COURSEPACK (Fall 2024-25)

1. THE SCHEME

<table>
<tr><td>Course Title</td><td colspan="3">Database Management System</td><td colspan="2">Course Type</td><td colspan="4">Integrated</td></tr>
<tr><td>Course Code</td><td colspan="3">E2UC302B</td><td colspan="2">Class</td><td colspan="4">B.Tech</td></tr>
<tr><td rowspan="6">Instruction delivery</td><td>Activity</td><td>Credits</td><td>Credit Hours</td><td colspan="4" rowspan="2">Total Number of Classes per Semester</td><td colspan="2" rowspan="2">Assessment in Weightage</td></tr>
<tr><td>Lecture</td><td>3</td><td>3</td></tr>
<tr><td>Tutorial</td><td>0</td><td>0</td><td rowspan="3">Theory</td><td rowspan="3">Tutorial</td><td rowspan="3">Practical</td><td rowspan="3">Self-study</td><td rowspan="3">CIE</td><td rowspan="3">SEE</td></tr>
<tr><td>Practical</td><td>1</td><td>2</td></tr>
<tr><td>Self-study</td><td>0</td><td>7</td></tr>
<tr><td>Total</td><td>4</td><td>12</td><td>45</td><td>0</td><td>30</td><td>105</td><td>50%</td><td>50%</td></tr>
<tr><td>Course Lead</td><td colspan="2">Dr. Pawan Kumar</td><td>Course Coordinator</td><td colspan="6">Dr. Anil Sharma</td></tr>
<tr><td rowspan="2">Names Course Instructors</td><td colspan="3">Theory</td><td colspan="6">Practical</td></tr>
<tr><td colspan="3">Dr.Pawan Kumar
Dr.Anil Sharma
Mr.Arunendra Mani Tripathi
Dr.Arvind Panwar
Ms.Chaya Rawal
Dr.ANJALI KAPOOR
Dr.Sandeep Kumar M
Ms.GREESHMA G S
Ms.Indervati
Mr.K.suresh
Ms.KIRTI
Mr.M R SUNDARAKUMAR
Dr.Manmohan Singh
Dr.Manu Singh
Dr.Muniraj Gupta
Ms.Nidhi Sharma
Ms.Priyanka Behera
Ms.R.RADHIKA
Ms.R.Sathiya Priya
Dr.Sheelesh Kumar Sharma
Dr.Shilpy Agrawal
Dr.Shipra shukla
Mr.Siddharth Gautam
Ms.Suman Devi
Dr.T GANESH KUMAR
Dr.Tanveer Hassan
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2. COURSE OVERVIEW

This course introduces the core principles and techniques required to design and implement database systems. This course focuses on relational database management systems, including database design theory: E-R modeling, data definition, and manipulation languages, database security, and administration. It also covers essential DBMS concepts such as Transaction Processing, Concurrency Control, and Recovery, various types of databases like distributed databases and, Client/Server. Students undertake a semester mini project to design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS. It also provides students with theoretical knowledge and practical skills using MySQL tool in the use of databases and database management systems in information technology applications

3. COURSEOBJECTIVES

- Students will familiar with basic concepts of databases and database management systems.
- Students are able to understand the design of the entity relationship diagram and the concept of database.
- Students are able to normalize various type of database system.
- Students to explore and implement the schemas on the SQL.

4. PREREQUISITE COURSE

PREREQUISITE COURSE REQUIRED	No	
If, yes please fill in the Details	Course code	Course Title
	NA	NA

5. PROGRAM OUTCOMES (POs):

PO No.	Description of the Program Outcome
PO1	Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO2	Problem Analysis: Identify, formulate, review research literature and analyse complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4).
PO3	Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5).
PO4	Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
PO5	Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6).
PO6	The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO7	Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9).
PO8	Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO9	Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
PO10	Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments..
PO11	Life-Long Learning: Recognize the need for, and have the preparation and ability for: i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8).

6. PROGRAM SPECIFIC OUTCOMES (PSOs):

Program Specific Outcomes (PSO) are statements that describe what the graduates of a discipline-specific program should be able to do. Two to Three PSOs per program should be designed.

