

Database Systems (CS2005) Sessional-II Exam**(A,B,C,D) (CS)**

Date: November 02, 2024

Total Time (Hrs): 1**Total Marks: 45****Total Questions: 2****Course Instructor(s):**Noor ul Ain, Hira Mastoor **A**Roll No **2**

Course Section

Student Signature

Do not write anything on the question paper except the information required above.**Instructions:**

1. Read the question carefully, understand the question, and then attempt your answers in the provided answer booklet.
2. Verify that you have **Ten (10)** printed page of the question paper including this page. There are **two parts of the paper i.e. PART A and PART B.**
3. **Solve Part A on the answer sheet and Part B on the question paper.**
4. Avoid long stories and irrelevant code while answering your question

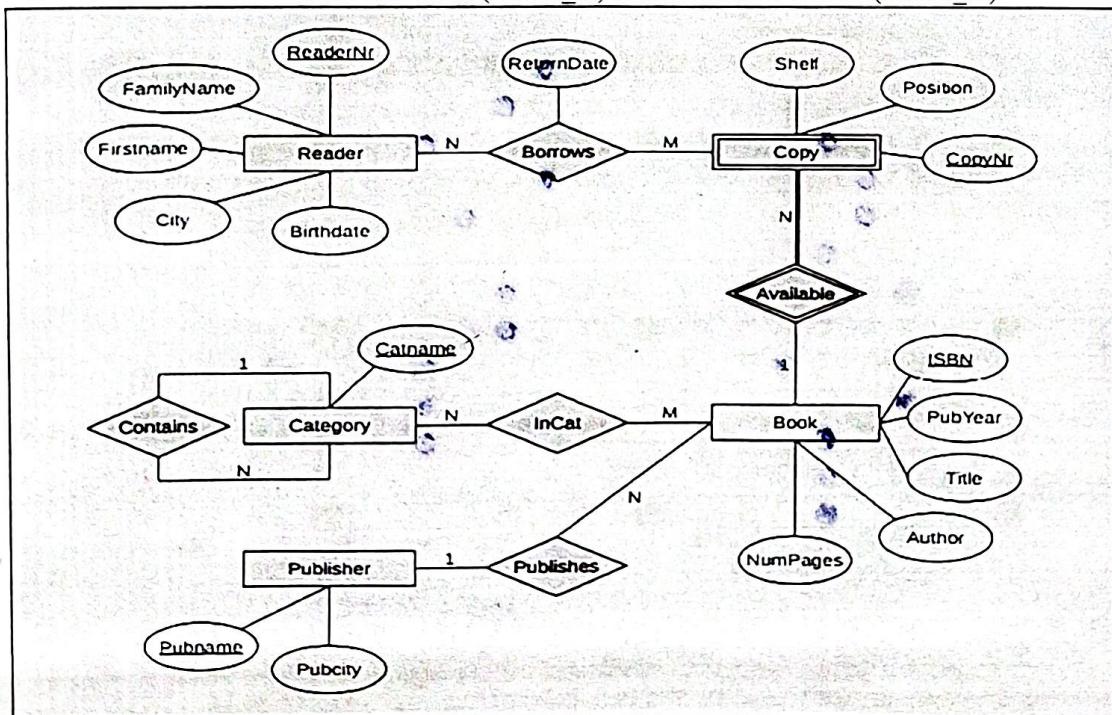
Attempt all the questions.**PART A****[CLO2: Design a conceptual model using (E)ER diagrams for an enterprise] [15 Marks]**

Convert the following ER diagrams into relational schemas. Define a primary key for each relation also mention the foreign key if present. Note: Use the following format to show the relational mapping any other format will be given zero marks

Aircraft(aircraft_id, model, capacity, airline_id)

PRIMARY KEY (aircraft_id),

FOREIGN KEY (airline_id) REFERENCES Airline(airline_id)



PART A:

