Go through some research papers on Higher thinking problems of Linear Programming Problem and Transportation Problem.
7. Consult the numerical methods that are available to solve such problems
8. Solve questions asked in NET/SLET/Gate examinations.

CONTINUOUS ASSESSMENT- III
OPERATIONS RESEARCH-I(MAT014D102)
CLASS TEST-II   FULL MARKS : 25

Q.No	CO	Question	Marks Assigned
1	CO1	**Define** a Game? What do you mean by Pure Strategy and Mixed Strategy? Give example.	5
2	CO2	Consider assigning five operators to five machines. The assignment cost are given below	5

Operators

		I	II	III	IV	V
	A	10	5	13	15	16
	B	3	9	18	3	6
Machines	C	10	7	2	2	2
	D	5	11	9	7	12
	E	7	9	10	4	12

Using Hungarian Method **determine** the assignment status of operators to machines so as to minimize the total cost of assignment?

Q.No	CO	Question	Marks
3	CO3	A student of OR has five days at his disposal to revise the subject before examination. The course is divided into four modules. He decides to devote a whole day to study some section so that he may study a section for 1 day, 2 days three days etc. The expected grade points he will get for different alternatives are given in the table below. **Make use of** state and stages to the problem and **demonstrate** the optimum distribution of study days to maximize his grade points	5

Modules

		I	II	III	IV
	0	1	1	0	0
Study	1	2	1	0	1
Days	2	2	2	1	2
	3	3	3	2	2
	4	4	3	3	3
	5	4	4	3	4

Q.No	CO	Question	Marks
4	CO4	A salesman located in a city A decides to travel to city J. The alternate routes from A to J and the distances are given in the following network diagram. **Divide** the following problem to 4 stages and **analyse** to help the salesman find the shortest route	5

| 5 | CO2
CO5 | **Show** that for the following game, value of the game ϑ lie between -1 and 2. **Justify** your answer using minimax and maximin principle. **Solve** the following 3 x 3 game using Matrix method. | 5 |

		B		
		1	2	3
	1	3	-1	1
A	2	-2	3	2
	3	2	-2	-1

Assessment Sheet for Continuous Assessment - III

Course Name	Name of the Faculty		Prof. (Dr.) Anuradha Devi						

Course Name	Operations Research-I	Total	Course Outcome Attainment with target in %					Average CO	Bright or Weak?
			CO1	CO2	CO3	CO4	CO5		
Distribution of Marks			50	60	70	85	95		Bright >90, Week<40
Set Target Level		25	% of Marks to be Scored					70	
Sl. No	Roll Numbers								
1	224011001	23	1	1	1	1	1	100	Bright
2	224011002	22	1	1	1	1	0	80	Bright
3	224011003	24	1	1	1	1	1	100	Bright
4	224011004	23	1	1	1	1	1	100	Bright
5	224011005	23	1	1	1	1	1	100	Bright
6	224011006	23	1	1	1	1	1	100	Bright
7	224011007	23	1	1	1	1	1	80	Bright
8	224011008	23	1	1	1	1	1	80	Bright
9	224011009	18	1	1	1	0	0	60	OK
10	224011010	23	1	1	1	1	1	100	Bright
11	224011011	23	1	1	1	1	1	100	Bright
12	224011012	17	1	1	1	0	0	60	Bright
13	224011013	23	1	1	1	1	1	100	Bright
14	224011014	23	1	1	1	1	1	80	Bright
15	224011015	23	1	1	1	1	1	100	OK
16	224011016	23	1	1	1	1	1	100	Bright
17	224011017	23	1	1	1	1	1	100	Bright
18	224011018	18	1	1	1	0	0	60	OK
19	224011019	23	1	1	1	1	0	80	Bright
20	224011020	18	1	1	1	0	0	60	OK

Strategy to support weak students

Criterion for selecting weak students:

7. CO based analysis of Continuous Assessment-I and Module I and 50% of Module II.
8. Students who are unable to meet any particular CO.
9. Students scores less than 65%.

It is clear that, three students secured 60% attainment of CO4 and CO5. They are instructed to attend.

5. Remedial classes based on CO4 and CO5
6. More interactions in the classroom during the theory class.

Strategy to support Bright students

Criterion for selecting Bright students:

7. CO based analysis of Continuous Assessment-I and Module I and 50% of Module II
8. Students who secure more than 65% attainment in COs.
9. Students scores less than 65%

The bright students of the above table are instructed to

9. Do more problems given in the exercise in reference books.
10. Go through some research papers on Higher thinking problems of Linear Programming Problem and Transportation Problem.
11. Consult the numerical methods that are available to solve such problems
12. Solve questions asked in NET/SLET/Gate examinations.

CA – IV Question Paper

https://docs.google.com/forms/d/e/1FAIpQLScTx_6F4hbe8xTPYBV4R0Fe
CuYw9mgQr-4j47xcDLJDBmjNSw/viewform?usp=pp_url

Assessment Sheet for Continuous Assessment - IV

Name of the Faculty		Prof. (Dr.) Anuradha Devi							
Course Name	**Operations Research-I**	**Course Outcome Attainment with target in %**							
		Total	CO1	CO2	CO3	CO4	CO5	Average CO	Bright or Weak?
Distribution of Marks			50	60	70	85	95	70	Bright >90, Week<40
Set Target Level		25							
Sl. No	Roll Numbers		% of Marks to be Scored						
1	224011001	24	1	1	1	1	1	100	Bright
2	224011002	20	1	1	1	0	0	60	Bright
3	224011003	25	1	1	1	0	0	60	OK
4	224011004	24	1	1	1	1	1	100	Bright
5	224011005	22	1	1	1	1	1	100	Bright
6	224011006	23	1	1	1	1	1	100	Bright
7	224011007	23	1	1	1	1	1	80	Bright
8	224011008	23	1	1	1	1	1	80	Bright
9	224011009	21	1	1	1	0	0	60	OK
10	224011010	23	1	1	1	1	1	100	Bright
11	224011011	23	1	1	1	1	1	100	Bright
12	224011012	18	1	1	1	0	0	60	Bright
13	224011013	23	1	1	1	1	1	100	Bright
14	224011014	21	1	1	1	1	0	80	Bright
15	224011015	23	1	1	1	1	1	100	OK
16	224011016	23	1	1	1	1	1	100	Bright
17	224011017	23	1	1	1	1	1	100	Bright
18	224011018	18	1	1	1	0	0	60	OK
19	224011019	20	1	1	1	1	0	80	Bright
20	224011020	20	1	1	1	1	0	80	OK

Strategy to support weak students

Criterion for selecting weak students:

10. CO based analysis of Continuous Assessment-I and Module I and 50% of Module II.
11. Students who are unable to meet any particular CO.
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It is clear that, three students secured 60% attainment of CO4 and CO5. They are instructed to attend.

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Strategy to support Bright students

Criterion for selecting Bright students:

10. CO based analysis of Continuous Assessment-I and Module I and 50% of Module II
11. Students who secure more than 65% attainment in COs.
12. Students scores less than 65%

The bright students of the above table are instructed to

13. Do more problems given in the exercise in reference books.
14. Go through some research papers on Higher thinking problems of Linear Programming Problem and Transportation Problem.
15. Consult the numerical methods that are available to solve such problems
16. Solve questions asked in NET/SLET/Gate examinations.

SUMMATIVE ASSAESSMENT

Course Name	Operations Research- I	Course Code	MAT014D102
Semester	1st Semester	Year	1st
Department	Mathematics	Faculty Name	Prof. (Dr.) Anuradha Devi
Total Number of Students (B)	20		

Sl No.	Questions	Yes (A1) Credit 4	largely (A2) Credit 3	Partially (A3) Credit 2	Marginally (A4) Credit 1	No (A5) Credit 0	Expected Percentage	Percentage Met
1	The stated course objectives have been met?	16	3	1	0	0	**75%**	95%
2	The stated course outcomes have been achieved?	16	1	3	0	0	**75%**	85%
3	Willingness of the teacher to answer course related queries?	18	1	1	0	0	**75%**	95%
4	Presentation and Completion of course material?	17	3	0	0	0	**75%**	100%
5	Encouragement to self- Learning?	19	1	0	0	1	**75%**	**100%**
6	Relationship of the conceptual/theoretical knowledge to its application in real world?	13	5	1	1	0	**75%**	**90%**
7	Method of applying theoretical concepts to problem solving?	17	2	1	0	0	**75%**	**95%**
8	Encouragement to learning through other platform??	15	4	1	0	0	**75%**	**95%**
9	Do you understand the importance of this course in Mathematics?	15	3	2	0	0	**75%**	**90%**

ATTENDANCE RECORDS
M.SC 1ST SEMESTER   OPERATIONS RESEARCH

Sl. No.	Roll No.	September,2022		October, 2022		November, 2022		December,2022		CUMULATIVE ATTENDANCE		
		TCH	TCA	TCH	TCA	TCH	TCA	TCH	TCA	TCH	TCA	%
1	224011001	4	4	10	10	18	16	10	10	**42**	**40**	**95**
2	224011002	6	6	10	10	18	17	10	9	**44**	**42**	**95**
3	224011003	4	4	10	10	18	17	10	10	**42**	**41**	**98**
4	224011004	4	4	10	8	18	18	10	5	**42**	**35**	**83**
5	224011005	4	2	10	10	18	18	10	8	**42**	**38**	**90**
6	224011006	6	6	10	10	18	16	10	9	**44**	**41**	**93**
7	224011007	6	6	10	10	18	18	10	10	**44**	**44**	**100**
8	224011008	6	6	10	10	18	18	10	10	**44**	**44**	**100**
9	224011009	0	0	10	8	18	18	10	10	**38**	**36**	**95**
10	224011010	4	4	10	8	18	16	10	10	**42**	**38**	**90**
11	224011011	6	6	10	8	18	16	10	5	**44**	**35**	**80**
12	224011012	0	0	10	8	18	12	10	9	**38**	**29**	**76**
13	224011013	6	6	10	8	18	18	10	9	**44**	**41**	**93**
14	224011014	0	0	10	10	18	18	10	6	**38**	**34**	**89**
15	224011015	6	2	10	6	18	16	10	10	**44**	**34**	**77**
16	224011016	6	6	10	8	18	18	10	9	**44**	**41**	**93**
17	224011017	0	0	0	0	16	16	10	8	**36**	**30**	**83**
18	224011018	0	0	0	0	16	16	10	10	**36**	**36**	**100**
19	224011019	0	0	0	0	4	4	10	10	**24**	**24**	**100**
20	224011020	0	0	0	0	0	0	10	10	**20**	**20**	**100**

The Assam Royal Global University, Guwahati
Royal school of Applied & Pure Sciences
M.Sc. Mathematics 1st Semester
Semester End Examination, December, 2023
Course Title: Operations Research-I
Course Code : MAT014D102

Time: 3 Hours **Maximum Marks: 70**

Note: Attempt all questions as per instructions given.
The figures in the right-hand margin indicate marks

Section A

1. Attempt **all questions**. (Maximum word limit 50) **2 x 8**
   a. Convert the following LPP to Standard form (CO1)
   Maximise , $Z = 3x_1 + 5x_2 + x_3$
   Subject to
   $$2x_1 + 3x_2 \leq 8$$
   $$2x_2 + 5x_3 \leq 10$$
   $$3x_1 + 2x_2 + 4x_3 \leq 15$$
   $$x_1, x_3 \geq 0$$

   b. What do you mean by feasible solution and optimal solution with reference to linear Programming problem?(CO1)

   c. Is the following transportation problem a balanced one? Justify your answer. Apply Row Minima method to find Initial Basic feasible Solution.(CO3)

   Destinations

		A	B	C	Supply
	1	12	20	14	400
Sources	2	15	32	25	500
	3	27	33	35	600
Demand		340	540	620	

   d. Solve the following Assignment problem (CO3)

   Machines

		1	2	3	4
	1	6	7	10	7
	2	8	5	9	6
Jobs	3	4	8	5	4
	4	11	5	7	3

   e. Distinguish between a pure strategy and mixed strategy of a game. (CO2)

f. Consider the game G with the following payoffs.