PO No.	Description of the Program-Specific Outcome
PSO1	Have the ability to work with emerging technologies in Computer Science and Engineering requisite to Industry 4.0.
PSO2	Demonstrate Engineering Practice learned through industry internship and research project to solve live problems in various domains.

7. COURSE CONTENT (THEORY)

CONTENT (Syllabus)
THEORY: **Introduction to Data Base management system:** An overview of the database management system, database system Vs file system, Database system concept and architecture, data model schema and instances, data independence and database language and interfaces, data definitions language, Data modeling using Entity Relationship (ER) model, Entity-Relationship Diagrams, Enhanced ER model, Overall Database Structure. **Domains, Relations and Keys:** domains, relations, kind of relations, relational database, various types of keys, candidate, primary, alternate and foreign keys. Relational Data Model and Language: Relational data model concepts, integrity constraints, entity integrity, referential integrity, Key constraints, Domain constraints, relational algebra, relational calculus, tuple, and domain calculus. **Introduction to SQL:** SQL operators and their procedures. Types of SQL commands: DDL, DML and DCL. Tables, views, and indexes. Queries and subqueries. Aggregate functions. Joins, Unions, Intersection, Minus, Cursors and Triggers. Database Design & Normalization: Functional dependencies, normal forms, first, second, and third normal forms, Normalization-Decomposition into BCNF. **Transaction Processing Concept:** Transaction system, testing of serializability, serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log-

based recovery. Concurrency Control Techniques: Concurrency control, Locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation-based protocol. Recovery with concurrent transactions.

PRACTICAL: Case Studies and Practical problem, Real-world Examples of database Implementations.

8. COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO No.	Description of the Course Outcome
E2UC302B.1	Conceptual understanding of DBMS, ability to define and manipulate data, understanding data independence, and the overall structure of databases.
E2UC302B.2	Ability to design and query relational databases using SQL, ensure data integrity, and apply relational algebra and calculus concepts in practical scenarios.
E2UC302B.3	Apply database Normalization techniques upto BCNF for the removal of anomalies.
E2UC302B.4	Ability to manage and ensure the consistency of transactions, implement concurrency control mechanisms, recovers from transaction failures.

9. TAXONOMY LEVEL OF THE COURSE OUTCOMES

Mapping of COs with Bloom's Level

CO No.	Remember **KL1**	Understand **KL 2**	Apply **KL 3**	Analyse **KL 4**	Evaluate **KL 5**	Create **KL 6**
R1UC701T.1	√	√				
R1UC701T.2		√	√			
R1UC701T.3			√			
R1UC701T.4				√		

10. COURSE ARTICULATION MATRIX

COs#/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**

R1UC701T.1	3	2	1	1	1	-	-	-	-	-	-		
R1UC701T.2	3	2	2	2	2	-	-	-	-	-	-		1
R1UC701T.3	2	3	2	2	2	-	-	-	-	-	-	2	2
R1UC701T.4	1	2	1	2	2	-	-	-	-	-	-	1	-

Note: 1-Low, 2-Medium, 3-High \ *first semester first course and first Course Outcome

11. TYPICAL EXAMPLE OF COURSES, CREDIT HOURS AND TEACHING HOURS

Type of Course	Credits Hours					Hours of engagement/ Week					12 weeks/ semester	Remarks
											Total no. of classes	
Integrated Course (Theory + Practical)	3	0	2	0	3+2	3	0	2	0	5	40(Th) 15(PR)	40 classes for theory 15 classes for practical

*1 credit = 3 self-learning hours (Not to mention in the lesson plan)

FOR THEORY **15 weeks * 3Hours = 45 Classes (1 credit =1 Lecture Hour)**
FOR PRACTICAL 15 weeks * 2Hours = 30 Hours lab sessions (1 credit = 2 lab hours)

L-No	Topic for Delivery	Tutorial / Practical Plan	Skill	Competency
1	Overview of the database management system	Theory	Conceptual understanding of DBMS, ability to define and manipulate data, understanding data independence, and the overall structure of databases.	CO1
2	Database system Vs file system	Theory		
3	Database system concept and architecture	Theory		
4	Data model schema and instances	Theory		
5	Data independence	Theory		
6	Database language and interfaces	Theory		
7	Data modeling using Entity Relationship (ER) model	Theory		
8	Enhanced ER model	Theory		
9	DDL, DML, DCL	Theory		
10	Overall Database Structure	Theory		
11	Domains, Relations and Keys: domains, relations, kind of relations	Theory	Ability to design and query relational databases using SQL, ensure data integrity, and	CO2
12	Various types of keys, candidate, primary, alternate and foreign keys	Theory		
13	RDBMS concepts, Integrity constraints,			
14	Entity integrity, referential integrity	Theory		

