National University of Computer and Emerging Sciences

FAST School of Computing **Spring-2024** **Islamabad Campus**

CS-2005: Database Systems

(SOLUTION)

Saturday, 24th February, 2024

Course Instructors

Dr. Ramoza Ahsan, Ms. Ayesha Kamran ul Haq

Serial No:

1st Sessional Exam

Total Time: 1 Hour
Total Marks: 60

_____
Signature of Invigilator

_____ _____ _____ _____
Student Name Roll No. Course Section Student Signature

DO NOT OPEN THE QUESTION BOOK OR START UNTIL INSTRUCTED.

Instructions:

1. Attempt on question paper. Read the question carefully, understand the question, and then attempt it.
2. No additional sheet will be provided for rough work.
3. Verify that you have **three? (3?)** different printed pages including this title page. There are **three (3)** questions.
4. Calculator sharing is strictly prohibited.
5. Use permanent ink pens only. Any part done using soft pencil will not be marked and cannot be claimed for rechecking.
6. Ensure that you do not have any electronic gadget (like mobile phone, smart watch, etc.) with you.

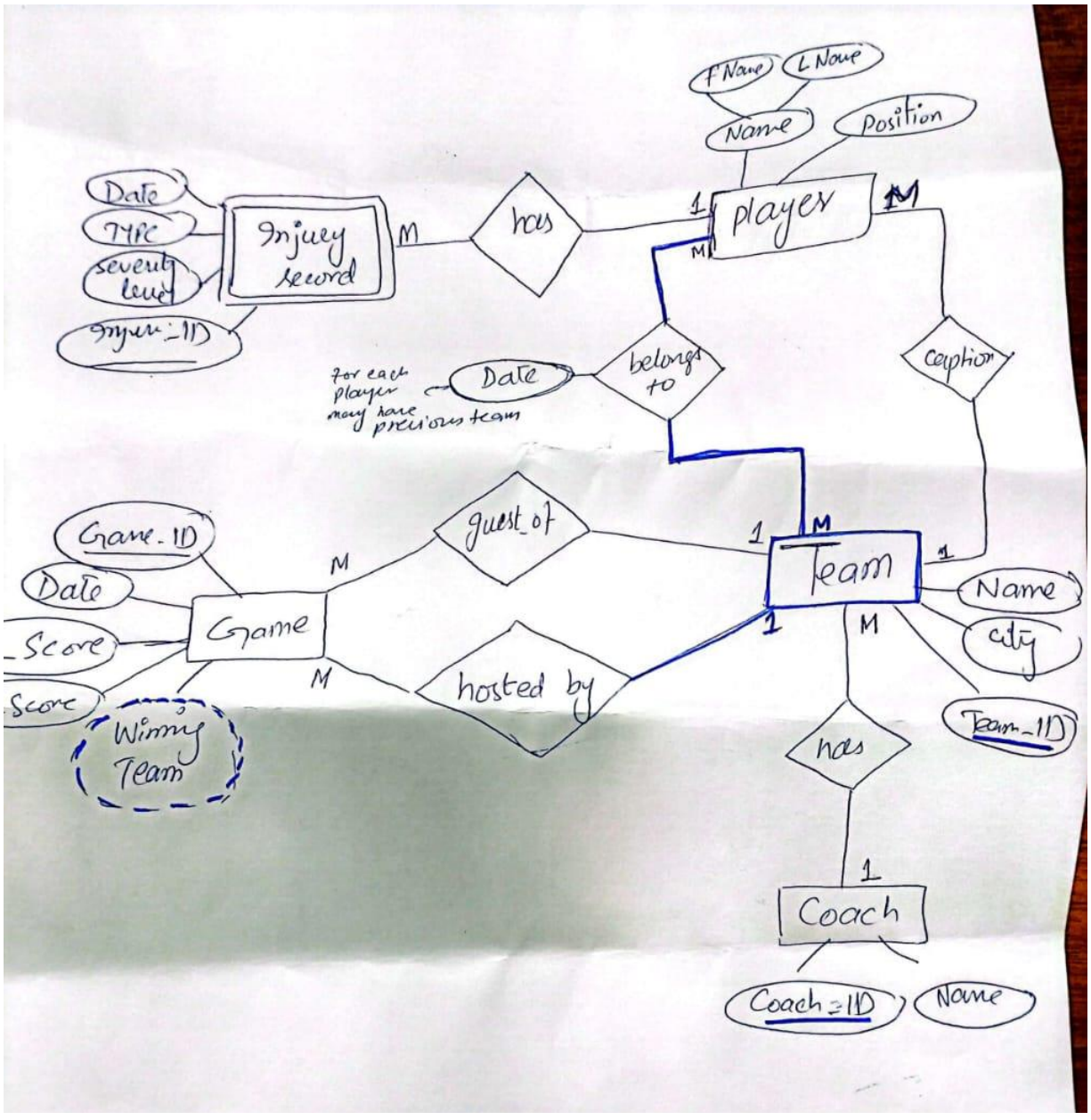
	Q-1	Q-2	Q-3	Total
Marks Obtained				
Total Marks	**25**	**20**	**15**	**60**