- Publisher (Pubname, Pubcity)
PRIMARY KEY (Pubname)
- Book (ISBN, PubYear, Title, Author, NumPages, PName)
PRIMARY KEY (ISBN),
FOREIGN KEY (PNAME) REFERENCES
Publisher (Pubname)
- Category (Catname, Cname)
PRIMARY KEY (Catname),
FOREIGN KEY (Cname) REFERENCES
Category (Catname)
- InCat (Catname, ISBN)
PRIMARY KEY (Catname, ISBN),
FOREIGN KEY (Catname) REFERENCES
Category (Catname),
FOREIGN KEY (ISBN) REFERENCES
Book (ISBN)
- Copy (ISBN, CopyNr, Shelf, Position)
PRIMARY KEY (ISBN, CopyNr),
FOREIGN KEY (ISBN) REFERENCES
Book (ISBN)

- Reader (ReaderNr, FamilyName, FirstName,
City, Birthdate)
PRIMARY KEY (ReaderNr)
- Borrows (ReaderNr, CopyNr, ReturnDate)
PRIMARY KEY (ReaderNr, CopyNr),
FOREIGN KEY (ReaderNr) REFERENCES
Reader (ReaderNr),
FOREIGN KEY (CopyNr) REFERENCES
Copy (CopyNr)

Consider the following Database Schema for the next 20 questions:

Airline(airline_id, airline_name, iata_code, country)

PRIMARY KEY (airline_id)

Airport(airport_code, airport_name, city, country)

PRIMARY KEY (airport_code)

Aircraft(aircraft_id, model, capacity, airline_id)

PRIMARY KEY (aircraft_id),

FOREIGN KEY (airline_id) REFERENCES Airline(airline_id)

Flight(flight_id, flight_no, departure_airport, arrival_airport, departure_time, arrival_time, airline_id)

PRIMARY KEY (flight_id),

FOREIGN KEY (airline_id) REFERENCES Airline(airline_id)



Passenger(passenger_id, first_name, last_name, email, phone)

PRIMARY KEY (passenger_id)

Booking(booking_id, passenger_id, booking_date, total_amount)

PRIMARY KEY (booking_id),

FOREIGN KEY (passenger_id) REFERENCES Passenger(passenger_id)

Booking_Flight(booking_flight_id, booking_id, flight_id, seat_number, class, price)

PRIMARY KEY (booking_flight_id),

FOREIGN KEY (booking_id) REFERENCES Booking(booking_id),

FOREIGN KEY (flight_id) REFERENCES Flight(flight_id))

Payment(payment_id, booking_id, amount, payment_date, payment_method)

PRIMARY KEY (payment_id),

FOREIGN KEY (booking_id) REFERENCES Booking(booking_id))

Following is the data in the tables

Airline

airline_id	airline_name	iata_code	country
1	United Airlines	UA	USA
2	Delta Airlines	DL	USA
3	Emirates	EK	UAE
4	British Airways	BA	UK
5	Qatar Airways	QR	Qatar

Airport

airport_code	airport_name	city	country
JFK	John F. Kennedy International	New York	USA
LAX	Los Angeles International	Los Angeles	USA
DXB	Dubai International	Dubai	UAE
LHR	London Heathrow	London	UK

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DOH	Hamad International	Doha	Qatar
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Aircraft

aircraft_id	model	capacity	airline_id
1	Boeing 777	300	1
2	Airbus A380	500	3
3	Boeing 737	200	2
4	Boeing 787	250	4
5	Airbus A350	350	5
6	Airbus A330	350	4

Flight

flight_id	flight_no	departure_airport	arrival_airport	departure_time	arrival_time	airline_id
1	UA100	JFK	LAX	2024-11-01 08:00:00	2024-11-01 11:00:00	1
2	DL200	LAX	DXB	2024-11-01 15:00:00	2024-11-02 05:00:00	2
3	EK300	DXB	JFK	2024-11-02 08:00:00	2024-11-02 18:00:00	3
4	BA400	LHR	DOH	2024-11-03 10:00:00	2024-11-03 16:00:00	4
5	QR500	DOH	LHR	2024-11-04 12:00:00	2024-11-04 18:00:00	5

Passenger

passenger_id	first_name	last_name	email	phone
1	John	Doe	john.doe@example.com	+1234567890
2	Jane	Smith	jane.smith@example.com	+0987654321
3	Ali	Khan	ali.khan@example.com	+1122334455
4	Emily	Davis	emily.davis@example.com	+1445566778
5	Ahmed	Hassan	ahmed.hassan@example.com	+1998877665