15	Keys constraints, Domain constraints	Theory	apply relational algebra and calculus concepts in practical scenarios.	
16	Relational algebra (Fundamental Operations)	Theory		
17	Additional Relational-Algebra Operations			
18	Relational calculus : Tuple Calculus	Theory		
19	Domain Calculus	Theory		
20	Introduction to SQL, Characteristics of SQL, advantages of SQL	Theory	Apply database Normalization techniques upto BCNF for the removal of anomalies.	CO3
21	SQL data type and literals. Types of SQL commands	Theory		
22	SQL operators and their procedure	Theory		
23	Tables, views, and indexes.	Theory		
24	Queries and Sub Queries, Aggregate functions	Theory		
25	Joins, Unions, Intersection, Minus	Theory		
26	Cursors, Triggers	Theory		
27	Functional dependencies	Theory		
28	Normal forms, first & second	Theory		
29	Normal forms, Third & BCNF	Theory		
30	Transaction system	Theory	Ability to manage and ensure the consistency of transactions, implement concurrency control mechanisms, recovers from transaction failures.	CO4
31	Testing of serializability, serializability of schedules	Theory		
32	conflict & view serializable schedule	Theory		
33	Recoverability	Theory		
34	Recovery from transaction failures	Theory		
35	Log-based recovery	Theory		
36	Concurrency Control Techniques			
37	Locking Techniques for concurrency control			
38	Time stamping protocols for concurrency control	Theory		
39	validation based protocols for concurrency control			
40	Recovery with concurrent transactions.	Theory		

LAB PLAN FOR THEORY COURSES (15 weeks * 2Hours =30 Classes)		
1	L	Draw an E-R diagram and convert entities and relationships to a relation table for a given scenario. (Two assignments shall be carried out i.e. consider two different scenarios (eg. bank, college)
2	L	Implementation of DDL commands of SQL with suitable examples.
3	L	Implementation of DML commands of SQL with suitable examples.
4	L	Implementation of different types of operators in SQL.
5	L	Implementation of different types of operators in SQL.
6	L	Perform the following: a. Creating Tables (With and Without Constraints(Key/Domain), b. Creating Tables (With Referential Integrity Constraints)
7	L	For a given set of relation schemes, create tables and perform the following Queries: a. Simple Queries b. Queries with Aggregate functions (Max/Min/Sum/Avg/Count), c. Queries with Aggregate functions (group by and having clause), d. Queries involving- Date Functions, String Functions, Math

		Functions
8	L	For a given set of relation schemes, create tables and perform the following Queries: Inner Join, a. Outer Join Subqueries- With IN clause, With EXISTS clause
9	L	For a given set of related tables perform the following:- a. Creating Views , b. Dropping views, c. Selecting from a view
10	L	Implementation of Group by & Having Clause, Order by Clause, Indexing.
11	L	Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID) write a cursor to select the five highest-paid employees from the table.
12	L	For a given set of related tables perform the following: a. Begin Transactions b. End Transaction
13	L	For a given set of related tables perform the following: a. Create roles b. Assign Privileges c. Revoke Privileges
14	L	Write a Pl/SQL program using a FOR loop to insert ten rows into a database table.
15	L	Perform the following: Inserting/Updating/Deleting Records in a Table, Saving (Commit) and Undoing (rollback)

12. BIBLIOGRAPHY

- **TextBook:**

1. Henry F Korth, Abraham Silberschatz, S.Sudarshan,"Database system concepts",McGraw-Hill
2. Date C J,"An Introduction to Database Systems", Addison Wesley

- ReferenceBooks:

