

Final Assessment Test (FAT) - July/August 2023

Programme	B.Tech.	Semester	Fall Inter Semester 22-23
Course Title	DATABASE SYSTEMS	Course Code	BCSE302L
Faculty Name	Prof. Jani Anbarasi L.	Slot	C2-TC2
		Class Nbr	CH2022232501092
Time	3 Hours	Max. Marks	100

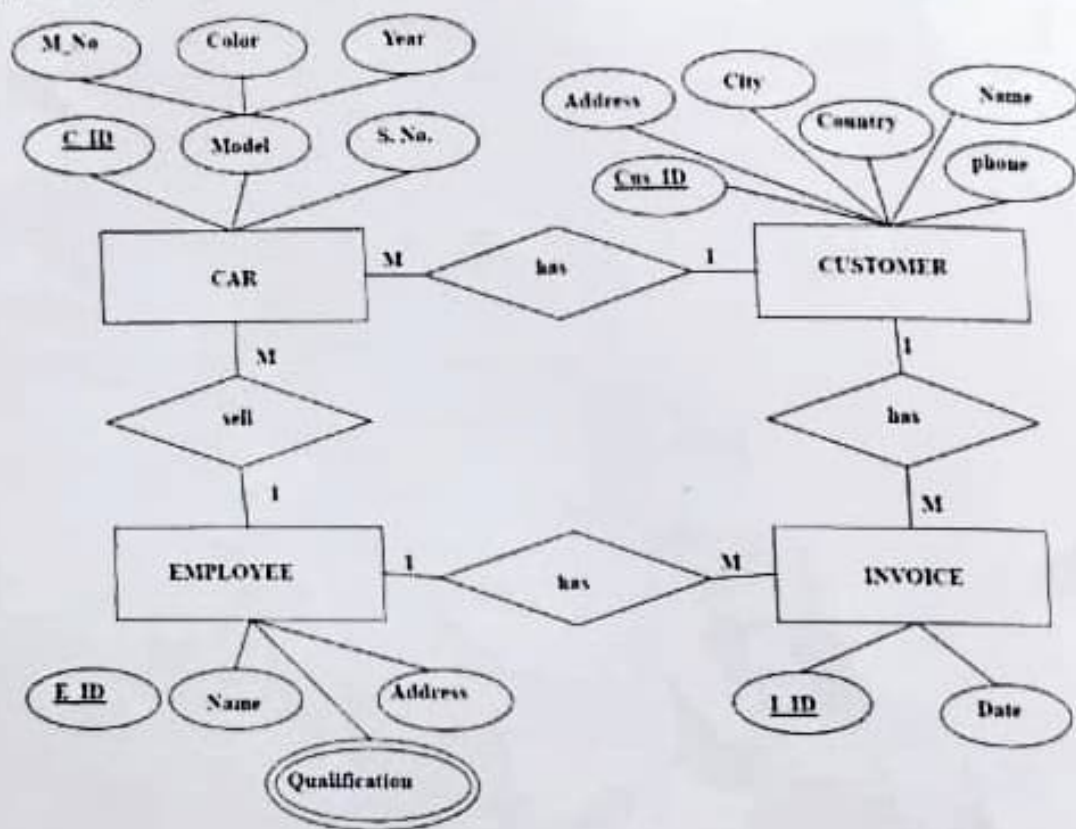
Part A (4 X 10 Marks)
Answer all questions

01. a) Consider a food manufacturing company that is managing the supply chain and tracking of production in the factories. List the characteristics of the relational database system maintained by the food manufacturing company (4marks). [10]
 b) Explain the roles of each actor related to food manufacturing database.(6marks) [10]
02. Consider the information about RR Sports Club:
 Registration_Table (Reg_id, Fname, Lname, Education, Age, Location, Gender)
 Sports_Table (Rid, Club, DateOfJoining, Level)
 Write the Relational Algebra expression and SQL query for the following
 a. List the name and location of students enrolled (age above 13) belonging to Football.(3 Marks)
 b. Count the level earned in each club by the student's group by Club.(2 Marks)
 c. List the name and date of joining of all girls in the Volleyball club. (2 Marks)
 d. List the DateOfJoining of the students enrolled whose qualification starts with letter 'B'. (3 Marks)
03. Consider the three transactions T1, T2, and T3, and the schedules S1 and S2 given below. Draw the serializability (precedence) graphs for S1 and S2, and state whether each schedule is serializable or not. If a schedule is serializable, write down the equivalent serial schedule(s) with proper explanation. If not, specify the reason for each schedule. [10]
 T1: r1(X); r1(Z); w1(X); w1(Z)
 T2: r2(Y); r2(Z); w2(Z)
 T3: r3(Y); r3(X); w3(Y)
 S1: r1(X); r3(Y); r3(X); r2(Y); r2(Z); w3(Y); w2(Z); r1(Z); w1(X); w1(Z) [5 marks]
 S2: r1(X); r3(Y); r2(Y); r3(X); r1(Z); r2(Z); w3(Y); w1(X); w2(Z); w1(Z) [5 marks]
04. A premier institute wants to store the research works carried out by its employees and their collaborators permanently. The type of research work can be a Journal publication, patents, Consultancy projects and challenging tasks. Each type of research may have information such as atomic data, multivalued data, numeric data and descriptive data. For example, data that has to be stored are the duration of research, starting and ending date, equipments used, description about the equipments, short biography about the researchers, short description of the research work carried or model description, whether published or not, if published where it is published and so on. Suggest a database to the institute for storing the data and explain how the data can be stored, retrieved and queried with suitable examples. [10]

