



Final Assessment Test (FAT) - May 2024

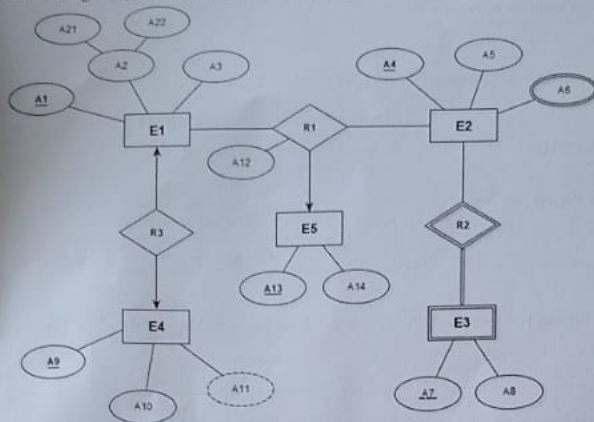
Programme	B.Tech.	Semester	WINTER SEMESTER 2023 - 24
Course Title	DATABASE SYSTEMS	Course Code	BCSE302L
Faculty Name	Prof. Leninisha Shanmugam	Slot	D1+TD1
		Class Nbr	CH2023240501567
Time	3 Hours	Max. Marks	100
General Instructions:			
• Write only Register Number in the Question Paper where space is provided (right-side at the top) & do not write any other details.			

Answer all questions (10 X 10 Marks = 100 Marks)

01. A manufacturing company wants to develop a website for its operations. The company operates multiple branches. Each branch has a name and specific location. The branch sells home appliances and household products. Each appliance/product has a brand which specifies the brand name and special features. [10]
- i) Select a suitable DBMS architecture that accomplishes the given requirements. Justify your selection. (4 marks)
- ii) Enumerate the steps involved in designing and implementing a database project, and elaborate on any two steps using the above mentioned scenario (6 Marks)
02. Create an ER diagram with the following business rules and clearly state any assumption you make: [10]
- Great Marbles is a small size company that produces two main types of products: Gems and Marbles. They produce two different sizes of Gems, and about six different sizes of Marbles. Both products are offered in 25 different colors. The different kinds of decoration marbles distinguish by color, size, and shape. The Gems are classified as a matt or a luster Gem.
 - The database system keeps track of the inventory levels, the backorder level (orders not satisfied yet), and the number of outstanding orders (orders that are not received yet). This information is used by the management to decide when and how much to produce.
 - Other than the information about the products, the database keeps information about the raw materials, suppliers and customers. For each type of raw materials, the database keeps the following information: identification number, name, price per unit, identification number of the product that it is used on, and name of the suppliers.
 - For each supplier, the database records: supplier identification number, name, address, orders and payments history. The company sells its products in different countries. For the international customers, the company provides special packaging, and charges different rates.
 - For each customer the following information is recorded: identification number, name, address, orders and payments history.

03. Consider the following ER model and convert it into an equivalent relational model by clearly mentioning the primary keys and foreign keys.

[10]



04. Normalize the following Relation Schema CourseRegistration upto BCNF using the functional dependencies mentioned below:

[10]

CourseRegistration (StuRegNo, StuName(FirstName, LastName), StuResidence, StudentMail, FacultyID, FacultyName, CabinNumber, CourseID, CourseTitle, NoOfCredits, SlotNumber)

In this relation StuRegNo, StuName, StuResidence, StudentMail is the Register Number, Name, Residential details(Hostler / DayBoarder) & email id of a student.

FacultyID, FacultyName, CabinNumber is the corresponding information about a Faculty.

CourseID, CourseTitle, NoOfCredits is the details about a course.

StuRegNo \rightarrow StuName, StuResidence, StudentMail

StuResidence \rightarrow SlotNumber

FacultyID \rightarrow FacultyName, CabinNumber, CourseID

CourseID \rightarrow CourseTitle, NoOfCredits

StuRegNo, FacultyID \rightarrow SlotNumber

FacultyID, CourseID \rightarrow CourseTitle

A faculty may enroll for more than one course and a student may register with more than one faculty member. Based on their residence, there is a restriction given here, DayBoarders are allowed only to take morning slots and the hostlers can opt for evening slots.