1. Elmasri, Navathe, "Fundamentals of Database Systems", Addison Wesley
2. O'Neil ,Databases ,Elsevier Pub.
3. Leon & Leon, "Database Management Systems", Vikas Publishing House
4. Bipin C. Desai, "An Introduction to Database Systems", Gagotia Publications
5. Majumdar & Bhattacharya, "Database Management System",TMH (14)
6. Ramakrishnan, Gehrke, "Database Management System", McGrawHill

- Webliography:

1. DML Statements and SQL Server Administration | Online | Alison https://alison.com/topic/learn/71105/using-dml-statements-learning-outcomes
2. SQLCourse:Beginner&AdvancedInteractiveSQLTutorials

- SWAYAM/NPTEL/MOOCs Certification:

1. Database Management System, By Prof. Partha Pratim Das & Prof. Samiran Chattopadhyay, IIT Kharagpur
https://onlinecourses.nptel.ac.in/noc22_ge08/preview

13. COURSE ASSESSMENT

Assessment forms an integral part of curriculum design. A learning-teaching system can only be effective if the student's learning is measured at various stages which means while the student processes learning (Assessment for Learning) a given content and after completely learning a defined content (Assessment of Learning). Assessment for learning is referred to as formative assessment, that is, an assessment designed to inform instruction.

The ability to use and apply the knowledge in different ways may not be the focus of the assessment. With regard to designing assessments, the faculty members must be willing to put in the time required to create a valid, reliable assessment,

that ideally would allow students to demonstrate their understanding of the information while remaining. The following are the five main areas that assessment reporting should cover.

1. **Learning Outcomes**: At the completion of a program, students are expected to know their knowledge, skills, and attitude. Depending on whether it is a UG or PG program, the level of sophistication may be different. There should be no strict rule on the number of outcomes to be achieved, but the list should be reasonable, and well-organized.
2. **Assessable Outcomes**: After a given learning activity, the statements should specify what students can do to demonstrate. Criteria for demonstration are usually addressed in rubrics and there should be specific examples of work that doesn't meet expectations, meets expectations, and exceeds expectations. One of the main challenges is faculty communication whether all faculty agreed on explicit criteria for assessing each outcome. This can be a difficult accomplishment when multiple sections of a course are taught or different faculty members. Hence there is a need for common understanding among the faculty on what is assessed and how it is assessed.
3. **Assessment Alignment**: This design of an assessment is sometimes in the form of a curriculum map, which can be created in something as easy as an Excel spreadsheet. Courses should be examined to see which program outcomes they support, and if the outcome is assessed within the course. After completion, program outcomes should be mapped to multiple courses within the program.
4. **Assessment Planning**: Faculty members need to have a specific plan in place for assessing each outcome. Outcomes don't need to be assessed every year, but faculty should plan to review the assessment data over a reasonable period of time and develop a course of action if the outcome is not being met.
5. **Student Experience**: Students in a program should be fully aware of the expectations of the program. The program outcomes are aligned on the syllabus so that students are aware of what course outcomes they are required to meet, and how the program outcomes are supported. Assessment documents should clearly communicate what is being done with the data results and how it is contributing to the improvement of the program and curriculum.

Designing quality assessment tools or tasks involves multiple considerations if it is to be fit for purpose. The set of assessments in a course should be planned to provide students with the opportunity to learn as they engage with formative tasks as well as the opportunity to demonstrate their learning through summative tasks. Encouraging the student through the use of realistic, authentic experiences is an exciting challenge for the course faculty team, who are responsible for the review and quality enhancements to assessment practices.

14. FORMATIVE AND SUMMATIVE ASSESSMENT

Assessment Pattern for Theory Course:

Type of Course (B)	CIE			Total Marks		Final Marks CIE*0.5+SEE*0.5
	IA1#	MTE	IA2#	CIE	SEE	
Integrated	25	50	25	100	100	100

@ Lab Work – 15 marks + Lab record – 10 marks

* Passing criteria – 30% of marks to be secured in the lab exam conducted by two examiners (one internal + one external).

15. PASSING STANDARDS

Passing Criteria for Different Course Types Effective from AY 2022-23 Onwards

S.No.	Course Type	Passing Criterion

1.	**Integrated Course (B)**	A student shall secure a minimum of **25% of the maximum marks** in the semester-end examination (SEE/ETE) and **40% of aggregate marks** in the course including Continuous internal examination (CIE) and SEE/ETE marks. i.e., the minimum Passing Grade is "P".