Player B

		B1	B2
Player A	A1	1	1
	A2	4	-3

Show that, G is strictly determinable but not a fair game. (CO3)

g. Write the general dynamic programming problem having additive constraint and multiplicative objective function. Express the form of recursion formula for such problem. (CO1 and CO2)

h. Describe a stage coach problem with example.(CO2)

Section – B

2. **Answer any two of the following**   7 x 2

a. A company produces two types of hats. The first type requires twice as much labour time as the second type of hat. If all hats are of 2nd type , the company can produce 500 hat a day. The market limits daily sales of first and second type of 150 and 250 hats. Assuming that profit per hat are Rs 8 for first type and Rs 5 for second type of hat, formulate the problem and find the numbers of production of both hats applying graphical method. (CO6 and CO3)

b. Use simplex method to solve the following LPP. (CO3 CO4)

Maximise , $Z = x_1 + 2x_2 + 4x_3$
Subject to $2x_1 + 3x_2 \leq 8$
               $2x_2 + 5x_3 \leq 10$
               $3x_1 + 2x_2 + 4x_3 \leq 15$
               $x_1, x_2, x_3 \geq 0$

Is the solution so obtained is unique? Give your justification.

c. The following LPP has no feasible solution. Justify the statement by applying Big M method.(CO3, CO4)

Maximise , $Z = 3x_1 + 2x_2$
Subject to $2x_1 + x_2 \leq 2$
               $3x_2 + 4x_2 \geq 12$
               $x_1, x_2 \geq 0$

3. **Answer any two of the following**   7 x 2

a. Five different jobs are to be done on five different machines. The following table indicates the cost of assigning job i on machine j in Rupees:

Machines

Jobs		1	2	3	4	5
	A	11	7	8	16	20
	B	9	7	12	6	15
	C	13	16	15	12	16
	D	21	24	17	28	26
	E	14	10	12	11	15

Assign jobs to different machines so that the total cost is minimized.(CO3)

b. Transporting from three farms to four plants is defined by the following cost matrix

		P_1	P_2	P_3	P_4	Supply
From	F_1	19	30	50	10	7
	F_2	70	30	40	60	9
	F_3	40	8	70	20	18
Demand		5	8	7	14	

Find the initial basic feasible solution using VAM. Use MODI method to obtain the optimal solution.(CO3)

c. Determine an initial basic feasible solution to the following transportation problem using (i) Row Minima method and (ii) VAM method. Compare the total transportation Cost.(CO3, CO4)

To

		1	2	3	4	5	Supply
From	A	3	4	6	8	9	20
	B	2	10	1	5	8	30
	C	7	11	20	40	3	15
	D	2	1	9	14	16	13
requirement		40	6	8	18	6	

4. Answer **any two** of the following   7 x 2= 14

a. What do you mean by a pay off matrix with reference to a game? Apply Matrix Method to solve the following Games:(CO1, CO3)

PTO

	B		
A	**1**	**2**	**3**
1	7	1	7
2	9	-1	1
3	5	7	6

b. A 2 x 5 game is given below. Find the value of the game by graphical method.(CO3)

		Player B				
		1	2	3	4	5
Player A	1	3	0	6	-1	7
	2	-1	5	-2	2	1

c. Apply principle of dominance to solve the game given below: (CO3)

Player A	Player B				
	B_1	B_2	B_3	B_4	B_5
A_1	1	3	2	7	4
A_2	3	4	1	5	6
A_3	6	5	7	6	5
A_4	2	0	6	3	1

5. Answer **any one** of the following   12 x 1

a. A salesman travels from starting city A to destination city K. Between A and K, there are nine cities from A to K connected and the distance in kilometers are shown in the following network:
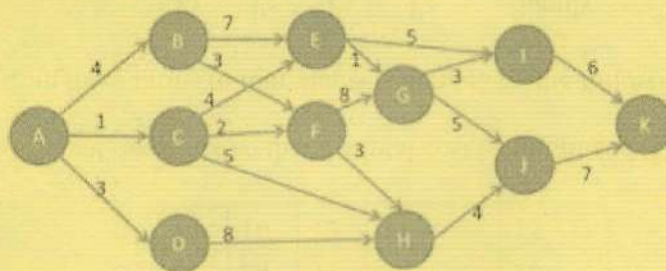
Formulate the states, stages and recursive relation. Apply Dynamic Programming Problem to find the shortest route.(CO3, CO4)

b. Determine the value of x_1, x_2 and x_3 so as to minimize $z = x_1^2 + x_2^2 + x_3^2$ subject to the constraint $x_1 + x_2 + x_3 = 10$ where x_1, x_2, x_3 are non-negative integers. (CO3)

Assessment Sheet for Semester End Examination

	Name of the Faculty	Course Code	Course Name		
	Prof. (Dr.) Anuradha Devi	MAT014D103	Operations Research-I		

| Sl. No | Maximum Marks | 70 | A | "CO" MET or NOT MET | course Outcome Attainment with target in % |
| | Set Target Level | A | | | |
	Roll No	Grade	Grade to Score		
1	224011001	A$^+$	9	Met	1
2	224011002	B$^-$	5	Met	1
3	224011003	O	10	Met	1
4	224011004	O	10	Met	1
5	224011005	A$^+$	9	Met	1
6	224011006	O	10	Met	1
7	224011007	O	10	Met	1
8	224011008	A$^+$	9	Met	1
9	224011009	O	10	Met	1
10	224011010	O	10	Met	1
11	224011011	A+	9	Met	1
12	224011012	B-	5	Met	1
13	224011013	A	8	Met	1
14	224011014	B	6	Met	1
15	224011015	A+	9	Met	1
16	224011016	A+	9	Met	1
17	224011017	O	10	Met	1
18	224011018	O	10	Met	1
19	224011019	A+	9	Met	1
20	224011020	B+	7	Met	1

Rationale:	
Students getting less than 40%	0
students getting 50%	2
students getting 60%	1
students getting 70%	1
students getting 80%	1
students getting 90%	15
Total	20

Course Outcome Attainment

Name of the Faculty	Prof. (Dr.) Anuradha Devi						
Course Code	**MAT014D103**						
Course Name	Operations Research-I						
Total No of Students in the Class		20					
Sl.No.	Exam	CO 1	CO 2	CO 3	CO 4	CO 5	Target (%)	Overall Achievement (%)
1	CA - I	20	20	20	17	12	70	89
2	CA - II	20	20	20	18	13	70	91
3	CA - III	20	20	20	16	14	70	90
4	CA - IV	20	20	20	15	12	70	87
	Average	80	80	80	66	51	70	89
7	University Exams	Met				A	87 (8.7 GPA)

Course Outcome	Total Students	Total Student who Attained Outcome	% Students Who Attained the Outcome	Course Outcome Met/Not Met	Course Outcome Attainment Level
CO1	20	20	100	MET	3
CO2	20	20	100	MET	3
CO3	20	20	100	MET	3
CO4	20	17	85	MET	3
CO5	20	13	65	MET	3
Average % Students who Attained the Course Outcomes through internal assessment (Direct)			90		3
% Students who Attained the Course Outcomes			87		3
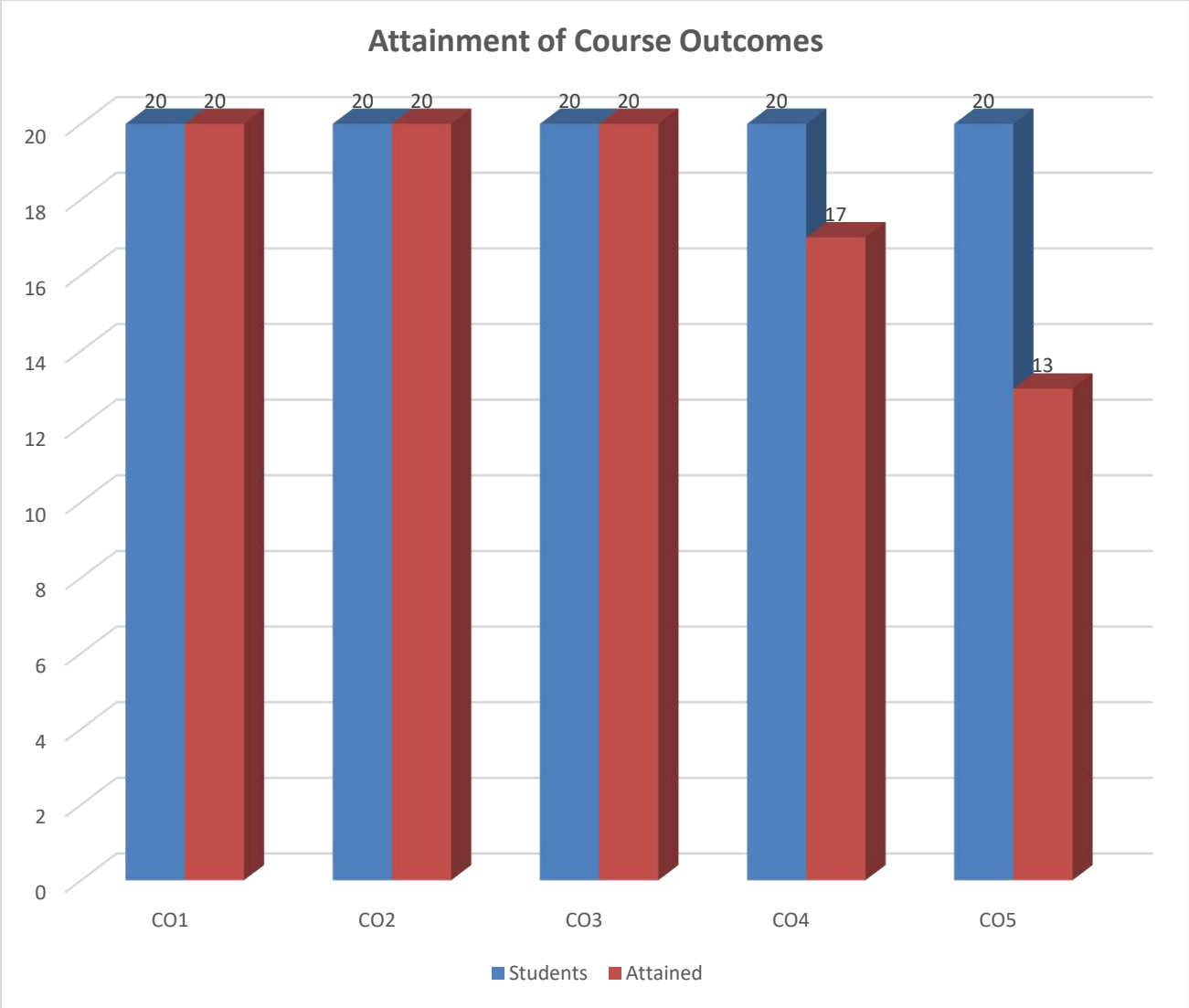
Attainment of Course Outcomes

Bar chart showing attainment of course outcomes for CO1–CO5, with Students (blue) and Attained (red) values:
- CO1: Students 20, Attained 20
- CO2: Students 20, Attained 20
- CO3: Students 20, Attained 20
- CO4: Students 20, Attained 17
- CO5: Students 20, Attained 13

Legend: Students, Attained

CERTIFICATE

I, the undersigned, have completed the course allotted to me as shown below,

Sl. No	Semester	Subject with Code	Total Units/ Chapters	Remarks
1	1st	Operations Research-I	All	Completed

Anuradha Devi
(Signature of Faculty)

Date: 24/1/24

Submitted to HOD

Certificate by HOD

I, the undersigned, certify that Prof. (Dr.) Anuradha Devi has completed the course work allotted to him satisfactorily.