Question 1 [25 Marks]

Consider the specified requirements for constructing a database system tailored to the National Hockey League (NHL). In this system, multiple teams populate the league, with each team having its name, city, coach, and captain. Each team boasts a roster of players, with each player exclusively affiliated with one team. Player profiles include attributes such as name, position (e.g., left-wing, goalie), skill level, and a record of past injuries such as detailing dates, types, and severities of injury. Players may have been associated with multiple teams throughout their careers. The game involves two competing teams, denoted as host_team and guest_team, and are distinguished by a date stamp (e.g., May 11th, 1999) and a score indicating the performance of each team (e.g., 4 to 2). The victorious team is determined automatically based on the game score. This database structure aims to efficiently manage NHL-related data, enabling comprehensive analysis and decision-making within the league.

Question 1-a [4+6 Marks]: Provide a comprehensive breakdown of the attributes associated with each entity. Also, mention the type of each attribute (other than simple and single).

Question 1-b [15 Marks]: Design the ER model for your application, emphasizing **entities**, **relationships**, and the **cardinalities** of relationships (e.g., 1:1, 1:M). Avoid discussing attribute specifics in this section, as they have already been done in the previous section.



Question 2 [20 Marks] MCQs

Please cross (X) the correct answer, any answer not provided in the table below would not be considered. Cutting, overwriting, and multiple answers would be considered incorrect. This question has no negative marking:

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Sr. No	A	B	C	D	E
01					
02					
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09					
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11					X
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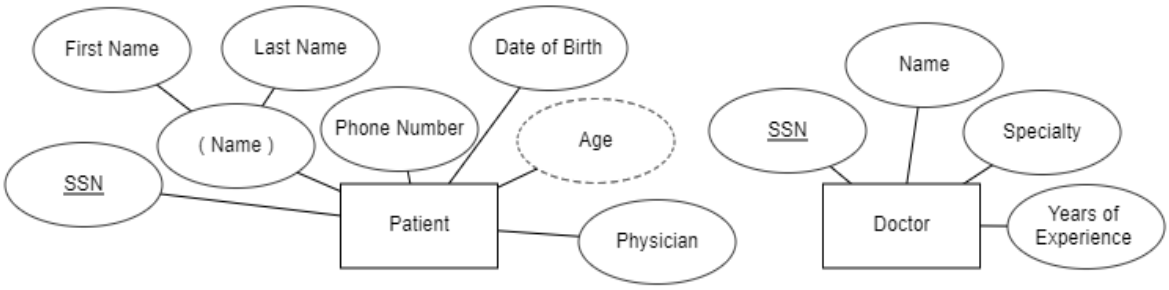
19					
20					

1. Patients are identified by an SSN, and their names, addresses, and ages must be recorded. Doctors are identified by an SSN. For each doctor, the name, specialty, and years of experience must be recorded. Every patient has a primary physician.

a



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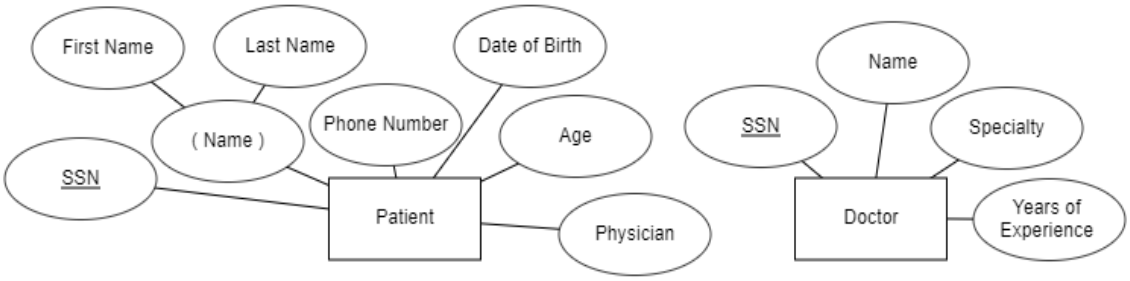