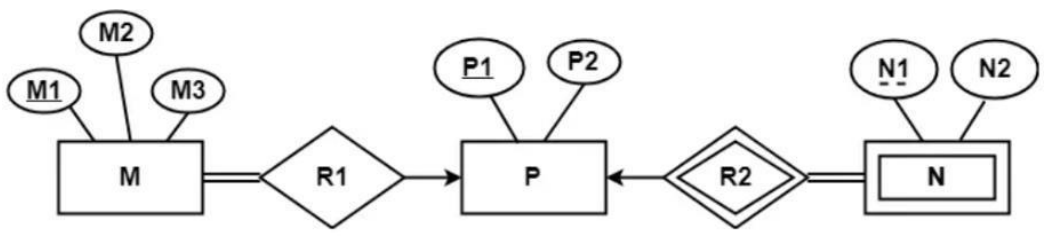
Note: Students unable to meet the overall passing criteria as mentioned shall be eligible for the following options to clear the course:

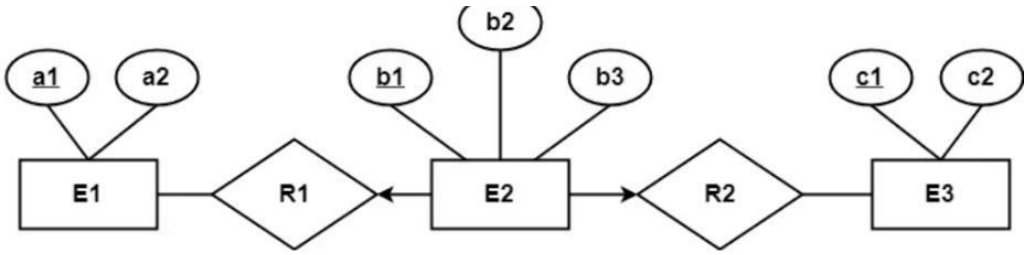
- Appear in the Back Paper Examinations and have to meet the criteria to score 40% in marks overall
- Appear in summer examinations (Internal +External) to meet the criteria as mentioned.

16. PROBLEM-BASED LEARNING/CASE STUDIES/CLINICS

Exercises in Problem-based Learning (Assignments) (Min 54 Problems)

S.No.	Problem	KL
1	Draw an ER diagram for the Hospital database. Be sure to indicate the various attributes of each entity and relationship set; also specify the key and participation constraints for each relationship set. Specify any necessary overlap and cover constraints as well.	K 1
2	Consider the instance of the sample Students' relation. 1. Give an example of an attribute (or set of attributes) that you can deduce is not a candidate key, based on this instance being legal. 2. Is there any example of an attribute	K 2
3	Consider the relations between Students, Faculty, Courses, Rooms, Enrolled, Teaches, and Meets. 1. List all the foreign key constraints among these relations. 2. Give an example of a constraint involving one or more of these relations that is not a primary key or foreign key constraint.	K 1
4	Write SQL for the following relational schema: Emp(eid: integer, ename: string, age: integer, salary: real) Works(eid: integer, did: integer, pct time: integer) Dept(did: integer, dname: string, budget: real, managerid: integer)	K 1
5	Suppose that we have a ternary relationship R between entities sets A, B, and C such that A has a key constraint and total participation and B has a key constraint; these are the only constraints. A has attributes a1 and a2, with a1 being the key; B and C are similar. R has no descriptive attributes. Write SQL statements that create tables corresponding to this information to capture as many of the constraints as possible. If you cannot capture some constraint, explain why?	K 1
6	Consider the following relations containing airline flight information: Flights (flno: integer, from: string, to: string, distance: integer, departs: time, arrives: time) Aircraft (aid: integer, aname: string, cruisingrange: integer) Certified(eid: integer, aid: integer) Employees (eid: integer, ename: string, salary: integer) 1. Find the eids of pilots certified for some Boeing aircraft. 2. Find the names of pilots certified for some Boeing aircraft. 3. Find the aids of all aircraft that can be used on non-stop flights from Bonn to Madras. 4. Identify the flights that can be piloted by every pilot whose salary is more than $100,000.	K 2