Kamal Sebnath
(Signature of HOD)

Head Department of Mathematics
The Assam Royal Global University

Date: 24/01/2024

Submitted to Dean - School

Anuradha Devi
(Signature of Dean)   DEAN/HEAD
ROYAL SCHOOL OF APPLIED & PURE SCIENCE
Betkuchi, Opp. Balaji Temple,
NH-37, Ghy-35, Assam

Date: 24/1/24

Submitted to Dean - Academics

25/1/24
(Signature of Dean Academics).

Date: 25. 01. 2024 .

Prof.(Dr.) Ankur Ganguly
Dean- Academics
Royal Global University
Guwahati, Assam, India

29

DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING

COURSE FILE
FOR

Database Management Systems (CSE022C403)
2022-2023

GUWAHATI, ASSAM INDIA

ROYAL GLOBAL UNIVERSITY
Department of Computer Science and Engineering

COURSE FILE
FOR
Database Management Systems
(CSE022C403)

THE ASSAM
ROYAL GLOBAL UNIVERSITY
— GUWAHATI —

Guwahati, Assam
India
2022 – 2023

ROYAL GLOBAL UNIVERSITY
GUWAHATI, ASSAM, PIN: 781035

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

GENERAL INFORMATION

Academic Year	2022-23	Version		CSE/022/403
Semester	Even	Date		08/02/23
Name of the Faculty	Ms. Ankita Goyal Agarwala			
Designation	Assistant Professor			
Email	agagarwal@rgu.ac			
Technical Assistant	None			
Program	B.Tech. (Computer Science and Engineering)			
Course Title	Database Management Systems	Semester	4th	
Theory code	CSE022C403	Year	2nd	
Number of Weeks	12			

Periods per week:	Lectures	03 H			
	Tutorials	00 H			
	Laboratory	02 + 02 H			

Associated Laboratory	Database Management System Laboratory	Class	Day	Time
Laboratory Code	CSE022C413	L-1	Monday	12:00-12:55
		L-2	Tuesday	11:00-12:00
Number of Experiments	11	L-3	Wednesday	9:00-10:00
		Lab-1	Thursday	11:00-12:55
		Lab-2	Friday	9:00-11:00

Contents

Vision of the Department

To offer globally integrated opportunities in the domain of computer science and engineering, fostering the development of students as global citizens with the skills and perspectives needed to thrive in an interconnected world.

Mission of the Department

1. To achieve academic excellence in computer science education through dynamic curriculum, research-driven initiatives, and industry-aligned programs.
2. To instill ethical values and a spirit of community service
3. To give back responsible leaders equipped to drive positive change and innovation in the global technological landscape.

Program Educational Objectives (PEO)

(Program educational objectives are the broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.)

The graduate will

PEO 1	To provide students with a strong foundation in the Mathematical, Scientific and Engineering fundamentals necessary to formulate, solve and analyze engineering problems and to prepare them for graduate studies, R&D.
PEO 2	To provide exposure to emerging cutting-edge technologies, adequate training & opportunities to work as teams on multidisciplinary projects with effective communication skills and leadership qualities.
PEO 3	To prepare the students for a successful career for bridging the digital divide and meeting the requirements of Indian and multinational companies.
PEO 4	To promote student awareness on life-long learning and to introduce them to professional ethics and codes of professional practice.

Program Specific Outcomes (PSO)

(PSOs are statements that describe what the graduates of a specific subject or program should be able to do)

PSO 1	Able to apply the knowledge of programming languages, data structures and Algorithms, data science, networks and software engineering principles for software product development.
PSO 2	Able to analyze and formulate solutions to real world and socially relevant problems over multi-disciplinary domains by using latest technologies.

PSO 3	Able to be a technically competent employee, researcher, entrepreneur, excel in competitive exams and zest for higher studies.

Program Outcomes (PO)

(The outcomes and attributes described in qualification descriptors are attained by students through learning, acquired on completion of a programme of study.)

PO 1 **Engineering knowledge** *(Disciplinary Knowledge)*: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2 **Problem analysis** *(Critical Thinking)*: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3 **Design/development of solutions** *(Problem Solving)*: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4 **Conduct investigations of *complex problems*** *(Analytical Reasoning)*: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5 **Modern tool usage** *(Information/digital literacy)*: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6

PO 6   **The engineer and society** *(Multicultural competence)*: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.

PO 7   **Environment and sustainability** *(Reflective thinking)*: Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

PO 8   **Ethics** *(Moral and ethical awareness/reasoning)*: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9   **Individual and teamwork** *(Cooperation/Teamwork)*: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10   **Communication** *(Communication Skills)*: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11   **Project management and finance** *(Leadership Readiness)*: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12   **Life-long learning** *(Lifelong Learning)*: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Objectives & Outcomes

Course Objective

(An objective is a statement in specific and measurable terms that describes what the learner will know or be able to do as a result of the learning activity)

7

To make the students learn about databases and the process of designing and constructing data models.

Course Outcome (CO)

(Course outcomes (COs) are direct statements that describe the essential and enduring disciplinary knowledge, abilities that students should possess and the depth of learning that is expected upon completion of a course.)

After completion of this course student are expected to be able to demonstrate following knowledge, skills, and attitudes

The student will be able to:

CO1   Understand the basic concepts and applications of database systems (BT2).

CO2   Apply the basic concepts of MySql and write queries using it. (BT3).

CO3   Analyze the designed database for normalization. (BT4).

CO4   Evaluate the process of transaction processing and concurrency control. (BT5)

Mapping of COs with POs and PSOs

Course Outcomes	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	3	2	3	-	-	-	-	-	2	3	-	-	-
CO2	3	3	3	3	3	-	-	-	-	-	2	3	3	3	3
CO3	3	3	3	3	-	-	-	-	-	-	2	3	3	3	3
CO4	3	3	3	3	2	-	-	-	-	-	-	2	-	-	-
Overall	3	3	3	3	2	-	-	-	-	-	2	3	3	3	3

CO-PO Scale		
	3	Strongly Related
	2	Moderately Related
	1	Weekly Related

Syllabus of Database Management Systems

Theory:

Unit - 1

Basic Concepts: Purpose of database systems-Components of DBMS –DBMS Architecture-Three Tier Architecture, and Data Independence-Data modelling -Entity

8

Relationship Model and Diagram, Relational –Network-Hierarchical and object-oriented models-Data Modelling using the Entity Relationship Model.

Unit - 2
Structure of Relational Databases: Relational databases –relational algebra-relational calculus, tuple and domain calculus. Data definition with SQL, insert, delete and update statements in SQL –views –data manipulation with SQL. assertions – triggers, Cursors

Unit – 3
Database Design: Design guidelines–Relational database design –Integrity Constraints –Domain Constraints-Referential integrity –Functional Dependency-Normalization using Functional Dependencies, Normal forms based on primary keys-general definitions of Second and Third Normal Forms. Boyce-Codd Normal Form–Multi-valued Dependencies and Forth Normal Form –Join Dependencies and Fifth Normal Form –Pitfalls in Relational Database Design, Properties of Relational Decomposition, Dependency Preserving Property, Lossless Non-Additive Join Property, Testing Relational Decompositions for non-additive and dependency preserving properties.

Unit – 4
Introduction to Transaction and Query Processing: Transaction and System Concepts-Desirable properties of Transactions-Schedules and Recoverability-Serializability of Schedules -Concurrency Control–Data Storage Indexing and Query processing and Optimization

MySQL case study: The basic structure of the MySQL system database structure and its manipulation in MySQL -storage organization in MySQL -Programming in PL/SQL-Cursor in PL/SQL

Books
Textbooks
1. Fundamentals of Database System, Elmasri and Navathe, 7thEdition, 2016, Pearson Education Asia
2. Database System Concepts, Henry F Korth, Abraham Silberschatz, 6th Edition, 2013, Mc Graw Hill.
3. DataBase Management System, Paneerselvam, 2nd Edition, 2011, PHI Learning

9

Reference Books

1. C. J. Date, An Introduction to Database Systems, 8th Edition, 2003, Pearson Education Asia

2. Bibin C. Desai, An Introduction to Database Systems, Revised Edition, 2012, Galgotia Publications

Laboratory:

List of Experiments:

1. Programs to understand the functionality and limitations of file system.
2. Consider the following relational schema

   Employee (Emp_no, Name, Salary, design, dept_id, DOJ)
   Department (Dept_id, DName, loc, DOE)
   a. Display the name of the employees working in marketing dept.
   b. Display the details of the employee joined in the month of July.
   c. Display the details of the employee who gets maximum salary.
   d. Count the no of employees in each department

3. Consider the following relational schema

   Student (Rollno, Name, Address, DOB, C_id)
   Course (C_id, Cname, Dur, Fees)
   a. Display rollno, name, cname, fees of each student
   b. Count the no of students in each course

4. Consider the following relational schema

   Books(book_id,b_name,author,purchase_date,cost)
   Members(member_id,m_name,address,phone,birthdate)
   Issue_return(book_id,member_id,issue_date,return_date)

   a. Find the author of the books that have not been issued.
   b. Display the member_id and no of books issued to that (Assume that if a book in Issue_Return relation does not have a return_date then it is issued)
   c. Find the book that has been issued the minimum no of times.
   d. Display the names and author of the books that have been issued at any time to a member whose name begins with "Ra".
   e. Display the name and Cost of those books that have been issued to any member whose date of birth is less than 01-01-1989 but not been issued to any member having the birth date equal to or greater than 01-01-1989.

