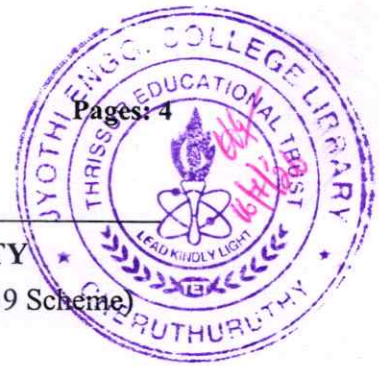




Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (S,FE) (FT/WP/PT) Examinations April/May 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 | Explain the advantages of database management systems over file systems. | 3 |
| 2 | Differentiate schema and instance. | 3 |
| 3 | Explain primary keys and candidate keys with example. | 3 |
| 4 | Explain the scenarios where ALTER and UPDATE commands are used in relational databases. | 3 |
| 5 | Explain correlated nested queries in SQL. | 3 |
| 6 | Differentiate B trees and B+ trees. | 3 |
| 7 | Explain the significance of normalisation in relational databases. | 3 |
| 8 | Explain BCNF. How it differs from 3NF. | 3 |
| 9 | Explain ACID properties of transactions | 3 |
| 10 | Explain the main characteristics of column family databases. | 3 |

PART B

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

Module -1

- 11 Assume we have the following application that models soccer teams, the games they play, and the players in each team. In the design, we want to capture the following: 14
- We have a set of teams, each team has an ID (unique identifier), name, main stadium, and to which city this team belongs.
- Each team has many players, and each player belongs to one team. Each player has a number (unique identifier), name, DoB, start year, and shirt number that he uses.
 - Teams play matches, in each match there is a host team and a guest team. The match takes place in the stadium of the host team.
 - For each match we need to keep track of the following:
i) The date on which the game is played

ii) The final result of the match

iii) The players participated in the match. For each player, how many goals he scored, whether or not he took yellow card, and whether or not he took red card.

• Each match has exactly three referees. For each referee we have an ID (unique identifier); name, DoB, years of experience. One referee is the main referee and the other two are assistant referee.

Design an ER diagram to capture the above requirements. Also indicate the participation constraints and cardinality ratio of the relationships involved in the ER diagram.

12 a) Explain DBMS three schema architecture with a neat diagram

8

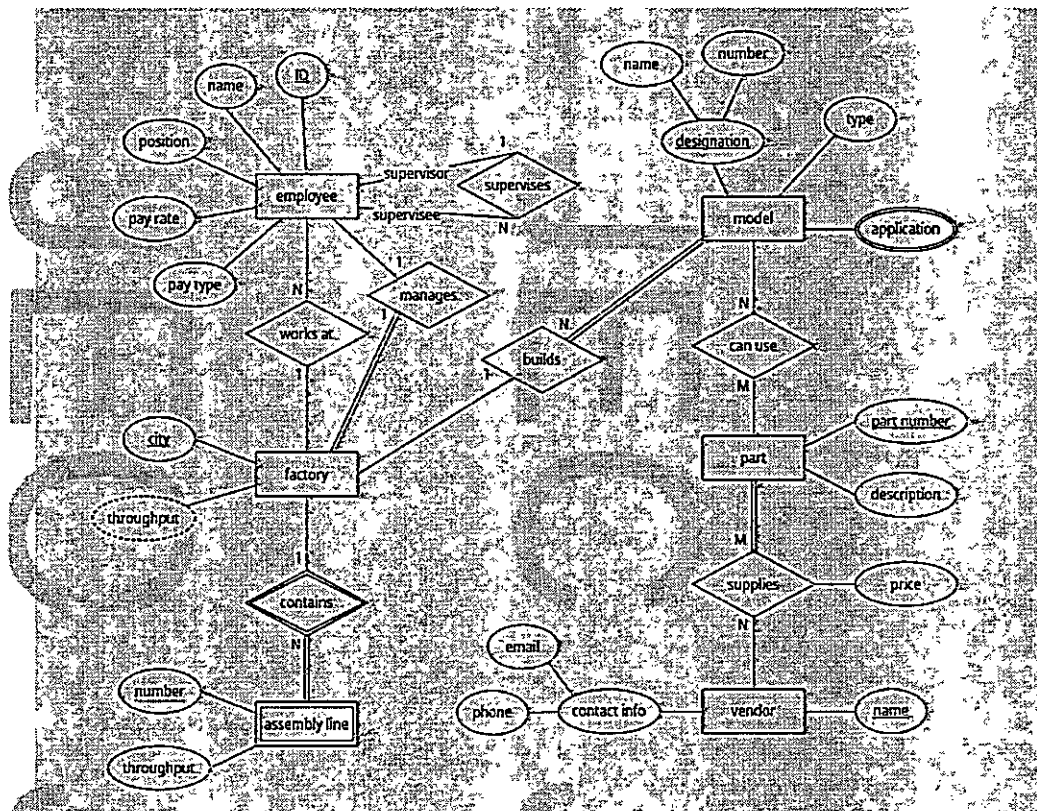
b) Explain different data models with examples.