	5. Find the names of pilots who can operate planes with a range greater than 3,000 miles but are not certified on any Boeing aircraft. 6. Find the eids of employees who make the highest salary. 7. Find the eids of employees who make the second highest salary. 8. Find the eids of employees who are certified for the largest number of aircraft. 9. Find the eids of employees who are certified for exactly three aircraft. Find the total amount paid to employees as salaries.	
7	Consider the following relational schema. An employee can work in more than one department; the pct time field of the Works relation shows the percentage of time that a given employee works in a given department. Emp (eid: integer, ename: string, age: integer, salary: real) Works (eid: integer, did: integer, pct time: integer) Dept (did: integer, budget: real, managerid: integer) Write the following queries in SQL: Print the names and ages of each employee who works in both the Hardware department and the Software department. 2. For each department with more than 20 full-time-equivalent employees (i.e., where the part-time and full-time employees add up to at least that many full-time employees), print the did together with the number of employees that work in that department. 3. Print the name of each employee whose salary exceeds the budget of all of the departments that he or she works in. 4. Find the managerids of managers who manage only departments with budgets greater than $1,000,000. Find the enames of managers who manage the departments with the largest budget.	K 2
8	Consider the instance of Sailors Let us define instance S1 of Sailors to consist of the first two tuples, instance S2 to be the last two tuples, and S to be the given instance. (a) Show the left outer join of S with itself, with the join condition being sid=sid. (b) Show the right outer join of S with itself, with the join condition being sid=sid. (c) Show the full outer join of S with itself, with the join condition being sid=sid. (d) Show the left outer join of S1 with S2, with the join condition being sid=sid. (e) Show the right outer join of S1 with S2, with the join condition being sid=sid. Show the full outer join of S1 with S2, with the join condition being sid=sid.	K 2
9	Draw E-R diagram of following pair of entities (i)Customer & Account (ii) Customer & Loan (iii) Doctor & Patient	K 3
10	Draw an ER diagram of the Hospital Management System. (i) Take only 2 entities (ii) Use all types of attributes Use proper relationship	K 3
.11	Find the minimum number of tables required for the following ER diagram in relational model- 	K 1

12	Find the minimum number of tables required to represent the given ER diagram in relational model-  	K 1
13	Write the following queries in SQL, using the university schema. (We suggest you actually run these queries on a database, using the sample data that we provide on the Web site of the book, db-book.com. Instructions for setting up a database, and loading sample data, are provided on the above Web site.) a. Find the titles of courses in the Comp. Sci. department that have 3 credits. b. Find the IDs of all students who were taught by an instructor named Einstein;make sure there are no duplicates in the result. c. Find the highest salary of any instructor. d. Find all instructors earning the highest salary (there may be more than one with the same salary). e. Find the enrollment of each section that was offered in Autumn 2009. f. Find the maximum enrollment, across all sections, in Autumn 2009. Find the sections that had the maximum enrollment in Autumn 2009.	K 2
14	Write Queries for the following requirements: (i) Find the customer names and their loan numbers for all customers having a loan at some branches. (ii) Find the names of all branches that have greater assets than some branch located in Lucknow. (iii) Find the names of all customers whose street includes the substring “main”. (iv) List in alphabetic order the names of all customers having a loan in “Knit Campus” branch. (v) Find all customers who have a loan, an account, or both. (vi) Find all customers who have both a loan and an account. (vii) Find all customers who have an account but no loan. Find all customers who have both an account and a loan at the same branch.	K 2
15	Write Queries for the following requirements: (i) Find all customers who have either an account or a loan (but not both) at the bank. (ii) Find all branches where the total account deposit is greater than the average of the total account deposits at all branches. (iii) Find the average account balance of those branches where the average account balance is greater than 100000. (iv) Account number and name of customer whose account balance is highest. (v) Find the name of the customer with the total balance, which is most valuable. (vi) Find all customers who have a loan at the bank but do not have an account at the bank (vii) Find the name of customers who have an account at all the branches	K 2