5. Consider the following relational schema

   Student(name,phone,dob,s_id)
   Course(c_id,cname,credit,teacher_id)
   Result(s_id,c_id,mark)
   a. Find the name of the students whose results are not declared in any course
   b. Find the teachers who are teaching more than one course

c. Display the name and marks of those students who were born before 1-1-1989 and score more than 80 marks in any course
d. Find the details of students securing pass marks in more than 3 course
e. Find the total no of credits earned by a students whose id is 10.
f. Find name of the students who got maximum overall marks.
g. Display the name and marks of those students who scored more than 80 marks in any subject.
h. Find the details of the students securing less than 30 marks in more than 3 subjects.

6. Consider the following relational schema

    Customer(C_id, Name , Address)
    Item(i_code , Name , Price)
    Purchase (P_id ,C_id , I_code, qty , pdate)

    a. Find the name of the customer who has done maximum purchase.
    b. Display the name of the item that has been purchased maximum no of times in the month of Feb.
    c. Display the name of the customer who didn't purchase any item.

7. Create three triggers (insert, delete and update) on emp table so that:
    a. Whenever a new record is inserted then the emp_id and date of insertion is stored in another table called new_rec.
    b. Whenever a record is deleted the emp_id and date of deletion is stored in another table called old_rec.
    c. Whenever employee's salary is updated the emp_id , old salary and updated salary is stored in another table called update_info.

8. Write a procedure to accept a emp_id and display the employee details.
9. Write a procedure to accept a emp_id and return the employee salary.
10. Given,

    Emp(emp_no,name,salary,supervisor_no,dept_code)
    Dept(dept_code, dept_name)
    a. employees who get more salary than their supervisor
    b. Department name and total number of employees in each Department.
    c. Name and department of employee(s) who earn maximum salary.

11. Programs on Views and Cursors

Module/Topic Layout

Sl. No	Module/Topic	Lecture + Tutorial	Laboratory
1	Basic Concepts	3+1	-
2	Structure of Relational Databases	5+1	Exp 1- Exp 11
3	Database Design	3+1	Exp 1- Exp 11
4	Introduction to Transaction and Query Processing	3+1	-

Database Management Systems (CSE022C403)

Week	Content	Tutorial	Laboratory	Hours			Assignment
				T	T	L	
1	Introduction to Data System, Drawbacks of Conventional File System, Purpose of database systems-Components of DBMS	-	Program on basic operations of Files and identifying their drawbacks	3	0	2	CA-I
2	DBMS Architecture and Data Independence-Data modelling -Entity Relationship Model	-	Program on basic operations of Files and identifying their drawbacks	3	0	2	
3	Network-Hierarchical and object-oriented models-Data Modelling using the Entity Relationship Model.	-	MySql Installation	3	0	2	
4	Relational databases –relational algebra-tuple relational calculus.	-	Query Solving using basic operations of MySql	3	0	2	
5	Data definition with SQL, insert, delete and update statements in SQL –views –data manipulation with SQL	-	Query Solving using basic operations of MySql	3	1	2	
6	Triggers and assertions, cursors	-	Programs on Triggers, Cursors and Stored Procedures	3	0	2	CA-2
7	Design guidelines – Relational database design –Integrity Constraints –Domain Constraints	-	Programs on Designing Databases ensuring Constraints	3	0	2	
8	Referential integrity –Functional Dependency-Normalization using Functional Dependencies, Normal forms based on primary keys-general definitions of Second and Third Normal Forms.	-	Programs on Database Design ensuring normalisation	3	0	2	
9	Boyce Codd Normal Form–Multivalued Dependencies and Forth Normal Form –	-	Programs on Database Design ensuring normalisation	3	0	2	CA-3

13

	Join Dependencies and Fifth Normal Form –Pitfalls in Relational Database Design, Lossless Non-additive Join Property of Decomposition, Dependency Preserving Decomposition							
10	Transaction and System Concepts- Desirable properties of Transactions	-	Programs on Database Design ensuring normalisation	3	0	2	CA-4
11	Schedules and Recoverability - Serializability of Schedules- Concurrency Control	-	Programs on Database Design ensuring normalisation	3	0	2	
12	Database Recovery Concepts- Caching, Checkpoints, Transaction Rollback, Case Study-Recovery Techniques in DBMS	-	Programs on Database Design ensuring normalisation	3	0	2	

Daily Lesson Plan

Database Management System

Day	Content	Planning
L1	Revision on the Basic Concepts of Programming and Data Structures	06-02-2023
L2	Revision on the Basic Concepts of Programming and Data Structures	07-02-2023
L3	Revision on the Basic Concepts of Programming and Data Structures	08-02-2023
L4	Definition of DBMS, Need for DBMS, Difference between Conventional File System and DBMS	13-02-2023
L5	Characteristics, Advantages, Disadvantages and Applications of DBMS	14-02-2023
L6	Overview on Schema and Instance, Types of Databases	15-02-2023
L7	Data Models and its Types, Database Languages	21-02-2023
L8	DBMS Architectures: 1-tier, 2-tier, 3-tier, Three Schema	22-02-2023
L9	Three Schema Architecture, Data Independence and its Types	27-02-2023
L10	ER model Concept, Basic Concepts, Entities and its types, Attributes and Relationships	28-02-2023
L11	Types of Attributes, Cardinalities, Participation	27-08-2022
L12	Notation for ER Diagram	01-03-2023
L13	Practice Problems on ER Diagram	11-03-2023
L14	Practice Problems on ER Diagram	13-03-2023
L15	Concept of Generalisation and Specialisation	14-03-2023
L16	DBMS Codd's Rule	15-03-2023
L17	Basic Concepts of Relational Data Model, tuples, domain, etc.	27-03-2023
L18	Types of Keys in DBMS	28-03-2023
L19	Constraints in DBMS and Operations Violating the Constraints	29-03-2023
L20	Relational Algebra Operations in DBMS with Examples	03-04-2023
L21	Drawbacks of Cartesian Product, Join Operation and its Types	04-04-2023
L22	Example Problems and Solutions on Relational Algebra	05-04-2023
L23	Basic Concept of Relational Calculus	10-04-2023

L24	Closure of an Entity Set, its need and Steps to find Closure with Example	11-04-2023
L25	Steps to find Candidate Keys and some Examples	17-04-2023
L26	Concept of Functional Dependency and its Different Types	25-04-2023
L27	Armstrong's Axioms on Functional Dependency along with Proof	01-05-2023
L28	Definition and importance of Normalisation, Explanation on 1NF, 2NF	02-05-2023
L29	Explanation on 3NF, 3.5NF, BCNF	03-05-2023
L30	Examples on Normalisation	08-05-2023
L31	Decomposition of Relations and Its Types	09-05-2023
L32	Concept of Dependency Preservation	10-05-2023
L33	Concept of Transactions and its ACID Properties	15-05-2023
L34	States of Transactions	16-05-2023
L35	Concept of Schedules, its various Types and Testing of Serializability	17-05-2023
L36	Conflict Serializability and Its Testing with Examples	22-05-2023
L37	View Serializability and Its Testing with Examples	23-05-2023
L38	Concept of Concurrency Control and the Problems associated with it	24-05-2023
L39	Lock-based and Timestamp based Concurrency Control Protocol	29-05-2023
L40	Timestamp based and Validation based Concurrency Control Protocol	30-05-2023
L41	Concept of Data Recovery and Backup	31-05-2023
L42	Protocols associated with Recovery	05-06-2023
L43	Revision and Doubt Clearing Session through Student Presentations	06-06-2023
L44	Revision and Doubt Clearing Session through Student Presentations	07-06-2023
L45	Revision and Doubt Clearing Session through Student Presentations	12-06-2023
L46	Revision and Doubt Clearing Session through Student Presentations	13-06-2023

Evaluation Scheme

Theory			
Evaluation Criteria	**Actual Marks**	**Marks after Scaling**	**Full Marks**
Continuous Assessment -I	5	5	
Continuous Assessment -II	20	10	
Continuous Assessment - III	5	5	25
Continuous Assessment - IV	5	5	
Attendance	5	5	5
University Exam	70	70	70
Total			100

			Laboratory						
Internal Marks			**External Marks**			**Total**			
30			70			100			
Evaluation Number	**Subject**	**Schedule**	**Internal Marks (30)**				**External Marks (70)**		
			Skill Test	Lab Copy	Viva	Attendance	ER Diagram	Database Design	Query Solving	Viva voce
			10	10	5	5	10	10	30	20
1	Exp1	24-02-23								
2	Exp2	02-03-23								
3	Exp3	09-02-23								
4	Exp4	16-03-23								
5	Exp5	06-04-23								
6	Exp6	27-04-23								
7	Exp7	04-05-23								
8	Exp8	18-05-23								
9	Exp9	25-05-23								
10	Exp10	01-06-23								
11	Exp11	08-06-23								

Course Outcome and PO alignment

Course Outcomes aligned to the PO		Skills/Competencies the student will be able to demonstrate	Level of Bloom's Taxonomy to be met	Target for Achievement	
PO1, PO2, PO3, PO4, PO5, PO11, PO12	CO1	Understand the basic concepts and applications of database systems	2	70% of student will achieve	70%
PO1, PO2, PO3, PO4, PO5, PO11, PO12	CO2	Apply the basic concepts of MySql and write queries using it.	3	70% of student will achieve	70%
PO1, PO2, PO3, PO4, PO11, PO12	CO3	Analyze the designed database for normalization.	4	70% of student will achieve	70%
PO1, PO2, PO3, PO4, PO5, PO12	CO4	Evaluate the process of transaction processing and concurrency control	5	70% of student will achieve	70%
70% of student will achieve					**70%**

Delivery Methodology

Outcome	Method	Supporting Tools for Theory	Supporting Tools for Laboratory
CO1	Classroom teaching, Self-learning, Tutorial, Assignment	White Board, Books & Web Resources, Class Test, Presentations, Viva	Simulation/ Experimental Setup of MySql
CO2	Classroom teaching, Self-learning, Tutorial, Assignment	White Board, Books & Web Resources, Class Test, Presentations, Viva	Simulation/ Experimental Setup of MySql
CO3	Classroom teaching, Self-learning, Tutorial, Assignment	White Board, Books & Web Resources, Class Test, Presentations, Viva	Simulation/ Experimental Setup of MySql
CO4	Classroom teaching, Self-learning, Tutorial, Assignment	White Board, Books & Web Resources, Class Test, Presentations, Viva	Simulation/ Experimental Setup of MySql

Assessment Methodology

Outcome	Assessment Tools		Specific Question/Activity aligned to the outcome
CO1-CO4	Direct Assessment	Test	CA-I – IV
CO1-CO4		Assignment	Assignment –I, II, III, IV
NA		Quiz	NA
NA		Presentation	NA
CO1-CO4		Laboratory	PCA1, PCA2 & External assessment
CO1-CO4		End of Semester Test	University Semester Examination
CO1-CO4	Indirect Assessment	Formative Feedback	After 15 days
CO1-CO4		Summative Feedback	After completion of the course

Formative Feedback

Royal Global University

Guwahati, Assam, India

Department of Electrical Engineering

Formative Feedback Analysis form

Course Name	Database Management System	Course Code	CSE022C403
Semester	4th	Year	2nd
Department	Computer Science & Engineering		
Total Number of Students (B)	43	Faculty Name	Ms. Ankita Goyal Agarwala