Booking

booking_id	passenger_id	booking_date	total_amount
1	1	2024-10-25	500.00
2	2	2024-10-25	800.00
3	3	2024-10-26	1200.00
4	4	2024-10-27	450.00
5	5	2024-10-27	950.00

Booking_Flight

booking_flight_id	booking_id	flight_id	seat_number	class	price
1	1	1	12A	Economy	200.00
2	1	2	14C	Economy	300.00
3	2	3	1A	First Class	800.00
4	3	4	20B	Business	450.00
5	4	5	10D	Economy	500.00

Payment

payment_id	booking_id	amount	payment_date	payment_method
1	1	500.00	2024-10-25	Credit Card
2	2	800.00	2024-10-25	PayPal
3	3	1200.00	2024-10-26	Credit Card
4	4	450.00	2024-10-27	Debit Card
5	5	950.00	2024-10-27	Bank Transfer

✓ 1. Which of the following SQL queries will calculate the average capacity of aircraft operated by each airline.

- A. SELECT airline_id, AVG(capacity) FROM Aircraft;
- B. SELECT airline_id, AVG(capacity) FROM Aircraft GROUP BY model;
- C.** SELECT airline_id, AVG(capacity) FROM Aircraft GROUP BY airline_id;
- D. SELECT airline_id, SUM(capacity) FROM Aircraft GROUP BY airline_id;

✓ 2. Which of the following SQL queries will determine the total revenue generated from all bookings?

- A. SELECT COUNT(total_amount) FROM Booking WHERE total_amount > 0;
- B.** SELECT SUM(total_amount) FROM Booking;
- C. SELECT AVG(total_amount) FROM Booking WHERE booking_date IS NOT NULL;
- D. SELECT SUM(total_amount) FROM Booking GROUP BY passenger_id;

✓ 3. Which of the following SQL queries will calculate the total number of passengers who have made bookings?

- A. SELECT COUNT(*) FROM Booking;
- B.** SELECT COUNT(DISTINCT passenger_id) FROM Booking;
- C. SELECT SUM(passenger_id) FROM Booking GROUP BY booking_id;
- D. SELECT MAX(passenger_id) FROM Booking;

✓ 4. Which of the following SQL queries will determine the airline(s) that operate(s) the aircraft with the highest seating capacity.

- A. SELECT airline_id, Max(Capacity) FROM Aircraft WHERE capacity = (SELECT MAX(capacity) FROM Aircraft);
- B. SELECT DISTINCT airline_id FROM Aircraft WHERE capacity = (SELECT SUM(capacity) FROM Aircraft);
- C.** SELECT airline_id FROM Aircraft WHERE capacity = (SELECT MAX(capacity) FROM Aircraft);
- D. SELECT airline_id FROM Aircraft GROUP BY airline_id HAVING MAX(capacity) = (SELECT SUM(capacity) FROM Aircraft);

✓ 5. Which of the following SQL queries will determine the flights with ticket prices above the average ticket price?

- A.** SELECT flight_id FROM Booking_Flight WHERE price > (SELECT AVG(price) FROM Booking_Flight);

- B. `SELECT flight_id FROM Booking_Flight WHERE price < (SELECT MAX(price) FROM Booking_Flight);`
- C. `SELECT flight_id, AVG(price) FROM Booking_Flight WHERE AVG(price) > (SELECT AVG(price) FROM Booking_Flight);`
- D. `SELECT flight_id FROM Booking_Flight WHERE AVG(price) > SUM(price);`

✓ 6. Which of the following SQL queries will determine the names of customers who have made the highest total booking amount.

- A. `SELECT first_name, last_name FROM Customer WHERE customer_id = (SELECT MAX(customer_id) FROM Booking);`
- B. `SELECT first_name, last_name FROM Customer WHERE customer_id = (SELECT Max(total_amount) FROM Booking);`
- C. `SELECT first_name, last_name FROM Customer WHERE customer_id = (SELECT customer_id FROM Booking WHERE total_amount = (SELECT SUM(total_amount) FROM Booking));`
- D. `SELECT first_name, last_name FROM Customer WHERE customer_id = (SELECT customer_id FROM Booking GROUP BY customer_id ORDER BY SUM(total_amount) DESC LIMIT 1);`

✓ 7. Which of the following SQL queries will determine the airports from which flights have a total revenue exceeding \$100,000.