	located in sultanpur. (viii) Find the name of all customer who have an account in all branches of NEW YORK city. (ix) Name of branches where total customers are more than 5. Name of customers whose branch city and city of living is the same.	
16	Create a Trigger on the banking database on update, insert operation.	K 2
17	Create a Trigger on the banking database on modify, delete operation.	K 3
18	Draw an ER diagram of the Airlines Management System. Demonstrate keys, Constraints, and relationships. Be sure to indicate the various attributes of each entity and relationship set; also specify the key and participation constraints for each relationship set. Specify any necessary overlap and cover constraints as well.	K 3
19	Draw an ER diagram of the Blood Bank Management System. Demonstrate keys, Constraints, and relationships. Be sure to indicate the various attributes of each entity and relationship set; also specify the key and participation constraints for each relationship set. Specify any necessary overlap and cover constraints as well.	K 3
20	Suppose a relational schema R(w x y z), and set of functional dependency as followings F : { wx yz, y w, zx } Find the candidate keys in above relation	K 3
21	Suppose a relational schema R(a, b, c, d, e), and set of functional dependency as follows F : { ab cd, d a, bc de } Find the candidate keys in the above relation.	K 3
22	Suppose that we have a relation marks (ID, score) and we wish to assign grades to students based on the score as follows: grade F if score < 40, grade C if 40 ≤ score < 60, grade B if 60 ≤ score < 80, and grade A if 80 ≤ score. Write SQL queries to do the following: a. Display the grade for each student, based on the mark's relation. Find the number of students with each grade	K 3
23	*branch(branch_name, branch_city, assets)* *customer (customer_name, customer_street, customer_city)* *loan (loan_number, branch_name, amount)* *borrower (customer_name, loan_number)* *account (account_number, branch_name, balance)* *depositor (customer_name, account_number)* Consider the bank database of Figure 2, where the primary keys are underlined. Construct the following SQL queries for this relational database. a. Find all customers of the bank who have an account but not a loan. b. Find the names of all customers who live on the same street and in the same city as "Smith". Find the names of all branches with customers who have an account in the bank and who live in "Harrison"	K 3
24	Let R = (A, B, C, D, E, F) be a relation scheme with the following dependencies- C → F E → A EC → D A → B Find Candidate keys.	K 3

25	Consider the given schedule S and check if it is view serializable or not. If yes, then give the serial Schedule: S : S1: R1(X) R1(Y) R2(X) R2(Y) W2(Y) W1(X).	K 4
26	Write SQL TRIGGER FOR database triggers to enforce data integrity and implement business rules.	K 3
27	*person* (*driver_id*, *name*, *address*) *car* (*license*, *model*, *year*) *accident* (*report_number*, *date*, *location*) *owns* (*driver_id*, *license*) *participated* (*report_number*, *license*, *driver_id*, *damage_amount*) a. Find the total number of people who owned cars that were involved in accidents in 2009. b. Add a new accident to the database; assume any values for required attributes.	K 5
28	Consider the database available in the previous question & perform following queries. a. Add a column to the table car. b. Drop the column date from table accident c. Modify the column location as location_Info Rename table owns to owner	K 6
29	*member*(*memb_no*, *name*, *age*) *book*(*isbn*, *title*, *authors*, *publisher*) *borrowed*(*memb_no*, *isbn*, *date*) Consider the library database. Write the following queries in SQL. a) Print the names of members who have borrowed any book published by "McGraw-Hill". b) Print the names of members who have borrowed all books published by "McGraw-Hill". c) For each publisher, print the names of members who have borrowed more than five books of that publisher. Print the average number of books borrowed per member.	K 6
30	Create the following Database of a Bank with following relations Branch(Branch_name , Branch_city , Assets) Customer(Customer_name,Customer_street,Customer_city) Account(account_number, Branch_name, Balance) Loan(Loan_number, Branch_name, Amount) Depositor(account_number,Customer_name) Borrower(Loan_number, Customer_name) Foreign keys: (i) In Account table Branch name is referring to Branch table (ii) In Loan table Branch name is referring to Branch table (iii) In the Depositor table, the account number is referring to the account table and the customer name is referring to the customer table. (iv) In Borrower table Loan number is referring to Loan table and customer name is referring to customer table. Insert data in different tables.	K 6

17. STUDENT-CENTERED LEARNING (SELF-LEARNING TOWARDS LIFE-LONG LEARNING)

S.No.	Typical Project/Problem	KL
1	Students will review the Research Papers and will write a Survey Paper for IAs.	KL6