SI No.	Questions	Yes (A1) Credit - 4	largely (A2) Credit – 3	Partially (A3) Credit – 2	Marginally (A4) Credit – 1	No (A5) Credit - 0	Expected Percentage	Percentage Met	Faculty Comments
1	Are the course objectives and outcome as mentioned in course description clear?	38	3	2	0	0	75%	95.9%	
2	Does the lecture start in time?	40	2	1	0	0	75%	97.7%	
3	Are the lectures easily understandable?	32	5	3	3	0	75%	88.4%	

4	Is the lecture material well presented?	32	4	2	5	0	75%	86.6%	
5	Is the class environment favourable to learning?	43	0	0	0	0	75%	100%	
6	Are the interactions in the class supportive in understanding the subject?	39	2	0	2	0	75%	95.3%	
7	Is the course Progressing as per the lesson plan?	38	2	3	0	0	75%	95.3%	
8	Are the lab experiments conducted as per schedule?	41	2	0	0	0	75%	98.8%	
9	is there an initiative to invites and discuss them?	33	4	2	4	0	75%	88.4%	

CA – I Question Paper

1. Differentiate between DBMS and Conventional File System in your own language   [CO1]

2. Draw the ER diagram on Hospital Management System elaborating on the entities, relationships, constraints, cardinalities and participation.   [CO2]

Assessment Sheet for Continuous Assessment – I

Name of the Faculty	Ms. Ankita Goyal Agarwala

Course name	Database Management System		Course Outcome Attainment with target in %						
		Total	CO1	CO2	CO3	CO4	Average CO	Bright or Week
	Distribution of Marks		50	60	70	80		
	Set Target Level	05	% of Marks to be Scored				65	Bright>80, Weak<40
Sl. No	Roll number							
1	212025003	4.0	1	1	1	1	80	Bright
2	212025004	4.0	1	1	1	1	80	Bright
3	212025005	4.0	1	1	1	1	80	Bright
4	212025006	3.0	1	1	0	0	60	Ok
5	212025008	5.0	1	1	1	1	100	Bright
6	212025010	2.0	0	0	0	0	40	Weak
7	212025011	4.0	1	1	1	1	80	Bright
8	212025012	4.0	1	1	1	1	80	Bright
9	212025013	4.0	1	1	1	1	80	Bright
10	212025015	4.0	1	1	1	1	80	Bright
11	212025016	3.0	1	1	0	0	60	Ok
12	212025017	4.0	1	1	1	1	80	Bright
13	212025019	3.0	1	1	0	0	60	Ok
14	212025020	3.0	1	1	0	0	60	Ok
15	212025021	4.0	1	1	1	1	80	Bright
16	212025023	3.0	1	1	0	0	60	Ok
17	212025024	4.0	1	1	1	1	80	Bright
18	212025026	4.0	1	1	1	1	80	Bright
19	212025028	3.0	1	1	0	0	60	Ok
20	212025029	3.0	1	1	0	0	60	Ok
21	212025030	4.0	1	1	1	1	80	Bright
22	212025032	3.0	1	1	0	0	60	Ok
23	212025034	3.0	1	1	0	0	60	Ok
24	212025036	3.0	1	1	0	0	60	Ok
25	212025037	3.0	1	1	0	0	60	Ok

26	212025038	3.0	1	1	0	0	60	Ok
27	212025041	3.0	1	1	0	0	60	Ok
28	212025042	4.0	1	1	1	1	80	Bright
29	212025043	4.0	1	1	1	1	80	Bright
30	212025044	4.0	1	1	1	1	80	Bright
31	212025045	4.0	1	1	1	1	80	Bright
32	212025046	4.0	1	1	1	1	80	Bright
33	212025047	3.0	1	1	0	0	60	Ok
34	212025049	4.0	1	1	1	1	80	Bright
35	212025050	4.0	1	1	1	1	80	Bright
36	212025051	4.0	1	1	1	1	60	Bright
37	212025054	3.0	1	1	0	0	60	Ok
38	212025055	3.0	1	1	0	0	60	Ok
39	212025056	3.0	1	1	1	1	80	Bright
40	212025059	4.0	1	1	1	1	80	Bright
41	226025001	3.0	1	1	0	0	60	Ok
42	226025002	3.0	1	1	0	0	60	Ok
43	226025004	4.0	1	1	1	1	80	Bright
Total no. of Student		3.53	43	43	24	24		

Strategy to support weak students

Criterion for selecting Weak student

1. CO based analysis of Assignment –I
2. Student who unable to meet any particular CO
3. Student who scores less than equal to 60% of marks

It is clear from the above table that all 19 students relatively weak in CO3 and CO4. They are instructed to:

1. Attain the remedial classes.
2. Regular basis interaction with class teacher after the theoretical class

Strategy to support Bright students

Criterion for selecting Bright student

1. CO based analysis of Assignment –II
2. Student who met all the CO's and score greater than 80% in CO1, CO2 and greater than 75% in CO3 and CO4

The bright students of the above table are instructed to

1. Study the Complex Engineering Problem which available in Reference books of Database Management System – I
2. Consult Conference/Journal Paper are related Complex Engineering Problems
3. Solve GATE Question paper and harder problem

25

CA - II Question Paper

ROYAL GLOBAL UNIVERSITY
GUWAHATI

The Assam Royal Global University

Royal School of Engineering and Technology (RSET)

MID SEMESTER EXAMINATION, April, 2023

Course: B. Tech (CSE) **Semester:** 4th

Subject: Database Management Systems **Course Code:** CSE022C403

Full Marks: 20 **Time:** 60 minutes

GROUP A

Q1. Choose the correct answers for the following: (Any six) 1 x 6 = 6

i. Which of the following is generally used for performing tasks like creating the structure of the relations, deleting relation? [CO2]
   a. DML (Data Manipulation Language) c. Relation Schema
   b. Query Language d. DDL (Data Definition Language)

ii. Which of the following refers to the level of data abstraction that describes exactly how the data actually stored? [CO1]
   a. Conceptual Level c. File Level
   b. Physical Level d. Logical Level

iii. Which of the following refers to the number of tuples in a relation? [CO2]
   a. Entity c. Cardinality
   b. Column d. None of the above

iv. Which of the following is a top-down approach in which the entity's higher level can be divided into two lower sub-entities? [CO1]
   a. Aggregation c. Specialization
   b. Generalization d. All of the above

v. What is information about data called? [CO1]
   a. Hyper data c. Meta data
   b. Tera data d. Relations

vi. The term "Data independence" refers to____ [CO1]
   a. Data is defined separately and not included in the programs
   b. Programs are not dependent on the logical attributes of the data
   c. Programs are not dependent on the physical attributes of the data
   d. Both B & C

26

vii. _____ is a set of one or more attributes taken collectively to uniquely identify a record. [CO2]
   a. Primary Key
   b. Foreign key
   c. Super Key
   d. Candidate Key

viii. In general, a file is basically a collection of all related_____. [CO2]
   a. Rows & Columns
   b. Fields
   c. Database
   d. Records

GROUP B

Q2. Write short answer the following questions: (Any two)   **2 x 2 = 4**

   i. Differentiate between multivalued and composite attributes citing suitable examples. [CO2]

   ii. What are the applications of DBMS? Explain any two in detail. [CO1]

   iii. Justify: All primary keys are simple attributes but all simple attributes are not primary. [CO1]

   iv. Illustrate the concept of schema and instance with suitable examples. [CO2]

GROUP C

Q3. Briefly answer the following questions: (Any two)   **5 x 2 = 10**

   i. Explain on the most distinguishing characteristics of a database management system. [CO1]

   ii. With a neat diagram, highlight the main purpose of the three-schema architecture of DBMS. [CO1]

   iii. Draw a neat and clean ER diagram on Railway Reservation System highlighting all the relevant details. [CO1]

   iv. Explain the concept of keys in DBMS citing relevant examples for each. [CO2]

Assessment Sheet for Continuous Assessment – II

Name of the Faculty	Ms. Ankita Goyal Agarwala

Course name	Database Management System	Total	Course Outcome Attainment with target in %				Average CO	Bright or Week
			CO1	CO2	CO3	CO4		
	Distribution of Marks		50	60	70	80		
	Set Target Level	10	% of Marks to be Scored				65	Bright>80, Week<40

SI. No	Roll number	Total	CO1	CO2	CO3	CO4	Average CO	Bright or Week
1	212025003	10.0	1	1	1	1	100	Bright
2	212025004	3.5	0	0	0	0	35	Weak
3	212025005	6.5	1	1	0	0	65	Ok
4	212025006	3.0	0	0	0	0	30	Weak
5	212025008	10.0	1	1	1	1	100	Bright
6	212025010	3.5	0	0	0	0	35	Weak
7	212025011	7.5	1	1	1	0	75	Ok
8	212025012	3.5	0	0	0	0	35	Weak
9	212025013	9.0	1	1	1	1	90	Bright
10	212025015	7.0	1	1	1	0	70	Ok
11	212025016	5.5	1	0	0	0	55	Ok
12	212025017	7.5	1	1	1	0	75	Ok
13	212025019	7.5	1	1	1	0	75	Ok
14	212025020	7.0	1	1	1	0	70	Ok
15	212025021	10.0	1	1	1	1	100	Bright
16	212025023	4.5	1	1	1	1	100	Bright
17	212025024	8.0	1	1	1	1	80	Bright
18	212025026	8.0	1	1	1	1	80	Bright
19	212025028	3.0	0	0	0	0	30	Weak
20	212025029	4.0	0	0	0	0	30	Weak
21	212025030	5.0	1	0	0	0	50	Ok
22	212025032	7.0	1	1	1	0	70	Ok
23	212025034	5.0	1	0	0	0	50	Ok
24	212025036	3.0	0	0	0	0	30	Weak

25	212025037	6.5	1	1	0	0	65	Ok
26	212025038	4.5	1	0	0	0	45	Ok
27	212025041	3.5	0	0	0	0	35	Weak
28	212025042	9.0	1	1	1	1	90	Bright
29	212025043	7.0	1	1	1	0	70	Ok
30	212025044	2.0	0	0	0	0	20	Weak
31	212025045	7.5	1	1	1	0	75	Ok
32	212025046	7.5	1	1	1	0	75	Ok
33	212025047	3.0	0	0	0	0	30	Weak
34	212025049	4.0	1	0	0	0	40	Weak
35	212025050	5.5	1	0	0	0	55	Ok
36	212025051	6.0	1	1	0	0	60	Ok
37	212025054	4.0	0	0	0	0	40	Weak
38	212025055	3.5	0	0	0	0	35	
39	212025056	4.0	0	0	0	0	40	Weak
40	212025059	4.0	0	0	0	0	40	Weak
41	226025001	4.0	0	0	0	0	40	Weak
42	226025002	2.5	0	0	0	0	25	Weak
43	226025004	4.0	0	0	0	0	40	Weak
Total no. of Student		5.60	26	20	17	08		

Strategy to support weak students

Criterion for selecting Weak student
1. CO based analysis of Assignment –II and CA –II
2. Student who unable to meet any particular CO
3. Student who score less than 60% of marks

It is clear from the above table that all a lot of students have weakness in CO3 and CO4. They are instructed to
1. Attain the remedial classes
2. Regular basis interaction with class teacher after the theoretical class

Strategy to support Bright students

Criterion for selecting Bright student
1. CO based analysis of Assignment –II
2. Student who met all the CO's and score greater than 80% in CO1, CO2 and greater than 75% in CO3 and CO4

The bright students of the above table are instructed to
1. Study the Complex Engineering Problem which available in Reference books of Database Management Systems – I
2. Consult Conference/Journal Paper are related Complex Engineering Problems
3. Solve GATE Question paper and harder problem

CA – III Question Paper

Solve the following queries using Relational Algebra: [CO2, CO3]

passenger (pid, pname, pgender, pcity)
agency (aid, aname, acity)
flight (fid, fdate, time, src, dest)
booking (pid, aid, fid, fdate)

1. Get the complete details of all flights to New Delhi.
2. Get the details about all flights from Chennai to New Delhi.
3. Find only the flight numbers for passenger with pid 123 for flights to Chennai before 06/11/2020.
4. Find the passenger names for passengers who have bookings on at least one flight.
5. Find the passenger names for those who do not have any bookings in any flights.
6. Find the agency names for agencies that located in the same city as passenger with passenger id 123.
7. Get the details of flights that are scheduled on both dates 01/12/2020 and 02/12/2020 at 16:00 hours.
8. Get the details of flights that are scheduled on either of the dates 01/12/2020 or 02/12/2020 or both at 16:00 hours.
9. Find the agency names for agencies who do not have any bookings for passenger with id 123.
10. Find the details of all male passengers who are associated with Jet agency.