- A. `SELECT departure_airport FROM Flight WHERE flight_id IN (SELECT flight_id FROM Booking_Flight GROUP BY flight_id HAVING SUM(price) > 100000);`
- B. `SELECT departure_airport FROM Flight WHERE flight_id = (SELECT flight_id FROM Booking_Flight WHERE price > 100000);`
- C. `SELECT departure_airport FROM Flight WHERE SUM(price) > 100000;`
- D. `SELECT flight_id FROM Booking_Flight GROUP BY departure_airport HAVING SUM(price) > 100000;`

✓ 8. Which of the following SQL queries will determine the flights whose booking price is below the average price for their specific departure airport.

- A. `SELECT flight_id FROM Booking_Flight WHERE price < (SELECT AVG(price) FROM Booking_Flight);`
- B. `SELECT flight_id FROM Booking_Flight WHERE price < (SELECT AVG(price) FROM Booking_Flight GROUP BY flight_id);`
- C. `SELECT flight_id FROM Flight WHERE flight_id IN (SELECT flight_id FROM Booking_Flight WHERE price < (SELECT AVG(price) FROM Booking_Flight WHERE flight_id = Flight.flight_id));`
- D. `SELECT flight_id FROM Flight WHERE price > (SELECT AVG(price) FROM Booking_Flight);`

✓ 9. Which query would add a departure_time column with TIME data type to the Flight table?

- A. `ALTER TABLE Flight ADD COLUMN departure_time DATE;`
- B. `ALTER TABLE Flight MODIFY COLUMN departure_time TIME;`
- C. `ALTER TABLE Flight ADD departure_time TIME;`
- D. `ALTER TABLE Flight ADD departure_time VARCHAR(50);`

10. Which of the following SQL queries will determine the aircraft models with capacities larger than the average capacity of all aircraft operated by the same airline.

- ~~X~~
- A. SELECT model FROM Aircraft WHERE capacity > (SELECT AVG(capacity) FROM Aircraft);
 - B. SELECT model FROM Aircraft a WHERE capacity = (SELECT MAX(capacity) FROM Aircraft WHERE airline_id = a.airline_id);
 - C. SELECT model FROM Aircraft GROUP BY model HAVING capacity > 100;
 - D. SELECT model FROM Aircraft a WHERE capacity > (SELECT AVG(capacity) FROM Aircraft WHERE airline_id = a.airline_id);

✓ 11. Which of the following SQL queries will determine the airports where flights are operated at an above-average ticket price for that airport.

- A. SELECT DISTINCT departure_airport FROM Flight WHERE price > (SELECT AVG(price) FROM Booking_Flight);
- B. SELECT departure_airport FROM Flight WHERE flight_id = (SELECT flight_id FROM Booking_Flight WHERE price > 500);
- C. SELECT DISTINCT departure_airport FROM Flight f JOIN Booking_Flight b ON f.flight_id = b.flight_id WHERE b.price > (SELECT AVG(price) FROM Booking_Flight WHERE flight_id = f.flight_id);
- D. SELECT departure_airport FROM Flight GROUP BY flight_id HAVING price > (SELECT AVG(price) FROM Booking_Flight);

12. Which of the following SQL queries will list the names of passengers along with their flight departure dates for all booked flights.

- A. SELECT first_name, last_name, departure_date FROM Passenger JOIN Booking ON Passenger.passenger_id = Booking.passenger_id JOIN Flight ON Booking.flight_id = Flight.flight_id;
- B. SELECT first_name, last_name, departure_date FROM Passenger JOIN Flight ON Passenger.passenger_id = Flight.passenger_id;
- C. SELECT first_name, last_name, departure_date FROM Passenger LEFT JOIN Booking ON Passenger.passenger_id = Booking.passenger_id LEFT JOIN Flight ON Booking.flight_id = Flight.flight_id;
- D. SELECT first_name, last_name, departure_date FROM Passenger LEFT JOIN Flight ON Passenger.passenger_id = Flight.passenger_id;

✓ 13. Which of the following SQL queries will determine all flights along with any booking amounts if available

- A. SELECT flight_id, price FROM Flight JOIN Booking_Flight ON Flight.flight_id = Booking_Flight.flight_id;
- B. SELECT flight_id, price FROM Flight LEFT JOIN Booking_Flight ON Flight.flight_id = Booking_Flight.flight_id;
- C. SELECT flight_id, price FROM Booking_Flight RIGHT JOIN Flight ON Flight.flight_id = Booking_Flight.flight_id;
- D. SELECT flight_id, price FROM Flight FULL JOIN Booking_Flight ON Flight.flight_id = Booking_Flight.flight_id;

✓ 14. Which of the following SQL queries will determine all aircraft models and their airline names.