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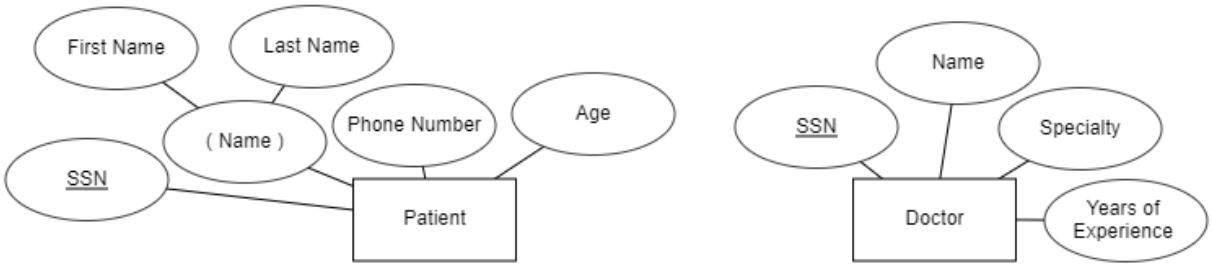

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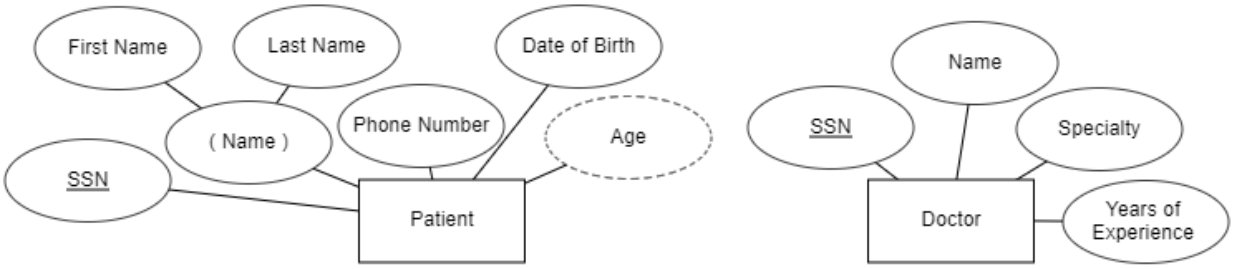

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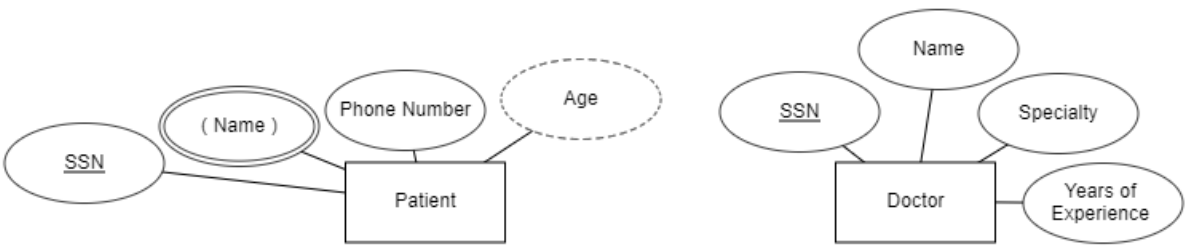


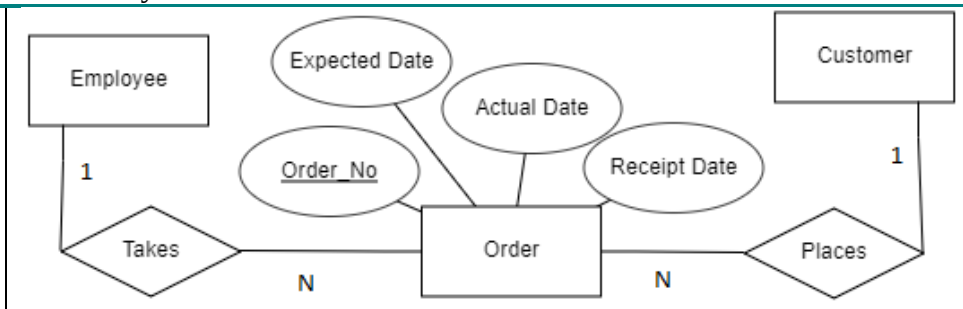
Q2-3

Consider a MAIL_ORDER database in which employees take orders for parts from customers. The data requirements are summarized as follows:

- The mail-order company has employees, each identified by a unique employee number, first and last name, and Zip Code.
- Each customer of the company is identified by a unique customer number, first and last name, and Zip Code.
- Each part sold by the company is identified by a unique part number, a part name, price, and quantity in stock.
- Each order placed by a customer is taken by an employee and is given a unique order number. Each order contains specified quantities of one or more parts. Each order has a date of receipt as well as an expected ship date. The actual ship date is also recorded.