Part B (4 X 15 Marks)

Answer all questions

05. i) A university wants to develop a system to manage its student enrollment process. The university offers multiple courses, and each course has several sections taught by different instructors. Students can enroll in multiple courses and sections. The university also wants to keep track of student grades for each course. Design an entity-relationship diagram (ERD) to represent the entities, relationships, and attributes involved in this scenario. The possible attributes you can use for designing an ERD are: ID, name, Email, credits, phone, time slot, class number, and grade. You can also use some attributes that are necessary to design an ERD for the scenario. This ERD represents the relationships between entities in the university's student enrollment system. It allows for the management of student enrollment, course offerings, instructor assignments, and grade tracking. (10 Marks)
- ii) Map the following Entity-Relationship diagram to an equivalent relational schema. Justify the same with proper explanation. (5 Marks)



06. i). Show the result of inserting 10, 8, 15, 7, 3, 6, 12, 5, 9, and 17 into an initially empty right-biased B+ tree with the order of the tree (m) is 3. After that, illustrate the deletion of key values 9, 10, and 15. (10marks)
- ii) Construct an extensible hashing structure by inserting the following key values into an empty bucket: (5marks)
- 5, 2, 6, 1, 7, 3, 4, 9
- Consider LSB of each key's binary value for insertion. Assume that each bucket can hold a maximum of two records.
- Show the extensible hashing structure after each insertion.
07. a. A MRF Company wants to develop a database to keep track of persons, their children and their cars. [15]

For this purpose, They will use the following relation:

PersonData(pNbr, pName, pAddress, cNbr, cName, cAddress, aLic, aMake, email, mobilenumbr)

pNbr, pName, pAddress is the person number, name and address of a person.

cNbr, cName, cAddress is the corresponding information for a child. Each person has exactly one address.

aLic, aMake is the license number and make of a car. A car may be owned by more than one person.

Normalize upto 3NF.

The functional dependencies hold by the relation as follows (9 marks)

FD1: PNbr \rightarrow pName, pAddress, cNbr, aLic, email, mobilenumbr

FD2: cNbr \rightarrow cName, cAddress

FD3: aLic \rightarrow aMake

FD4: PNbr, cNbr \rightarrow cName, email, mobilenumbr

FD5: PNbr, aLic \rightarrow aMake

b. Consider the following Functional Dependencies for the Relation Schema $R = (A, B, C, D, E)$. Compute the minimal cover.

i) $A \rightarrow B, C \rightarrow B, D \rightarrow ABC, AC \rightarrow D$ (3 Marks)

ii) $AB \rightarrow C, D \rightarrow E, AB \rightarrow E, E \rightarrow C$ (3 Marks)

08. a) Consider the following transactions of a schedule:

Add necessary locking-unlocking instructions so that the entire schedule becomes recoverable and cascadeless. [10 Marks]

<div>T1</div> <div>Read(P)</div> <div>P=P+10</div> <div>Write(P)</div> <div>Read(Q)</div> <div>Q=Q-5</div> <div>Write(Q)</div>		
	<div>T2</div> <div>Read(P)</div> <div>Read(Q)</div> <div>Read(Sum)</div> <div>Sum = Sum + P * Q</div> <div>Write(Sum)</div>	
		<div>T3</div> <div>Read(Sum)</div> <div>Read(Q)</div> <div>Sum = Sum + 2</div> <div>Write(Sum)</div> <div>Q = Q + 2</div> <div>Write(Q)</div>

b. Consider the following transaction scenario and check whether there exists any deadlock or not using wait-for graph. Justify your answer. (5 marks)

Transactions	Data items requested
T1	A(Exclusive lock), B(Shared lock)
T2	B(Exclusive lock)
T3	B(Shared lock)
T4	A(Shared lock), C(Exclusive lock)

[15]