30

Assessment Sheet for Continuous Assessment – III

Name of the Faculty	Ms. Ankita Goyal Agarwala

Course name		Course Outcome Attainment with target in %						
	Database Management System	Total	CO1	CO2	CO3	CO4	Average CO	Bright or Week
	Distribution of Marks		50	60	70	80		
	Set Target Level	05	% of Marks to be Scored				65	Bright>80, Week<40
Sl. No	Roll number							
1	212025003	4.0	1	1	1	1	80	Bright
2	212025004	3.0	1	1	0	0	60	ok
3	212025005	4.0	1	1	1	1	80	Bright
4	212025006	3.0	1	1	0	0	60	ok
5	212025008	4.0	1	1	1	1	80	Bright
6	212025010	2.0	0	0	0	0	20	Weak
7	212025011	4.0	1	1	1	1	80	Bright
8	212025012	4.0	1	1	1	1	80	Bright
9	212025013	0.0	0	0	0	0	0	Weak
10	212025015	4.0	1	1	1	1	80	Bright
11	212025016	4.0	1	1	1	1	80	Bright
12	212025017	4.0	1	1	1	1	80	Bright
13	212025019	3.0	1	1	0	0	60	ok
14	212025020	3.0	1	1	0	0	60	ok
15	212025021	3.0	1	1	0	0	60	ok
16	212025023	4.0	1	1	1	1	80	Bright
17	212025024	3.0	1	1	0	0	60	ok
18	212025026	3.0	1	1	1	1	80	Bright
19	212025028	4.0	1	1	1	1	80	Bright
20	212025029	3.0	1	1	0	0	60	ok
21	212025030	4.0	1	1	0	0	60	ok
22	212025032	4.0	1	1	1	1	80	Bright
23	212025034	3.0	1	1	0	0	60	ok
24	212025036	3.0	1	1	0	0	60	ok
25	212025037	0.0	1	1	0	0	60	ok

26	212025038	3.0	1	1	0	0	60	ok
27	212025041	3.0	1	1	0	0	60	ok
28	212025042	4.0	1	1	0	0	60	ok
29	212025043	4.0	1	1	1	1	80	Bright
30	212025044	3.0	1	1	1	1	80	Bright
31	212025045	3.0	1	1	1	1	80	Bright
32	212025046	3.0	1	1	1	1	80	Bright
33	212025047	3.0	1	1	1	1	80	Bright
34	212025049	4.0	1	1	0	0	60	ok
35	212025050	4.0	1	1	1	1	80	Bright
36	212025051	3.0	1	1	1	1	80	Bright
37	212025054	3.0	1	1	1	1	80	Bright
38	212025055	2.0	0	0	0	0	20	Weak
39	212025056	3.0	1	1	0	0	60	ok
40	212025059	2.0	0	0	0	0	20	Weak
41	226025001	3.0	1	1	1	1	80	Bright
42	226025002	4.0	1	1	1	1	80	Bright
43	226025004	4.0	1	1	0	0	60	ok
	Total no. of Student	3.21	39	39	22	22		

Strategy to support weak students

Criterion for selecting Weak student

1. CO based analysis of Assignment –III
2. Student who unable to meet any particular CO
3. Student who score less than 60% of marks

It is clear from the above table that all 21 students have weakness in CO3 and CO4. They are instructed to
1. Attain the remedial classes
2. Regular basis interaction with class teacher after the theoretical class

Strategy to support Bright students

Criterion for selecting Bright student

1. CO based analysis of Assignment –III
2. Student who met all the CO's and score greater than 80% in CO1 and CO2 and greater than 75% in CO3 and CO4

The bright students of the above table are instructed to
1. Study the Complex Engineering Problem which available in Reference books of Database Management System – I
2. Consult Conference/Journal Paper are related Complex Engineering Problems
3. Solve GATE Question paper and harder problem

CA – IV Question Paper

Topics of Presentation

1. Normalisation in DBMS [CO3]
2. Decomposition and Dependency Preserving in DBMS [CO3]
3. Data Independence in DBMS [CO1]
4. Concurrency Control [CO4]
5. Finding Candidate Keys in Relational Schema [CO3]
6. View Serializability [CO4]
7. Applications of DBMS [CO1]
8. Serializability in DBMS [CO4]
9. Constraints and Operations Violating them [CO2]
10. Architectures of DBMS [CO1]
11. Generalisation and Specialisation [CO1]
12. Relational Algebra Operations [CO2]
13. Types of Join Operations [CO2]
14. Transactions [CO4]
15. Types of Keys in DBMS [CO2]
16. ER Diagram [CO1]
17. Data Recovery [CO4]
18. Recoverability of Schedules [CO4]

Assessment Sheet for Continuous Assessment – IV

Name of the Faculty		Ms. Ankita Goyal Agarwala						

Course name	Database Management System	Total	Course Outcome Attainment with target in %					
			CO1	CO2	CO3	CO4	Average CO	Bright or Week
	Distribution of Marks		50	60	70	80		
	Set Target Level	05	% of Marks to be Scored				65	Bright>80, Week<40

Sl. No	Roll number	Total	CO1	CO2	CO3	CO4	Average CO	Bright or Week
1	212025003	4.0	1	1	1	1	80	Bright
2	212025004	4.0	1	1	1	1	80	Bright
3	212025005	4.0	1	1	1	1	80	Bright
4	212025006	2.0	0	0	0	0	40	Weak
5	212025008	4.0	1	1	1	1	80	Bright
6	212025010	3.0	1	1	0	0	60	ok
7	212025011	4.0	1	1	1	1	80	Bright
8	212025012	4.0	1	1	1	1	80	Bright
9	212025013	4.0	1	1	1	1	80	Bright
10	212025015	4.0	1	1	1	1	80	Bright
11	212025016	0.0	0	0	0	0	0	Weak
12	212025017	4.0	1	1	1	1	80	Bright
13	212025019	4.0	1	1	1	1	80	Bright
14	212025020	4.0	1	1	1	1	80	Bright
15	212025021	4.0	1	1	1	1	80	Bright
16	212025023	4.0	1	1	1	1	80	Bright
17	212025024	3.0	1	1	0	0	60	Ok
18	212025026	4.0	1	1	1	1	80	Bright
19	212025028	3.0	1	1	0	0	60	Ok
20	212025029	4.0	1	1	1	1	80	Bright
21	212025030	4.0	1	1	1	1	80	Bright
22	212025032	4.0	1	1	1	1	80	Bright
23	212025034	4.0	1	1	1	1	80	Bright
24	212025036	3.0	1	1	0	0	60	Ok
25	212025037	4.0	1	1	1	1	80	Bright

34

26	212025038	4.0	1	1	1	1	80	Bright
27	212025041	4.0	1	1	1	1	80	Bright
28	212025042	4.0	1	1	1	1	80	Bright
29	212025043	4.0	1	1	1	1	80	Bright
30	212025044	3.0	1	1	0	0	60	Ok
31	212025045	3.0	1	1	0	0	60	Ok
32	212025046	3.0	1	1	0	0	60	Ok
33	212025047	4.0	1	1	1	1	80	Bright
34	212025049	4.0	1	1	1	1	80	Bright
35	212025050	4.0	1	1	1	1	80	Bright
36	212025051	3.0	1	1	0	0	60	Ok
37	212025054	2.0	0	0	0	0	40	Weak
38	212025055	4.0	1	1	1	1	80	Bright
39	212025056	4.0	1	1	1	1	80	Bright
40	212025059	3.0	1	1	0	0	60	Ok
41	226025001	4.0	1	1	1	1	80	Bright
42	226025002	3.0	1	1	0	0	60	Ok
43	226025004	4.0	1	1	1	1	80	Bright
Total no. of Student		3.60	41	41	30	30		

Strategy to support weak students

Criterion for selecting Weak student

1. CO based analysis of Assignment –IV
2. Student unable to meet any particular CO
3. Student who scores less than 60% of marks

It is clear from the above table that all 13 students have weakness in CO3 and CO4. They are instructed to
1. Attain the remedial classes

Strategy to support Bright students

Criterion for selecting Bright student

1. CO based analysis of Assignment –IV
2. Student who met all the CO's and score greater than 80% in CO1 and CO2 and greater than 75% in CO3 and CO4

The bright students of the above table are instructed to
1. Study the Complex Engineering Problem which available in Reference books of Database Management System – I
2. Consult Conference/Journal Paper are related Complex Engineering Problems
3. Solve GATE Question paper and harder problem

Daily Lesson Plan Execution Details

Database Management System

Day	Content	Date of Execution
L1	Revision on the Basic Concepts of Programming and Data Structures	06-02-2023
L2	Revision on the Basic Concepts of Programming and Data Structures	07-02-2023
L3	Revision on the Basic Concepts of Programming and Data Structures	08-02-2023
L4	Definition of DBMS, Need for DBMS, Difference between Conventional File System and DBMS	13-02-2023
L5	Characteristics, Advantages, Disadvantages and Applications of DBMS	14-02-2023
L6	Overview on Schema and Instance, Types of Databases	15-02-2023
L7	Data Models and its Types, Database Languages	21-02-2023
L8	DBMS Architectures: 1-tier, 2-tier, 3-tier, Three Schema	22-02-2023
L9	Three Schema Architecture, Data Independence and its Types	27-02-2023
L10	ER model Concept, Basic Concepts, Entities and its types, Attributes and Relationships	28-02-2023
L11	Types of Attributes, Cardinalities, Participation	27-08-2022
L12	Notation for ER Diagram	01-03-2023
L13	Practice Problems on ER Diagram	11-03-2023
L14	Practice Problems on ER Diagram	13-03-2023
L15	Concept of Generalisation and Specialisation	14-03-2023
L16	DBMS Codd's Rule	15-03-2023
L17	Basic Concepts of Relational Data Model, tuples, domain, etc.	27-03-2023
L18	Types of Keys in DBMS	28-03-2023
L19	Constraints in DBMS and Operations Violating the Constraints	29-03-2023
L20	Relational Algebra Operations in DBMS with Examples	03-04-2023
L21	Drawbacks of Cartesian Product, Join Operation and its Types	04-04-2023
L22	Example Problems and Solutions on Relational Algebra	05-04-2023