2. Select correct the conceptual schema considering the relationship between customers, employees, and orders only.

a



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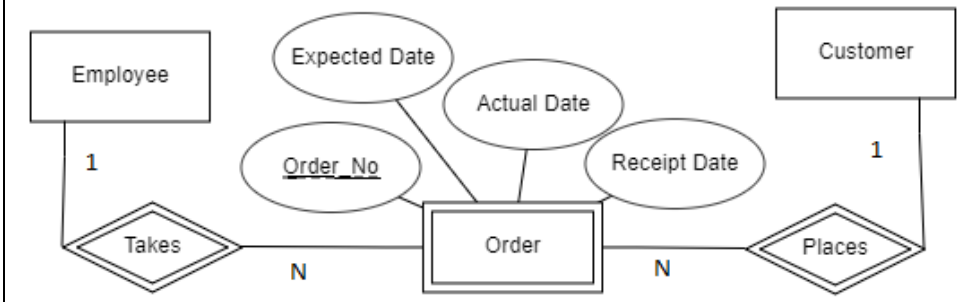

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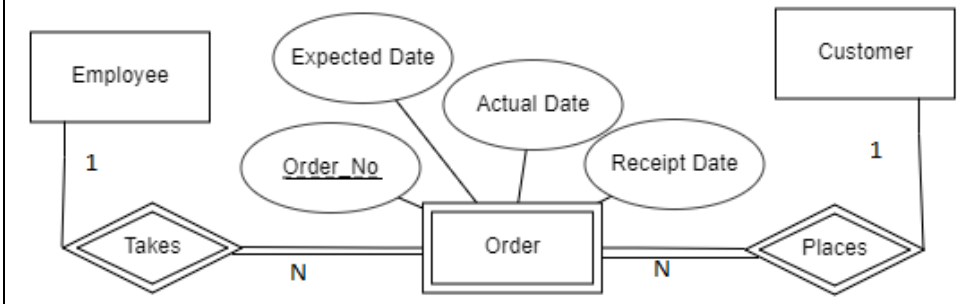

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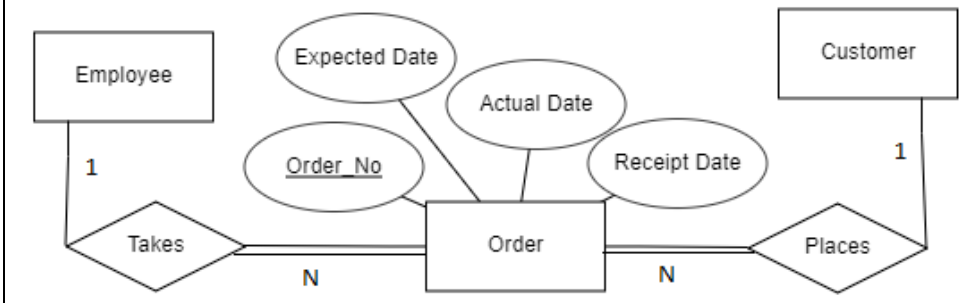

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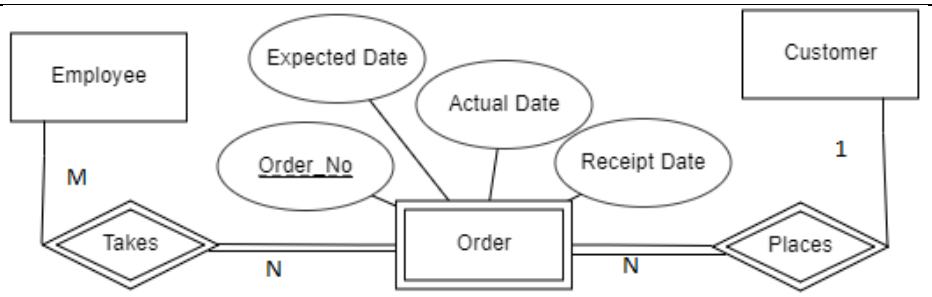
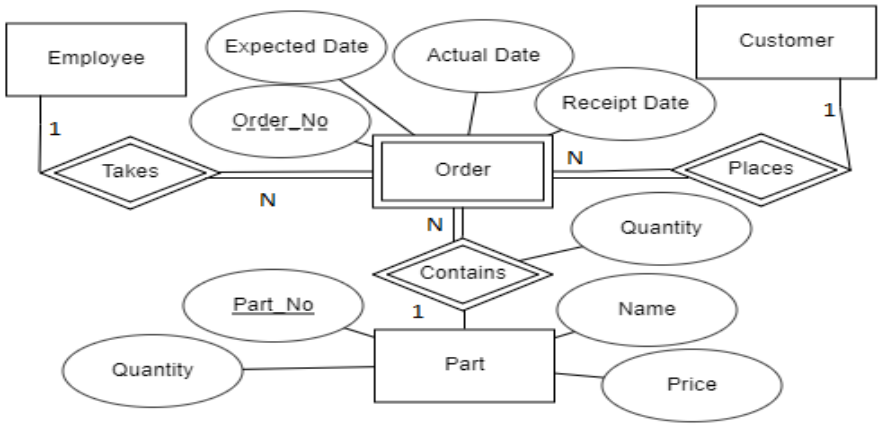