- A. SELECT model, name FROM Aircraft INNER JOIN Airline ON Aircraft.airline_id = Airline.airline_id;

- B. SELECT model, name FROM Aircraft LEFT JOIN Airline ON Aircraft.airline_id = Airline.airline_id;
- C. SELECT model, name FROM Aircraft RIGHT JOIN Airline ON Aircraft.airline_id = Airline.airline_id;
- D. SELECT model, name FROM Aircraft FULL JOIN Airline ON Aircraft.airline_id = Airline.airline_id;

✓ 15. Which of the following SQL queries will determine the airports where flights have been booked but exclude airports with no bookings.

- A. SELECT DISTINCT departure_airport FROM Flight LEFT JOIN Booking_Flight ON Flight.flight_id = Booking_Flight.flight_id;
- B. SELECT DISTINCT departure_airport FROM Flight FULL JOIN Booking_Flight ON Flight.flight_id = Booking_Flight.flight_id;
- C. ~~SELECT~~ departure_airport FROM Flight LEFT JOIN Booking_Flight ON Flight.flight_id = Booking_Flight.flight_id WHERE booking_flight_id IS NOT NULL;
- D. ① SELECT DISTINCT departure_airport FROM Flight INNER JOIN Booking_Flight ON Flight.flight_id = Booking_Flight.flight_id;

✓ 16. Which of the following SQL queries will retrieve airline names and the total number of aircraft each operates.

- A. ② SELECT name, COUNT(aircraft_id) FROM Airline LEFT JOIN Aircraft ON Airline.airline_id = Aircraft.airline_id GROUP BY name;
- B. SELECT name, COUNT(aircraft_id) FROM Airline RIGHT JOIN Aircraft ON Airline.airline_id = Aircraft.airline_id;
- C. SELECT name, COUNT(aircraft_id) FROM Airline FULL JOIN Aircraft ON Airline.airline_id = Aircraft.airline_id;
- D. SELECT name, COUNT(aircraft_id) FROM Airline JOIN Aircraft ON Airline.airline_id = Aircraft.airline_id;

✓ 17. Which of the following SQL queries will list all passengers who have no bookings.

- A. SELECT first_name, last_name FROM Passenger JOIN Booking ON Passenger.passenger_id = Booking.passenger_id;
- B. SELECT first_name, last_name FROM Passenger LEFT JOIN Booking ON Passenger.passenger_id = Booking.passenger_id WHERE booking_id IS NOT NULL;
- C. ③ SELECT first_name, last_name FROM Passenger LEFT JOIN Booking ON Passenger.passenger_id = Booking.passenger_id WHERE booking_id IS NULL;
- D. SELECT first_name, last_name FROM Passenger RIGHT JOIN Booking ON Passenger.passenger_id = Booking.passenger_id;

✓ 18. Which of the following SQL queries will determine the airline names and the average capacity of aircraft they operate.

- A. SELECT name, AVG(capacity) FROM Airline RIGHT JOIN Aircraft ON Airline.airline_id = Aircraft.airline_id GROUP BY airline_id;
- B. ④ SELECT name, AVG(capacity) FROM Airline LEFT JOIN Aircraft ON Airline.airline_id = Aircraft.airline_id GROUP BY name;
- C. SELECT name, AVG(capacity) FROM Airline JOIN Aircraft ON Airline.airline_id = Aircraft.airline_id;

D. `SELECT name, capacity FROM Airline LEFT JOIN Aircraft ON Airline.airline_id = Aircraft.airline_id;`

✓ 19. Which of the following SQL queries will list all passengers who have bookings along with their total booking amount,