6

Module -2

13 Convert the following ER diagram to relational model:

14



14 a) Consider a company database having the following schema and frame Relational algebra queries for the following problems. Primary keys are underlined.

10

EMPLOYEE (SSN, Name, SupervisorSSN, Dnum)

DEPARTMENT (Dnumber, Dname, MgrSSN)

PROJECT (Pnumber, Plocation, ControlDeptNum)

WORKS ON(ESSN, Pno, hours)

- (i) Find the employee names and the project numbers they are working on.
- (ii) Find the names of all employees who are managers of any departments.
- (iii) Find all project numbers that are under "Technical" department.
- (iv) List all employee names and their department names.
- (v) List all project numbers that "John Smith" works on.

b) Explain the syntax of the following SQL DDL commands with examples

(i) INSERT (ii) ALTER

4

Module -3

- 15 a) Consider the following relation schema and write SQL queries:

8

EMPLOYEE(Fname, Minit, Lname, SSN, Bdate, Address, Sex, Salary SuperSSN, Dno)

DEPARTMENT(Dname, Dnumber, MgrSSN, MgrStartDate)

DEPT_LOCATIONS(Dnumber, Dlocaions)

PROJECT(Pname, Pnumber, Plocation, Dnum)

WORKS_ON(ESSN, Pno, Hours)

(i) Retrieve all employees who were born during the 1950s.

(ii) Retrieve all employees in department 5 whose salary is between 50,000 and 60,000.

(iii) Retrieve the name and address of all employees who work for the 'Technical' department.

(iv) Retrieve the total number of hours worked by each employee across all projects.

b) Differentiate assertions and triggers with examples.

6

- 16 a) Explain single level indexing and multi level indexing

8

b) Explain aggregate functions in SQL with example queries

6

Module -4

- 17 a) Define normalisation. Define 1NF, 2NF and 3NF with examples.

8

b) What are the different anomalies that can occur in a poorly designed database?

6

- 18 a) Consider the relation $R = \{A, B, C, D, E, F, G, H\}$ and the set of functional dependencies $F = \{A \rightarrow DE, B \rightarrow F, AB \rightarrow G, G \rightarrow GH, G \rightarrow H\}$. What is the key for R? Decompose R into 2NF and then 3NF relations.

10

b) What is the lossless join property of decomposition? Why is it important?

4

Module -5

- 19 a) What is two phase locking protocol? Explain its types 8
 b) What are the main characteristics of NOSQL systems 6
- 20 a) Consider the schedule S of three transactions T1, T2 and T3 given below. State 6
 whether the schedule is serializable or not.
 S: r3(Y), r3(Z), r1(X), w1(X), w3(Y), w3(Z), r2(Z), r1(Y), w1(Y), r2(Y), w2(Y),
 r2(X), w2(X)
- b) Describe the different states of a transaction with the help of a neat sketch. 8