3. Select the correct ERD covering the complete requirements of MAIL_ORDER database

a



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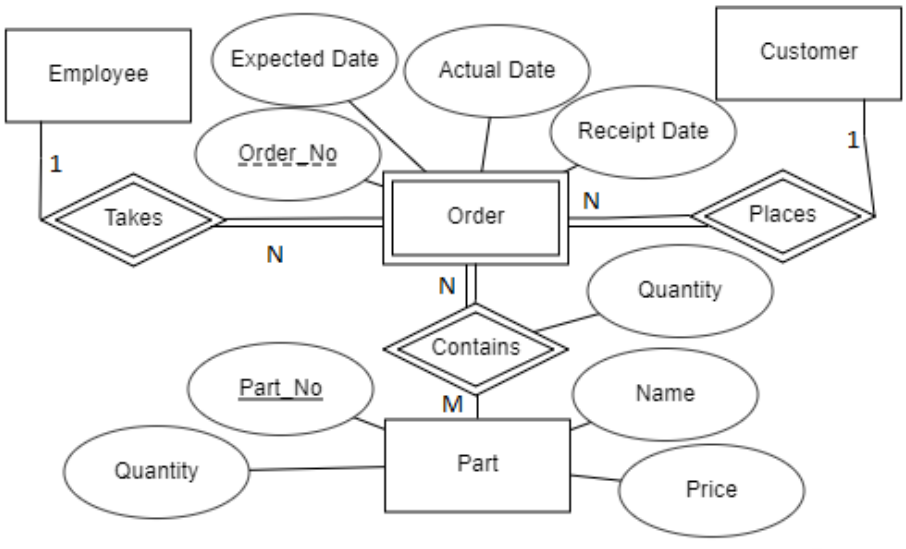

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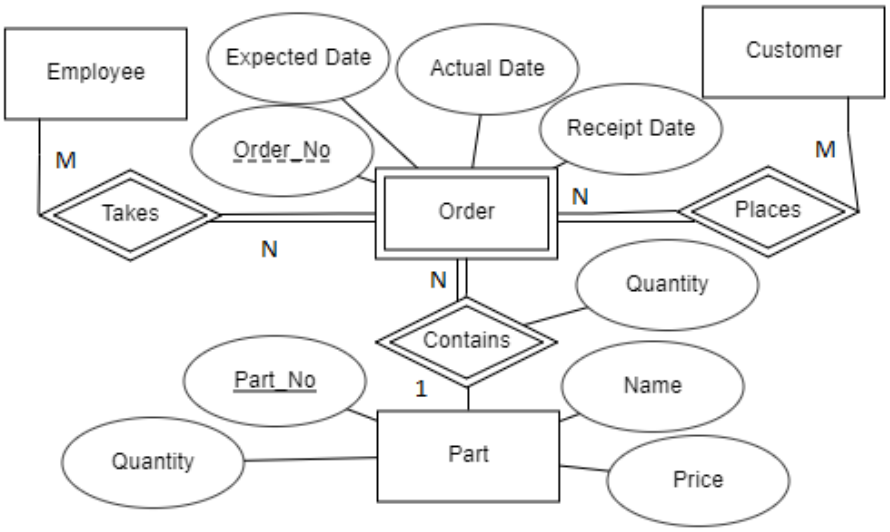
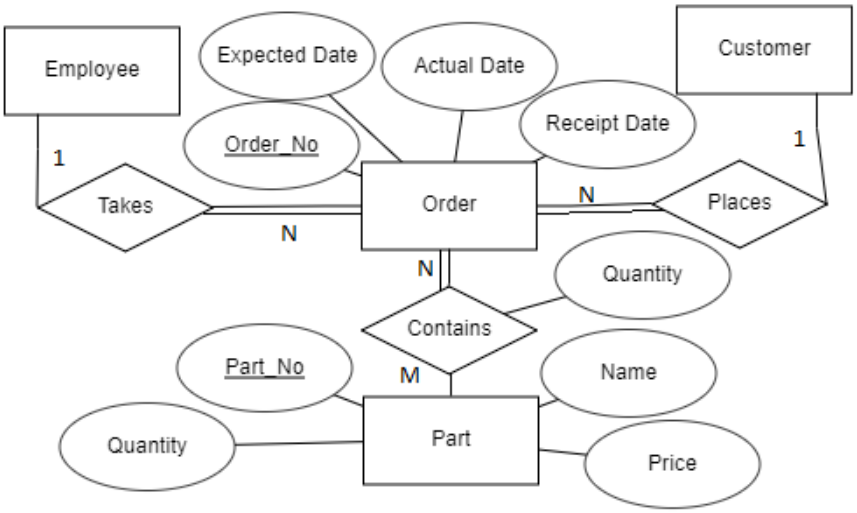

