Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (S,FE) (FT/WP/PT) Examination December 2025/January 2026 (2019 Scheme)

Course Code: CST204
Course Name: Database Management Systems

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks) Marks

1 Differentiate database schema and instance with suitable example. 3

2 Define the term: Composite attribute, Derived attribute, Multivalued attribute. 3

3 Discuss the entity integrity and referential integrity constraints. 3

4 Explain the difference between theta join and natural join with an example. 3

5 Write short note on views in SQL. 3

6 Differentiate sparse index and dense index with a neat diagram. 3

7 Identify which of the following functional dependencies may hold in the relation. Specify the reason, if the dependency cannot hold. 3

XY →Z

YZ → X

XZ → Y

X	Y	Z
1	4	2
1	5	3
1	6	3
3	2	2

8 Explain the need of normalization in database design. 3

9 Explain the desirable properties of transaction. 3

10 List out any three salient features of NoSQL database. 3

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

11 a) Explain the advantage of using DBMS Approach. 8

b) Explain how database management systems are classified. 6

12 a) Draw an ER diagram based on the following information 8

Consider a MOVIE database in which data is recorded about the movie industry. The data requirements are summarized as follows:

Each movie is identified by title and year of release. Each movie has a length in minutes. Each has a production company, and each is classified under one or more genres (such as horror, action, drama, and so forth). Each movie has one or more directors and one or more actors appear in it. Each movie also has a plot outline. Finally, each movie has zero or more quotable quotes, each of which is spoken by a particular actor appearing in the movie.

- Actors are identified by name and date of birth and appear in one or more movies. Each actor has a role in the movie.
- Directors are also identified by name and date of birth and direct one or more movies. It is possible for a director to act in a movie (including one that he or she may also direct).
- Production companies are identified by name, and each has an address. A production company produces one or more movies.

b) Explain the constraint on binary relationship types. 6

Module -2

13 a) Consider the following relational database schema consisting of the four relation schemas: 8

Passenger (pid, pname, pgender, pcity)

Agency (aid, aname , acity)

Flight (fid, fdate, time , src, dest)

Booking (pid, aid , fid , fdate)

Answer the following question using relational algebra queries.

i) Find the passenger names for passengers who have bookings on at least one flight.

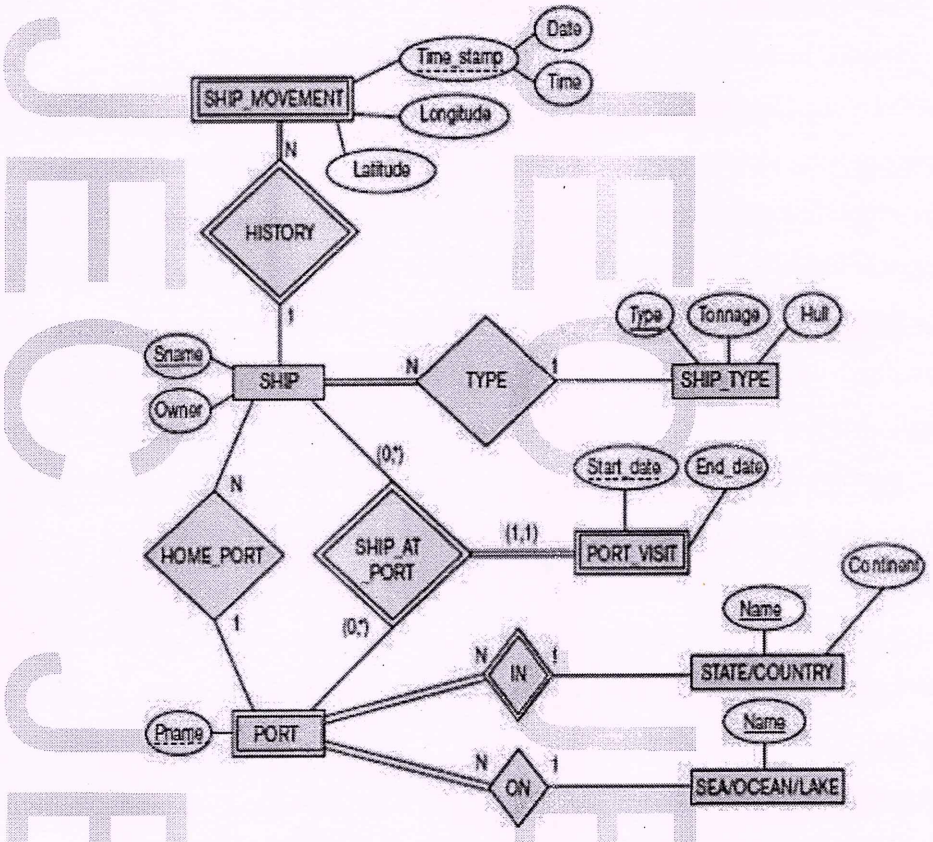
ii) Find the passenger names for those who do not have any bookings in any flights.