L23	Basic Concept of Relational Calculus	10-04-2023
L24	Closure of an Entity Set, its need and Steps to find Closure with Example	11-04-2023
L25	Steps to find Candidate Keys and some Examples	17-04-2023
L26	Concept of Functional Dependency and its Different Types	25-04-2023
L27	Armstrong's Axioms on Functional Dependency along with Proof	01-05-2023
L28	Definition and importance of Normalisation, Explanation on 1NF, 2NF	02-05-2023
L29	Explanation on 3NF, 3.5NF, BCNF	03-05-2023
L30	Examples on Normalisation	08-05-2023
L31	Decomposition of Relations and Its Types	09-05-2023
L32	Concept of Dependency Preservation	10-05-2023
L33	Concept of Transactions and its ACID Properties	15-05-2023
L34	States of Transactions	16-05-2023
L35	Concept of Schedules, its various Types and Testing of Serializability	17-05-2023
L36	Conflict Serializability and Its Testing with Examples	22-05-2023
L37	View Serializability and Its Testing with Examples	23-05-2023
L38	Concept of Concurrency Control and the Problems associated with it	24-05-2023
L39	Lock-based and Timestamp based Concurrency Control Protocol	29-05-2023
L40	Timestamp based and Validation based Concurrency Control Protocol	30-05-2023
L41	Concept of Data Recovery and Backup	31-05-2023
L42	Protocols associated with Recovery	05-06-2023
L43	Revision and Doubt Clearing Session through Student Presentations	06-06-2023
L44	Revision and Doubt Clearing Session through Student Presentations	07-06-2023
L45	Revision and Doubt Clearing Session through Student Presentations	12-06-2023
L46	Revision and Doubt Clearing Session through Student Presentations	13-06-2023

Laboratory Execution Sheet

PCA- I

	Assessment Sheet for Practical Continuous Assessment							
Name of the Faculty	Ms. Ankita Goyal Agarwala							
Course name	Database Management System	Total	Course Outcome Attainment with target in %					
			CO1	CO2	CO3	CO4	Average CO	Bright or Week
	Distribution of Marks		50	60	70	80		
	Set Target Level	30	% of Marks to be Scored				65	Bright>80, Week<40
Sl. No	Roll number							
1	212025003	26	1	1	1	1	87	Bright
2	212025004	20	1	1	0	0	67	Bright
3	212025005	21	1	1	1	0	70	Bright
4	212025006	12	0	0	0	0	40	Weak
5	212025008	27	1	1	1	1	90	Bright
6	212025010	12	0	0	0	0	40	Weak
7	212025011	24	1	1	1	1	80	Bright
8	212025012	20	1	1	0	0	67	Ok
9	212025013	18	1	1	0	0	60	Ok
10	212025015	25	1	1	1	1	83	Bright
11	212025016	14	0	0	0	0	47	Weak
12	212025017	24	1	1	1	1	80	Bright
13	212025019	19	1	1	0	0	63	Ok
14	212025020	23	1	1	1	0	77	Ok
15	212025021	25	1	1	1	1	83	Bright
16	212025023	18	1	1	0	0	60	Ok
17	212025024	22	1	1	1	0	73	Ok
18	212025026	23	1	1	1	0	77	Ok
19	212025028	16	1	0	0	0	53	Ok
20	212025029	18	1	1	0	0	60	Ok
21	212025030	22	1	1	1	0	73	Ok

22	212025032	19	1	1	0	0	63	Ok
23	212025034	18	1	1	0	0	60	Ok
24	212025036	15	1	0	0	0	50	Ok
25	212025037	16	1	0	0	0	53	Ok
26	212025038	16	1	0	0	0	53	Ok
27	212025041	18	1	1	0	0	60	Ok
28	212025042	24	1	1	1	1	80	Bright
29	212025043	24	1	1	1	1	80	Bright
30	212025044	18	1	1	0	0	60	Ok
31	212025045	19	1	1	0	0	63	Ok
32	212025046	22	1	1	1	0	73	Ok
33	212025047	19	1	1	0	0	63	Ok
34	212025049	19	1	1	0	0	63	Ok
35	212025050	23	1	1	1	0	77	Ok
36	212025051	19	1	1	0	0	63	Ok
37	212025054	17	1	0	0	0	57	Ok
38	212025055	16	1	0	0	0	53	Ok
39	212025056	17	1	0	0	0	57	Ok
40	212025059	17	1	0	0	0	57	Ok
41	226025001	17	1	0	0	0	57	Ok
42	226025002	17	1	0	0	0	57	Ok
43	226025004	22	1	1	1	0	73	Ok
Total no. of Student		19.60	40	30	16	08		

Practical University

Assessment Sheet for University Practical Examination

Name of the Faculty	Ms. Ankita Goyal Agarwala						

Course name	Database Management System		Course Outcome Attainment with target in %					
		Total	CO1	CO2	CO3	CO4	Average CO	Bright or Week
	Distribution of Marks		50	60	70	80		
	Set Target Level	70	% of Marks to be Scored				65	Bright>80, Week<40
SI. No	Roll number							
1	212025003	65	1	1	1	1	93	Bright
2	212025004	55	1	1	1	0	79	Ok
3	212025005	58	1	1	1	1	83	Bright
4	212025006	44	1	1	0	0	63	Ok
5	212025008	69	1	1	1	1	99	Bright
6	212025010	40	1	0	0	0	57	Ok
7	212025011	59	1	1	1	1	84	Bright
8	212025012	61	1	1	1	1	84	Bright
9	212025013	57	1	1	1	1	84	Bright
10	212025015	63	1	1	1	1	84	Bright
11	212025016	47	1	1	0	0	67	Ok
12	212025017	49	1	1	1	0	70	Ok
13	212025019	62	1	1	1	1	89	Bright
14	212025020	41	1	0	0	0	59	Ok
15	212025021	67	1	1	1	1	96	Bright
16	212025023	41	1	0	0	0	59	Ok
17	212025024	47	1	1	0	0	67	Ok
18	212025026	66	1	1	1	1	94	Bright
19	212025028	47	1	1	0	0	67	Ok
20	212025029	54	1	1	1	0	77	Ok
21	212025030	46	1	1	0	0	66	Ok
22	212025032	52	1	1	1	0	74	Ok
23	212025034	44	1	1	0	0	63	Ok
24	212025036	36	1	0	0	0	51	Ok

25	212025037	31	0	0	0	0	44	Ok
26	212025038	53	1	1	1	0	76	Ok
27	212025041	47	1	1	0	0	67	Ok
28	212025042	57	1	1	1	1	81	Bright
29	212025043	59	1	1	1	1	84	Bright
30	212025044	50	1	1	1	0	71	Ok
31	212025045	47	1	1	0	0	67	Ok
32	212025046	53	1	1	1	0	76	Ok
33	212025047	44	1	1	0	0	63	Ok
34	212025049	51	1	1	1	0	73	Ok
35	212025050	49	1	1	1	0	70	Ok
36	212025051	47	1	1	0	0	67	Ok
37	212025054	37	1	0	0	0	53	Ok
38	212025055	38	1	0	0	0	54	Ok
39	212025056	0	0	0	0	0	0	FAIL
40	212025059	51	1	1	1	0	73	Ok
41	226025001	60	1	1	1	1	86	Bright
42	226025002	39	1	0	0	0	56	Ok
43	226025004	45	1	1	0	0	64	Ok
Total no. of Student		49.50	40	30	16	08		

Summative Feedback

ROYAL GLOBAL UNIVERSITY
Guwahati, Assam

Department of Computer Science & Engineering

Summative Feedback

Course Name	Database Management System	Course Code	CSE022C203
Semester	4th	Year	2022-23
Department	Computer Science & Engineering	Faculty Name	Ms. Ankita Goyal Agarwala
Total Number of Students (B)	43		

Sl No.	Questions	Yes (A1) Credit – 4	largely (A2) Credit – 3	Partially (A3) Credit – 2	Marginally (A4) Credit – 1	No (A5) Credit - 0	Expected Percentage	Percentage Met	Committee Comments
1	The stated course objectives have been met?	37	3	2	1	0	75%	94.2%	
2	The stated course outcomes have been achieved?	35	4	2	2	0	75%	91.8%	
3	Willingness of the teacher to answer course related queries?	40	2	1	0	0	75%	97.7%	
4	Presentation and Completion of course material?	32	5	2	4	0	75%	87.8%	

5	Encouragement to self-Learning?	35	2	3	2	2	75%	89.5%
6	Relationship of the conceptual/theoretical knowledge to its application in real world?	36	2	2	1	2	75%	90.1%
7	Method of applying theoretical concepts to problem solving?	33	3	1	4	2	75%	85.4%
8	Encouragement to learning through lab experiments. (if application)	39	2	2	0	0	75%	96.5%
9	Do you understand the importance of this course in your engineering stream?	37	4	1	1	0	75%	94.7%

Faculty Signature

Attendance Sheet

SL No	Roll No.	Name of the Students	Total Classes Held	Total Classes Attended	Cumulative Attendance Percentage
1	212025003	AKANSHA JAIN	45	45	100
2	212025004	AKASH KALITA	45	45	100
3	212025005	AMAN DUTTA	45	43	96
4	212025006	ANGARAJ KASHYAP	45	36	80
5	212025008	Bedatrayee Goswami	45	45	100
6	212025010	BRIAN PHUKAN	45	36	80
7	212025011	Chiya Das	45	41	91
8	212025012	DEBAJIT NATH	45	45	100
9	212025013	DEBOJIT DUTTA	45	45	100
10	212025015	DEV SHAH	45	45	100
11	212025016	DEVRAJ KEISHAM	45	39	87
12	212025017	DIDARUL ISLAM LASKAR	45	45	100
13	212025019	DIKSHITA BORAH	45	42	93
14	212025020	DIPAN DEBBARMA	45	40	89
15	212025021	FARHAAT ADNAAN MOHAMMAD	45	43	96
16	212025023	HONGNYEI PHOM	45	36	80
17	212025024	HRISHIRAJ GOGOI	45	40	89
18	212025026	JESSICA SAIKIA	45	45	100
19	212025028	Koshtav Medhi	45	40	89
20	212025029	KRISH KODAK DUTTA	45	36	80
21	212025030	MAHESH GHIMIRE	45	41	91
22	212025032	MITTEM RATAN	45	44	98
23	212025034	NEELAV MEDHI	45	43	96
24	212025036	NORING DAULAGUPHU	45	28	62
25	212025037	OMAR FARUK	45	40	89
26	212025038	PARINEETA DAS	45	40	89
27	212025041	RAHNAK LASKAR	45	36	80
28	212025042	Rajnandini Mazumder	45	42	93
29	212025043	RAKESH DAS	45	45	100
30	212025044	RICHARD KASHYAP	45	43	96
31	212025045	RICHY LASKAR	45	43	96
32	212025046	RISHAV SINHA	45	41	91
33	212025047	ROMIT BARUAH	45	39	87
34	212025049	Saniul Hussain	45	39	87
35	212025050	SARUNGBAM ALEN MEETEI	45	45	100
36	212025051	SEIKH AFTAVE	45	42	93
37	212025054	Tissa Deka	45	37	82
38	212025055	TRIDIP DAS	45	37	82
39	212025056	UDIPTA KALITA	45	37	82

44

40	212025059	VISHNU GIRI	45	41	91
41	226025001	Hillol Jyoti Sarmah	45	36	80
42	226025002	Imturabang Jamir	45	41	91
43	226025004	Karan Ali Ahmed	45	36	80

Semester End Examination Question Paper

The Assam Royal Global University, Guwahati
Royal School of Engineering and Technology (RSET)
B. Tech CSE, 4th Semester
Semester End Examination, June 2023
Course Title: Database Management Systems
Course Code: CSE022C403

Time: 3 Hours

Maximum Marks: 70

Note: Attempt all questions as per instructions given.
The figures in the right-hand margin indicate marks.