Employee
Expected Date
Actual Date
Customer
Order_No
Receipt Date
M
M
Takes
Order
N
Places
N
N
Quantity
Contains
Part_No
1
Name
Quantity
Part
Price

d


Employee
Expected Date
Actual Date
Customer
Order_No
Receipt Date
1
1
Takes
Order
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N
Quantity
Contains
Part_No
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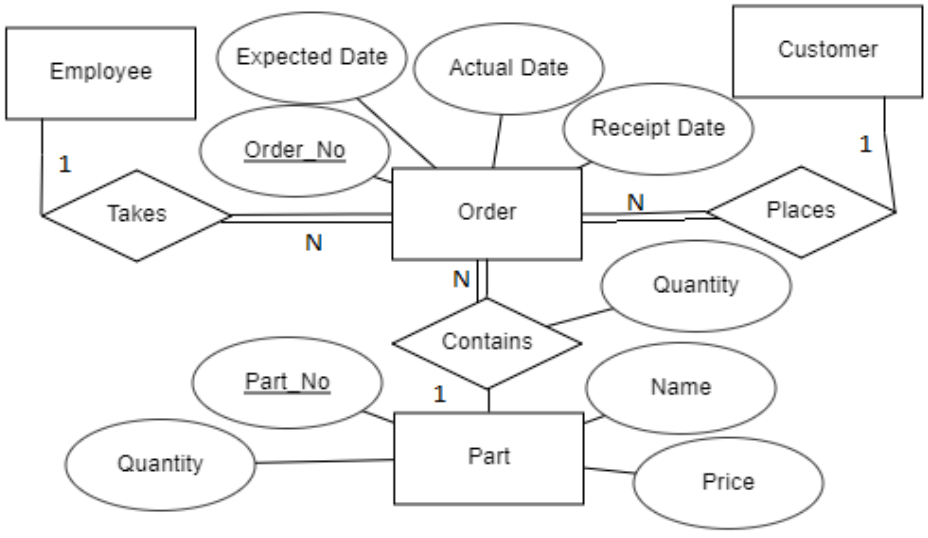
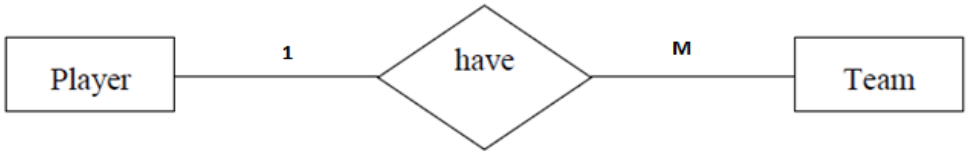
Name
Quantity
Part
Price

e


Employee
Expected Date
Actual Date
Customer
Order_No
Receipt Date
1
1
Takes
Order
N
Places
N
N
Quantity
Contains
Part_No
1
Name
Quantity
Part
Price

4. Each Player may play in a 0 to 1 team, and each Team should have many Players. All teams must have players and a player may not have a team.

a



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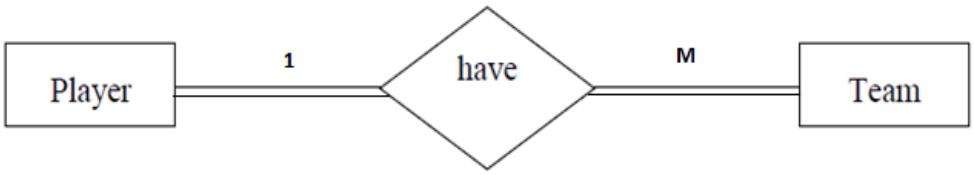

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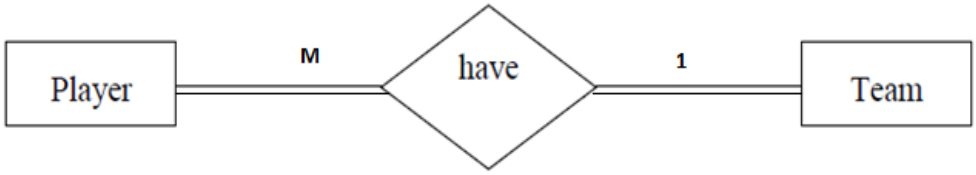

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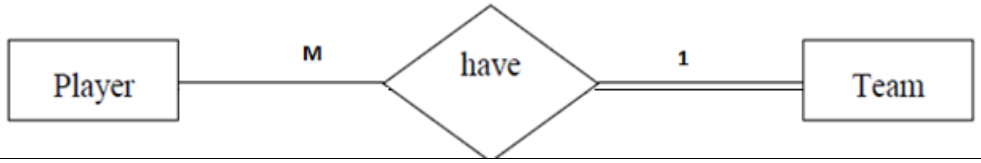