- A. `SELECT first_name, last_name, total_amount FROM Passenger JOIN Booking ON Passenger.passenger_id = Booking.passenger_id;`
- B. `SELECT first_name, last_name, SUM(total_amount) AS total_spent FROM Passenger LEFT JOIN Booking ON Passenger.passenger_id = Booking.passenger_id GROUP BY Passenger.passenger_id;`
- C. `SELECT first_name, last_name, SUM(total_amount) FROM Passenger RIGHT JOIN Booking ON Passenger.passenger_id = Booking.passenger_id GROUP BY first_name;`
- D. `SELECT first_name, last_name, total_amount FROM Passenger LEFT JOIN Booking ON Passenger.passenger_id = Booking.passenger_id;`

? 20. Which of the following SQL queries will determine the flights with the lowest booking price for each airline

- A. `SELECT airline_id, MIN(price) FROM Booking_Flight GROUP BY flight_id;`
- B. `SELECT airline_id, MIN(price) FROM Flight JOIN Booking_Flight ON Flight.flight_id = Booking_Flight.flight_id GROUP BY airline_id;`
- C. `SELECT flight_id, MIN(price) FROM Booking_Flight WHERE price = (SELECT MAX(price) FROM Booking_Flight);`
- D. `SELECT airline_id FROM Flight WHERE flight_id = (SELECT MIN(price) FROM Booking_Flight);`

Consider the following table and answer question no 21-30

Student_Course

StudentID	StudentName	Course	Instructor	Credits
101	Ali	Database Systems	Dr. Smith	4
102	Amna	Web Development	Dr. Jones	3
103	Sara	Database Systems	Dr. Smith	4
104	Maaz	Network Security	Dr. Johnson	3
105	Sara	Web Development	Dr. Jones	3

✓ 21. Which of the following is a correct functional dependency based on the table?

- A. $\text{StudentID} \rightarrow \text{StudentName, Course}$ ✓
- B. $\text{Course} \rightarrow \text{StudentName}$ ✗
- C. $\text{Instructor} \rightarrow \text{StudentName}$ ✗
- D. $\text{StudentName} \rightarrow \text{Instructor}$ ✗

Updation names

✓ 22. In the context of the table, which functional dependency is likely to lead to redundancy?

- A. $\text{StudentID} \rightarrow \text{Course}$
- B. $\text{Course} \rightarrow \text{Instructor}$
- C. $\text{StudentID} \rightarrow \text{Instructor}$
- D. $\text{Instructor} \rightarrow \text{StudentID}$

Ins → Cons

✓ 23. If the Instructor's name uniquely determines the Course, which functional dependency can be inferred?

- A. $\text{Course} \rightarrow \text{StudentID}$
- B. $\text{StudentID} \rightarrow \text{Instructor}$

- C. StudentName → Course
- D. Instructor → Course

✓ 24. Which of the following functional dependencies indicates a transitive dependency in the given table?

- A. StudentID → StudentName and StudentName → Course
- B. StudentID → Course and Course → Instructor
- C. StudentID → Instructor and Instructor → StudentName
- D. Instructor → Course and Course → StudentName

?) 25. What can be possible the primary key for this table?

- A. Course
- B. StudentName
- C. StudentID
- D. Instructor

✓ 26. What kind of anomaly occurs if a new course is added but there are no students enrolled in it?

- A. Deletion anomaly
- B. Insertion anomaly
- C. Update anomaly
- D. Functional dependency violation

✓ 27. What is a potential issue when changing the number of credits for a course if multiple students are enrolled?

- A. Functional dependency violation
- B. Insertion anomaly
- C. Update anomaly
- D. Deletion anomaly

✓ 28. In the given table, what happens if a student enrolls in a course that has not been taught yet?

- A. Insertion anomaly occurs
- B. Update anomaly occurs
- C. Deletion anomaly occurs
- D. No anomaly occurs

✓ 29. If Maaz drops the "Network Security" course and Dr. Johnson is the only instructor for that course, what information might be lost?

- A. The number of credits for the course
- B. Maaz's student information ✓
- C. Dr. Johnson's instructor information ✓
- D. All of the above

✓ 30. If an existing course "Web Development" is removed from the table, what anomaly may occur if there are still enrolled students?

- A. Insertion anomaly
- B. Update anomaly
- C. Deletion anomaly
- D. Referential integrity violation