Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (S, FE) / S4 (PT) (S, FE) / S4 (WP) (S) Examination December 2024 (2019 Scheme)

Course Code: CST 204
Course Name: DATABASE MANAGEMENT SYSTEMS

Max. Marks: 100 Duration: 3 Hours

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

|		
1	Write a short note on (i) Multiple views on data	3
	(ii) Self-describing nature of data	
2	Define the term "Data models"	3
3	Discuss the significance of the DROP statement in DDL. When and why would you use it?	3
4	Discuss the differences between an equi-join and a natural join.	3
5	Discuss the role of triggers in SQL databases	3
6	Write the difference between correlated and non-correlated nested queries	3
7	Explain the concept of functional dependency in a relational database. Provide an example to illustrate.	3
8	F={A→B, B→C, AC→D, AD→E} Find A+	3
9	Define concurrency control in the context of transaction processing. Why is it important?	3
10	List and explain the desirable properties of transactions.	3

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

Module -1

11 a) Each book has a unique ISBN, title, author, publication date, publisher, and genre and 14
due date. A book can be borrowed by multiple members, but only one at a time. Each
member has a unique membership ID, name, address, phone number, and email
address. A member can borrow multiple books at a time, each with a loan start date and
due date. A book can be borrowed by multiple members, but only one at a time. If a
book is returned late, a fine is generated with an amount and payment date. A fine can
be associated with one loan. Design an ER model for this library database, identifying
the main entities, their attributes, and the relationships between them. Be sure to include
cardinality and participation constraints and weak entities if any.

12 a) Explain the functions of Database Administrator 4

b) Describe the three-schema architecture in a Database Management System. Explain Data independence 10

Module -2

13 Convert the following ER diagram to a relational model. 14
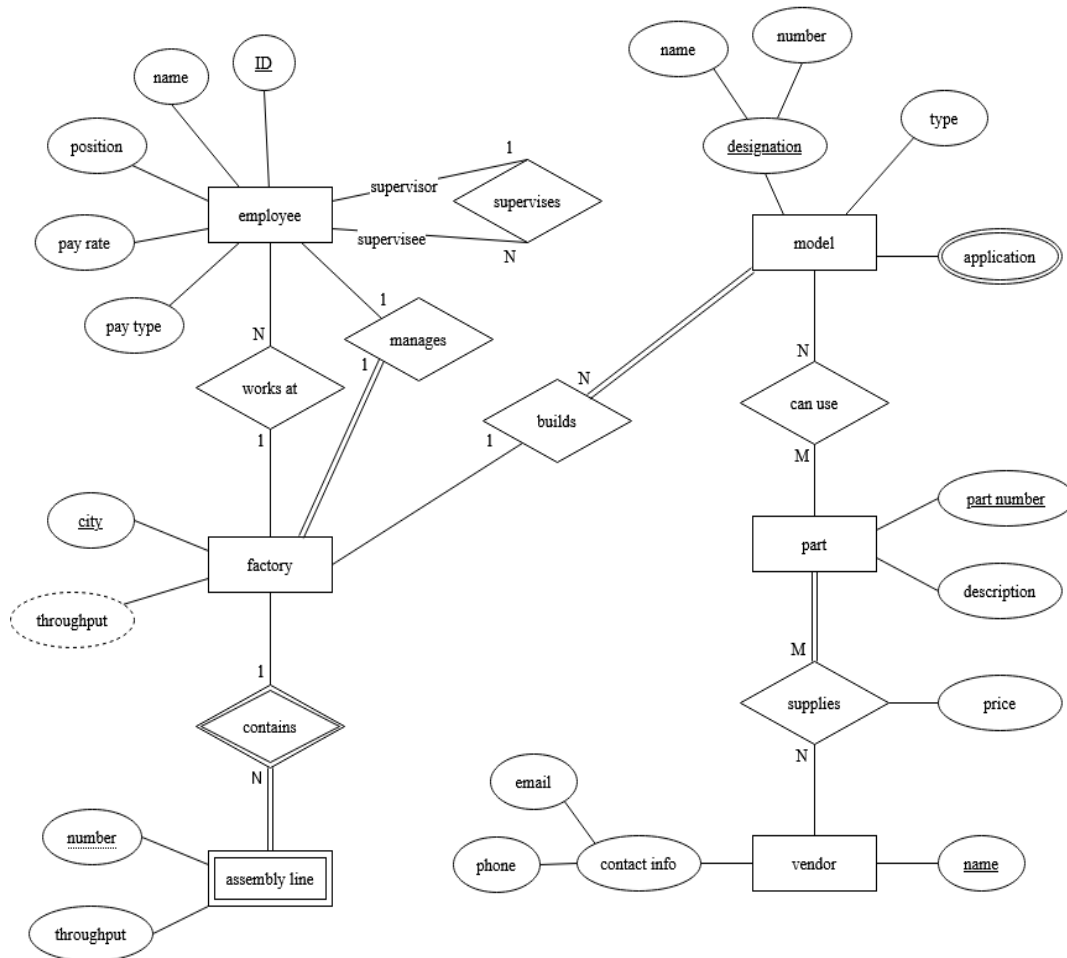
14 a) Sailors(sid,sname,rating,age) , Boats(bid, name,color), Reserves(sid,bid,day) 9