Section – A

Q.1. Attempt **all questions**. (Maximum word limit 50)   **2 x 8=16**

a. Why is a database management system needed?   [CO1]

b. Differentiate between a primary key and a foreign key.   [CO2]

c. What is the use of DELETE and TRUNCATE commands?   [CO2]

d. Let R($\underline{a}$, b, c) and S(d, e, f) be two relations in which 'd' is the foreign key of S that refers to the primary key of R. What type of operations can violate the referential integrity constraint?   [CO3]

e. What is the role of a database administrator?   [CO1]

f. How is abstraction provided in a DBMS?   [CO1]

g. Why is a recovery mechanism important in transactions?   [CO4]

h. What is the difference between cartesian product and join operation in relational algebra?   [CO2]

Section – B

Q.2. Answer the following questions: **(Any Two)**   **6 x 2=12**

a. What are the advantages of a DBMS over the conventional file system? Discuss the main characteristics of database approach.   [CO1]

b. Explain the simplified database environment with a suitable diagram explaining each component.   [CO1]

c. In a university, a student enrolls in Courses. A student must be assigned to at least one or more Courses. Each course is taught by a single Professor. To maintain instruction quality, a professor can deliver only one course. Draw an ER diagram on the same giving justifications.   [CO1]

Q.3.   Answer the following questions: (Any Two)   7 x 2=14

   a. Discuss in detail Codd's rules for relational data model.   [CO2]

   b. Differentiate between relational algebra and relational calculus. Citing relevant
       examples, explain the problems associated with referential integrity constraint.
       [CO2]

   c. Consider the following Schema: [CO2]

           author (author_id, first name, last name)
           author_pub (author_id, pub_id, author_position)
           book (book_id, book_title, month, year, editor_id)
           pub (pub_id, title, book_id)
       Write the queries for the following using relational algebra:

       i.   Display the names of all books which are published in the month of July,
             1990.
       ii.   Display the names of all authors who are book editors.
       iii. Display the authors who are authors but not book editors.
       iv.   Display the names of all authors who are not book editors.
       v.   Display the names of all authors who have at least one publication.

Q.4.   Answer the following questions: (Any Two)   7 x 2=14

   a. What is the purpose of normalization in DBMS? Discuss all the normal forms
       in detail.   [CO3]

   b. Let R = (A, B, C, D, E, F) be a relation scheme with the following dependencies:
       C→F, E→F, EC→D, A→B. Find the candidate key of the given relation. Test
       whether this relation can be normalized or not.   [CO3]

   c. Explain in detail with suitable examples the various join operations in DBMS.
       [CO3]

Q.5.   Answer the following questions: (Any Two)   7 x 2=14

   a. Explain the concept of transaction management in a DBMS and discuss the
       ACID properties of a transaction.   [CO4]

   b. What is concurrency control? Explain in detail the problems associated with
       concurrency control.   [CO4]

   c. Discuss serializability by two-phase locking using suitable examples.   [CO4]

University Marks – Theory

Assessment Sheet for Semester End Examination

Name of the Faculty	Course Code	Course Name		
Ms. Ankita Goyal Agarwala	CSE022C403	Database Management Systems		

| Sl. No | Maximum Marks | 100 | B | "CO" MET or NOT MET | course Outcome Attainment with target in % |
| | Set Target Level | B | | | |
	Roll No	Grade	Grade to Score		
1	212025003	A+		Met	1
2	212025004	B-		Not met	0
3	212025005	A		Met	1
4	212025006	B		Met	1
5	212025008	O		Met	1
6	212025010	C+		Not met	0
7	212025011	A+		Met	1
8	212025012	B+		Met	1
9	212025013	A		Met	1
10	212025015	A		Met	1
11	212025016	B		Met	1
12	212025017	A+		Met	1
13	212025019	A+		Met	1
14	212025020	B		Met	1
15	212025021	A		Met	1
16	212025023	B+		Met	1
17	212025024	B		Met	1
18	212025026	A		Met	1
19	212025028	B+		Met	1
20	212025029	B+		Met	1
21	212025030	A		Met	1
22	212025032	A		Met	1
23	212025034	B+		Met	1
24	212025036	B-		Not met	0
25	212025037	B		Met	1
26	212025038	B+		Met	1
27	212025041	B-		Not met	0
28	212025042	B+		Met	1

29	212025043	B+		Met	1
30	212025044	B		Met	1
31	212025045	B+		Met	1
32	212025046	A		Met	1
33	212025047	B-		Not Met	0
34	212025049	B+		Met	1
35	212025050	B		Met	1
36	212025051	B+		Met	1
37	212025054	B+		Met	1
38	212025055	Ex		Not met	0
39	212025056	B		Met	1
40	212025059	B		Met	1
41	226025001	B-		Not Met	0
42	226025002	B		Met	1
43	226025004	A		Met	1
	Total no. student			**Met**	**36**

Rationale:	
Students getting less than 40%	2
students getting 50%	5
students getting 60%	9
students getting 70%	12
students getting 80%	9
students getting 90%	6

Course Attainment
Course Outcome Attainment

Name of the Faculty	Ms. Ankita Goyal Agarwala					
Course Code	CSE022C403					
Course Name	Database Management System					
Total No of Students in the Class				43		

Sl. No.	Exam	CO 1	CO 2	CO 3	CO 4	Target (%)	Overall Achievement (%)
1	CA – I	43	43	24	24	65	79
2	CA – II	26	20	17	08	65	55
3	CA – III	39	39	22	22	65	68
4	CA – IV	41	41	30	30	65	70
5	PCA-I	40	30	16	08	65	75
6	UEP	40	30	16	08	65	73
7	**Average**	38.2	34	21	17	65	88
8	University Exams	Met			B		54

Attainment of Course Outcomes
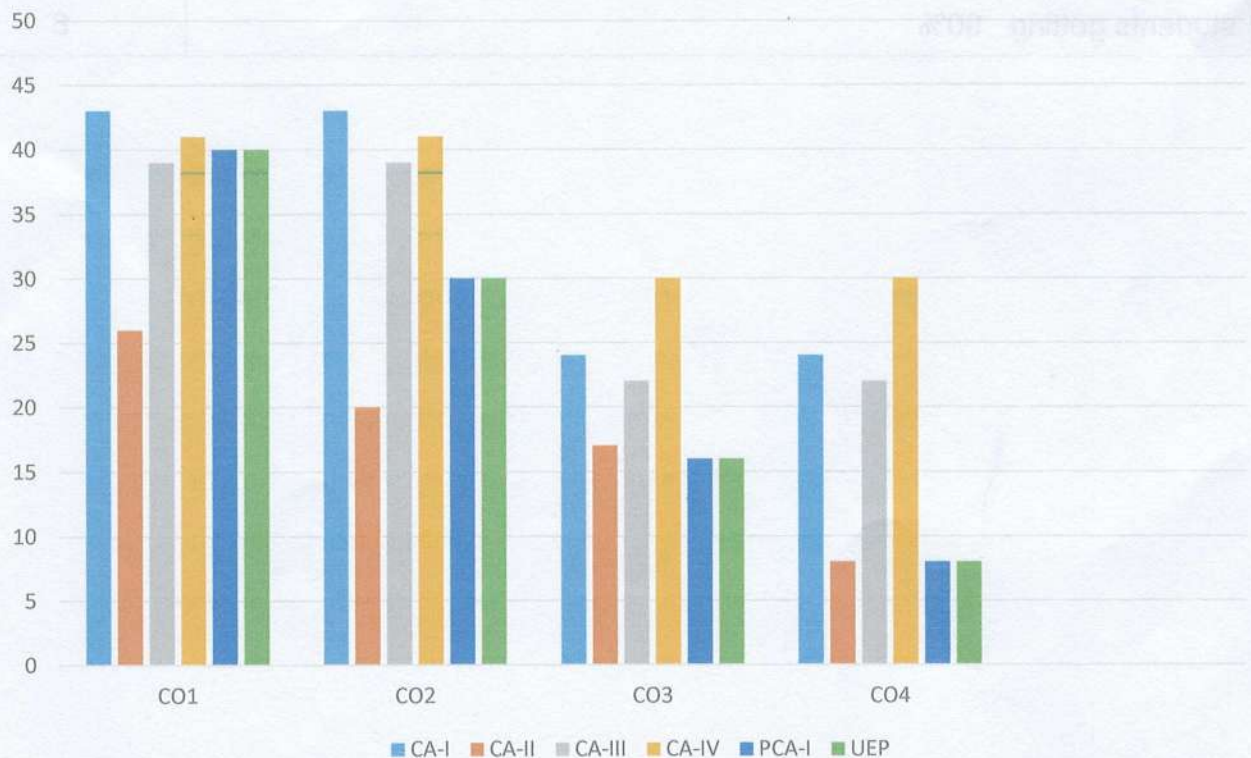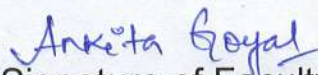
50

CERTIFICATE

I, the undersigned, have completed the course allotted to me as shown below,

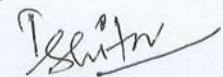| Sl. No	Semester	Subject with Code	Total Units/ Chapters	Remarks
1	4th	Database Management System	All	Completed

Date: 10.08.2023

Ankita Goyal
(Signature of Faculty)

Submitted to HOD

Certificate by HOD

I, the undersigned, certify that Ms. Ankita Goyal Agarwala has completed the course work allotted to him satisfactorily.

Date: 10.08.2023 .

(Signature of HOD)
HOD/Coordinator
Department of Computer Science & Engineering
Royal School of Engineering & Technology
The Assam Royal Global University
Betkuchi, NH 37, Guwahati 781035

Submitted to Dean - School

Date: 11.08.2023 .

(Signature of Dean)
Prof.(Dr.) Ankur Ganguly
Dean- Royal School of Enginerring
Royal Global University
Guwahati, Assam, India

Submitted to Dean - Academics

Date: 11.08.2023

(Signature of Dean Academics)

Prof.(Dr.) Ankur Ganguly
Dean-Academics
Royal Global University
Guwahati, Assam, India