05. Consider the following query, write down the relational algebra expression and perform optimization of this query through query tree.

[10]

Student (sID: int, sName: varchar2(10), CGPA: int, city: varchar2(15), phone_number: int)

Apply (sID: int, cName: varchar2(20), stream: varchar2(10))

College(cName: varchar2(20), state: varchar2(15))

Display the IDs, names, CGPA of students and name of college with CGPA > 9 applying to MIT.

06. a) A concurrency control manager is tasked with analyzing the given transactions as they adhere to various schedules:

[10]

T1 : R1(A), R1(B), W1(A), W1(B)

T2 : R2(B), W2(B), R2(C), W2(C)

T3 : R3(C), W3(C), R3(A), W3(A)

The different schedules are as follows:

i) S1: R2(B), W2(B), R3(C), W3(C), R3(A), W3(A), R2(C), W2(C), R1(A), R1(B), W1(A), W1(B)

ii) S2: R2(B), W2(B), R3(C), W3(C), R1(A), R1(B), W1(A), W1(B), R2(C), W2(C), R3(A), W3(A)

Are the schedules conflict-serializable? If yes, indicate a serialization order. [3+3=6 marks]

b) Consider the following schedule:

S: R1(A), R1(B), R2(B), W2(B), R2(C), W2(C), Commit2, R3(C), W3(C), R3(A), W3(A), Commit3, W1(A), W1(B), Commit1

Whether the schedule is recoverable? Justify. [4 marks]

07. A schedule contains three transactions **T1**, **T2** and **T3**. The instructions are executed from top to bottom. [10]

i) Apply the concept of timestamp ordering algorithm to the schedule given below. [6 Marks]

ii) Determine whether the algorithm will permit the execution of the schedule or not. [4 Marks]

T1	T2	T3
read_item(P)		
write_item(P)		
	read_item(R)	
	read_item(Q)	
	write_item(Q)	
		read_item(Q)
	read_item(R)	read_item(R)
read_item(Q)		
write_item(Q)		
	read_item(Q)	
	write_item(Q)	
	read_item(R)	
	write_item(R)	
		write_item(Q)
		write_item(R)

08. Consider the schedule containing two transactions: [10]

T1	T2
lock-x (A)	
R(A)	
W(A)	
	lock-x (B)
	R(B)
	W(B)
lock-x (B)	
R(B)	
W(B)	
	lock-x (A)
	R(A)
	W(A)

a). Justify with a suitable answer whether the above schedule will result in a deadlock or not. [4 marks]

b). Discuss any two ways to prevent deadlock in the above schedule. [6 marks]

09. Assume that ABC online shopping sector maintains software for recommendation system for providing suggestions to the buyers and those who are spending more time with internet. Suggest an appropriate database with proper justification, to store all these details of products including product images, scanned copy of vouchers(or bills) along with reviews and ratings, customer's purchase history, wish list, shopping cart items, search list, and number of clicks on the suggested products. [10]

10. Consider the following relations concerning a driving school. A student takes one theory class and one practical driving class, and at the end of the session, he or she obtains marks for both theory and driving. The primary key of each relation is underlined. [10]

STUDENT (RegNo, St_Name, Class#, Th_Mark, Dr_Mark, Age)

TEACHER (Tr_Id, Tr_Name, RegNo)

TEACHER_VEHICLE (Tr_Id, LicenseNo)

VEHICLE (LicenseNo, Make, Model, Year)

Write SQL queries for the following

i) Show the creation of the first two relations (STUDENT and TEACHER) with all necessary constraints. Check that the student's age is greater than 18 and a positive integer. (2+2+1 marks)

ii) List the Model and Year of the vehicle in which its Make ends with 'J'. (1 mark)

iii) List the students who scored better marks than "Louis" in both theory and driving. (2 marks)

iv) List the Teacher Name associated with the make 'Audi' (2 marks)