Write relational algebra query for the following

    (i)   Find the name of sailors who have rating atleast 7

    (ii)   Find the name of sailors who have reserved boat with id 110

    (iii)   Find the name of sailors who have reserved red and blue boats

b) Differentiate Primary key, candidate key and superkey with suitable example 5

Module -3

15 a) **Employees(** employee_id, employee_name, department_id, salary, hire_date)
Departments(department_id, department_name, location)
Projects (project_id, project_name, start_date, end_date)
Assignments(assignment_id, employee_id, project_id, assignment_date) 14

Write an SQL query expression for the following

1. Retrieve the names of employees along with their department names
2. Find the total salary expenditure per department
3. List employees who are currently assigned to a project
4. Find the average salary of employees in projects that started after 22/11/2022

16 a) Consider a file with a fixed block size of 256 bytes. The records in the file have a fixed size of 40 bytes each. Calculate the blocking factor for this file.   6

   b) Differentiate   8
      (i)   Single level and Multi level indexing
      (ii)   B Trees and B+ Trees

Module -4

17 a) Given a relation R(P, Q, R, S, T, U, V, W, X, Y) and Functional Dependency set FD = { PQ → R, P → ST, Q → U, U → VW, and S → XY}, determine whether the given R is in 3NF? If not convert it into 3 NF.   10

   b) What are the different anomalies that can occur in a poorly designed database? Provide examples for each.   4

18 Consider a relation R with six attributes (A, B, C, D, E, F) and the following set of five functional dependencies: 14

   1. A, B → C

   2. C → D

   3. D, E → F

   4. B → E

   5. F → A

   The relation R is decomposed into R1(A,B,C),R2(C,D),R3(D,E,F),R4(B,E), and R5 (F,A) . Check whether the given decomposition is lossless or lossy?

Module -5

19 a) What is log-based recovery, and how does it ensure database consistency after a failure?   4

   b) Explain the two phase locking protocol in detail   10

20 a) Check Whether the following schedule is conflict serializable or not   8
      (i) $R_2(A), W_2(A), R_2(B), W_2(B), R_1(B), W_1(B), R_1(A), W_1(A)$
      (ii) $R1(X)R2(X)R_2(Y) W_2(Y) R_1(Y) W_1(X)$

   b) $R1(x), R2(x), R1(z), R3(x), R3(y),$ **W1(x), C1, W3(y), C3,** $R2(y),$ **W2(z), W2(y), C2**;   6
   Check Whether the given schedule is strict? Justify your answer

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