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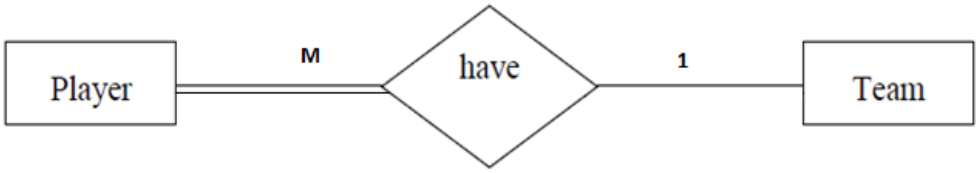
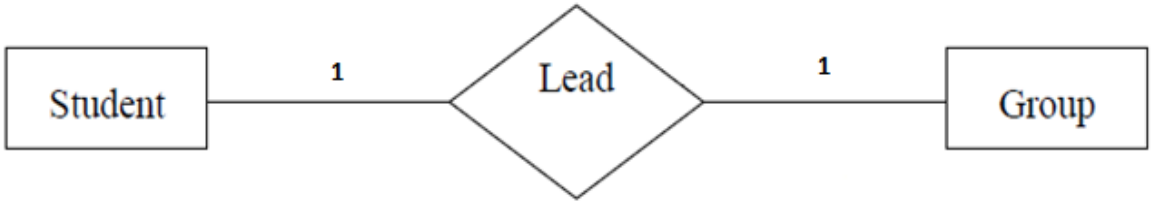


5. Each Student may lead 0 to 1 Group, and each Group should be led by only one Student. Not all students can lead groups. All groups must be led.

a



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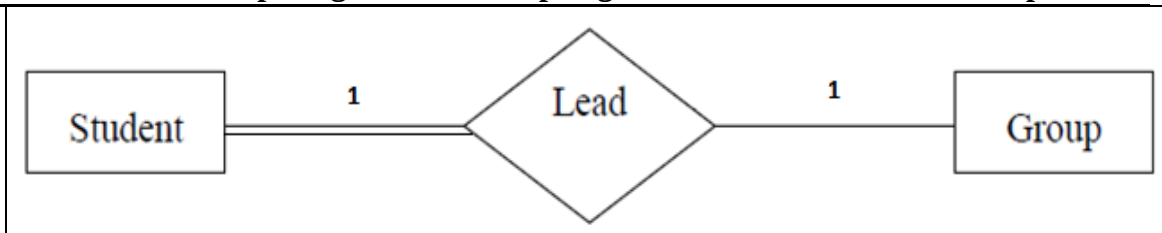

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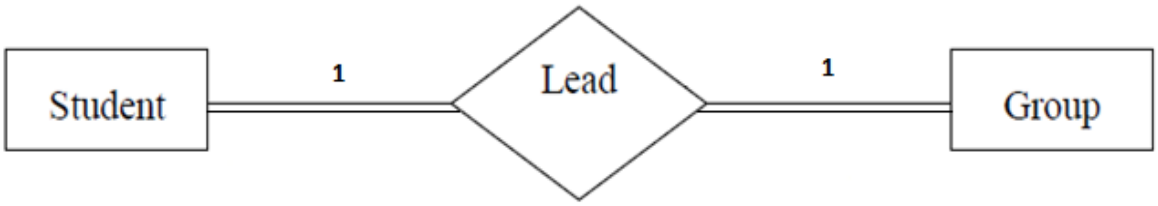

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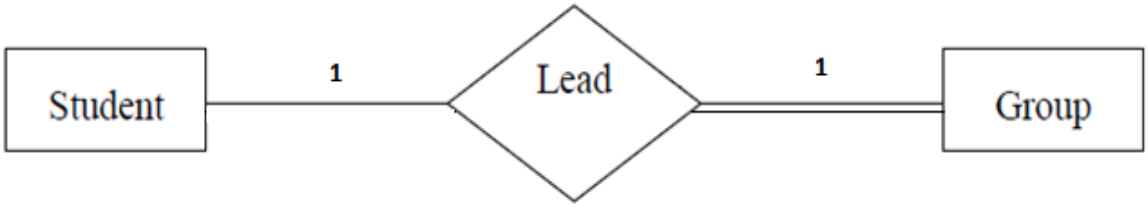

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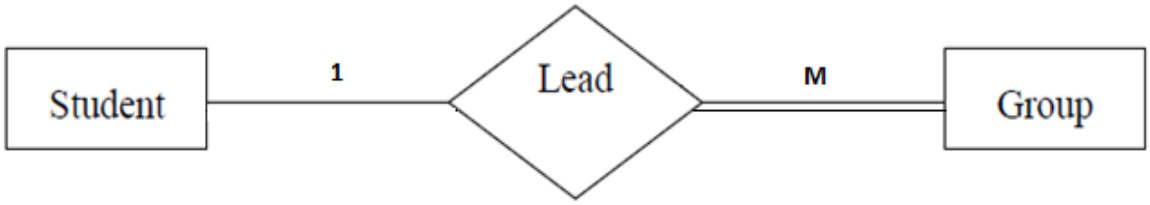