iii) Find the agency names for agencies that located in the same city as passenger with passenger id 123.

iv) Find the details of all male passengers who are associated with Jet agency.

b) Explain outer join with suitable example. 6

14 a) Convert the ER Schema of ship tracking database into a relational schema. Specify all primary keys and foreign keys. 8



b) Differentiate alter, update and drop, delete statements in SQL 6

Module -3

15 a) Consider the relation schema 8

Flights (flno: integer, from: string, to: string, distance: integer, departs: time, arrives: time, price: real)

Aircraft (aid: integer, aname: string, cruising range: integer)

Certified (eid: integer, aid: integer)

Employees (eid: integer, ename: string, salary: integer)

Note that the Employees relation describes pilots and other kinds of employees as well; every pilot is certified for some aircraft, and only pilots are certified to fly.

Write SQL query for the following.

i) Find the number of flights in the route from Los Angeles to Chicago.

ii) For each pilot who is certified for more than three aircraft, find the eid and the maximum cruising range of the aircraft for which she or he is certified.

iii) Find the names of pilots whose salary is less than the price of the cheapest route from Los Angeles to Chicago.

iv) Find the names of pilots certified for some Boeing aircraft.

b) Explain correlated and non-correlated queries 6

16 a) Consider an ordered file with r =300,00 records stored on a disk with block size B=4096 bytes. File records are of fixed size and are unspanned, with record length r=100 bytes. Find the blocking factor for the file. Find the binary search time to access a data. 8

Suppose the ordering key field of the file, v= 9 bytes long and a block pointer of size 6 bytes long. Find the binary search time to access a data after indexing is used. Find the number of levels and block access needed if multilevel indexing is used.

b) Compare single level index and multi-level index. 6

Module -4

17 a) Compute the closure of the following set F of functional dependencies for the relation schema R= (A, B, C, D, E). A → BC, CD → E , B → D, E → A. List the candidate keys for R. 8

b) Explain different normal forms in database. 6

18 a) Consider a relation schema R (A, B, C, D, E, F, G, H) with the following functional dependencies AB →CE, C →DE, F→ GH, E → F. Determine whether the decomposition of R into R1 (A, B), R2 (B, C, D), R3 (D, E, F) and R4(C, G, H) is lossless or lossy. Write the complete steps. 8

b) Show that the following two sets of Functional dependency are equivalent. 6

F = { A → C , AC →D , E→ AD , E → H } and G = { A → CD , E → AH }

Module -5

19 a) Explain the different variation of two phase locking method. 8

b) Determine if the following schedule is serializable. 6

S1: r1(X), r2(Z), r1(Z), r3(X), r3(Y), w1(X), w3(Y), r2(X), w2(Z), w1(Y)

S2: r3(X), r2(X), w3(X), r1(X), w1(X).

(Note: ri(X)/wi(X) means transaction Ti issues read/write on item X)

20 a) Explain column oriented database and document oriented database. 6

b) Determine if the following schedule is recoverable. Is the schedule cascadeless? Justify your answer. 4

r1(X), r2(Z), r1(Z), r3(X), r3(Y), w1(X), c1, w3(Y), c3, r2(Y), w2(Z), w2(Y), c2

(Note: ri(X)/wi(X) means transaction Ti issues read/write on item X; ci means transaction Ti commits.)

c) Explain no undo / redo recovery technique in recovery system. 4

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