6. Which of the following refers to the level of data abstraction that describes exactly how the data is stored?

   a) Conceptual Level
   b) Logical Level
   c) File Level
   d) Physical Level
   e) None of the above

7. _____ property ensures that the transaction maintains data integrity constraints.

   a. Atomicity
   b. Isolation
   c. Durability
   d. Consistency

8. The schema of the database is also called _____ and the database state is called _____ of the schema.

a. Extension ,Intension
b. Extension, Intension
c. Instance, Snapshot
d. Intension, Extension
e. None of the above

For questions (9 – 14) that follow, refer to the figure that shows the ER Diagram of an Airline Database system. Choose the best option for answering the given MCQs.

9. Which of the following is a key attribute in AIRPLAN_TYPE?
   a. Seat_no
   b. Code
   c. Date
   d. Type_name
   e. All of the above
10. Which of the following is not true about Flight Legs:
   a. A single flight leg must depart from one airport only
   b. A single flight leg must arrive to one airport only
   c. Many flights may depart from the same airport
   d. A flight may not depart from any airport
   e. None of the above
11. All of the following are weak entities except:
   a. Fare
   b. Seat
   c. Leg Instance
   d. Flight Leg
   e. None of the Above
12. Which of the following is a multi-valued attribute:
   a. Seat_no
   b. Airplance_id
   c. Cphone
   d. Weekdays
   e. None of the above
13. Which of the following is an example of a Recursive Relationship
   a. Can_Land
   b. Assigned
   c. Departs,Arrives
   d. Legs,Fares
   e. None of the Above
14. What is not true about LEG_INSTANCE -----DEPARTS----- AIRPORT
   a. In the DEPARTS binary relationship type, AIRPORT:LEG_INSTANCE is of cardinality ratio 1:N
   b. Each airport can be related to any number of LEG_INSTANCES
   c. A LEG INSTANCE can be related to (departs from) at most one AIRPORT

d. For this particular relationship type DEPARTS, a particular AIRPORT entity can be related to any number of LEG_INSTANCES.
e. A LEG INSTANCE can be related to any number of AIRPORTs.

15. Information is known recorded facts while data is an understandable specific representation of data.

a. True
b. False

16. The data in the database at a particular moment in time is called a database _____

a. Schema
b. Instance
c. Both a and b
d. None of the above

17. Which of the following is not a feature of DBMS?

a. Minimum Duplication and Redundancy of Data
b. Single-user Access only
c. High Level of Security
d. Support ACID Property
e. Lack of Data Integrity Controls

18. The values appearing in given attributes of any tuple in the referencing relation must likewise occur in specified attributes of at least one tuple in the referenced relation, according to _____ integrity constraint.

a. Entity
b. Referential
c. Attribute
d. Domain

19. The ability to query data, as well as insert, delete, and alter tuples, is offered by _____

a. TCL (Transaction Control Language)
b. DML (Data Manipulation Langauge)
c. DCL (Data Control Language)
d. DDL (Data Definition Langauge)

20. What are rows of a relation known as?

e. Degree
f. Tuple
g. Entity
h. None of the above

Question 3 [15 Marks] MCQs

Question 3-a: **(2 Mark**) Imagine a medium-sized company that relies heavily on file systems for data storage and management. Each department within the company maintains its own set of files on shared network drives. Write down the 2 disadvantages of this approach and why.

Data Redundancy
Limited Security
Lack of Data Integrity
Scalability Challenges
Limited Collaboration

Question 3-b: **(6 Mark)** List any 3 design issues/errors along with the solutions of the table below where student_number and section_identifier (combined) is the primary key.

Student_number	Student_name	Section_identifier	Course_number	Grade
17	Smith	112	MATH2410	B
18	Smith	119	CS1310	C
17	Brown	112	MATH2410	B
	Jack	115	CS1310	A
17	Smith	B	CS3320	4

Missing value in Student_number which is a primary key
Wrong domain value in section_identifier
Grade cannot be numeric
Data redundancy issue

Question 3-c: **(5 Mark)** Identify the type of data for each application along with the reason why each application falls into the identified category.

1. Web Search Engine (Google) — Unstructured
2. Twitter Reviews — Unstructured
3. HTML Language — Semi-Structure
4. Cell phone numbers — Structure
5. PowerPoint Slides — Unstructured

Question 3-d: **(2 Mark)** Consider the Employee table below where ID is the primary key. **Name** the two Integrity constraints it violates (just write down the names of the constraints it violates and mark the place of violation as well).

ID	**Name**	**Salary**
1101	Jackson	40000
1102	Smith	50000
1103	Ryan	70000
	Steve	-10000

Entity integrity (primary key cannot be null)
Domain constraint for Salary (it cannot be negative)