Final Assessment Test (FAT) - July/August 2023

Programme	B.Tech.	Semester	Fall Inter Semester 22-23
Course Title	DATABASE SYSTEMS	Course Code	BCSE302L
Faculty Name	Prof. DEEPIKA R	Slot	D1+TD1
		Class Nbr	CH2022232500800
Time	3 Hours	Max. Marks	100

Section A (4 X 10 Marks)
Answer All questions

01. A government department approached a software organization to develop software that automates its various services. As a part of the development team, you are assigned to design a database system environment. Identify and justify the various components that constitute a database system environment and the types of computer system software with which the DBMS interacts. **[10]**

02. Check whether the schedules are conflict serializable or not, If yes write down equivalent serial schedule(s) **[10]**

    S1: $r1(X);r2(Z);r1(Z);r3(X);r3(Y);w1(X);w3(Y);r2(Y);w2(Z);w2(Y);$ (5 Marks)
    S2: $r1(X);r2(Z);r3(X);r1(Z);r2(Y);r3(Y);w1(X);w2(Z);w3(Y);w2(Y);$ (5 Marks)

03. Consider the following tables and do the following **[10]**

Table – EmployeeDetails

EmpId	FullName	ManagerId	DateOfJoining	City
121	John	321	01/31/2019	Chennai
321	White	986	01/30/2020	Delhi
421	Rana	876	27/11/2021	Bangalore

Table – EmployeeSalary

EmpId	Project	Salary	Variable
121	P1	8000	500
321	P2	10000	1000
421	P1	12000	0

a. Write an SQL query to create given tables with suitable key constraints (2 Marks)
b. Write an SQL query to include a check constraint on the Salary attribute such that salary values are greater than 7000 then insert 2 records (2 Marks)
c. Write an SQL and Relational algebra query to fetch all the Employee FullNames who are also managers from the EmployeeDetails table (3 Marks)
d. Write an SQL and Relational algebra query to retrieve the number of employees working on each project (3 Marks)

04. APEX Sports a famous sports organization collects information about football players belonging to different countries. The data includes personal information, Club details, hobbies, winning titles, advertisements signed, match history, and future matches through various means. Highlight the design challenges for the data using NoSQL. Also, detail about applications for which the NoSQL can be used. **[10]**

05. a) A multinational company wants to design a database to store all the relevant information about [15]
its employees with the following assumptions:
   • The company keeps information about each employee's name, unique identification
     number, address, contact number, date of birth, age, salary, and date of joining. An
     employee may have multiple contact numbers. Each employee has to report to the
     manager. An employee must belong to only one department. However, there is a facility
     to collaborate with other departments for some project work.
   • The company provides 30 percent of education fees to the children of permanent
     employees. There is a probation period of one year for each newly joined employee.
   • Each department is characterized by a unique identification number, name, and phone
     number. Each department is handled by a head of the department. The minimum
     requirement for getting a head of the department position in a specific department is 10
     years of work experience in the same company. Each department has multiple projects.
   • Each project is described by a unique project code, project name, budget, duration, and
     status (ongoing/completed). Each employee can work on any number of projects.
     However, there is one principal investigator for each project.

Design an entity-relationship (ER) diagram to represent the entities, relationships, and attributes
involved in the above scenario.   (8 Marks)

b) Map the following entity-relationship (ER) diagram to an equivalent relational schema.
Justify the same with a proper explanation. Identify all types of key constraints for each
relation.   (7 Marks)
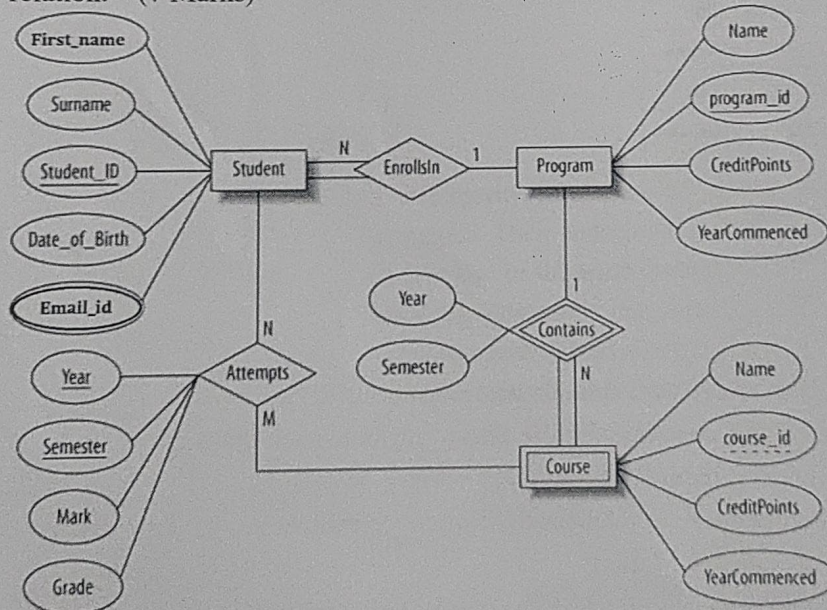
06. Consider the relation R(A, B, C, D, E) and the set of functional dependencies [15]
   A->BC, CD->E, B->D, E->A
   a) Identify the candidate keys of R (3 Marks)
   b) Identify the Prime and Non-Prime attributes, any two superkeys (2 Marks)
   c) Decompose R into 2NF and 3NF (4 Marks)
   d) Find the Minimal Cover (4 Marks)
   e) Justify whether it is in BCNF or not (2 Marks)

07. a) Insert the following Keys in the B+ tree of order 4.

D, H, Z, K, B, P, Q, E, A, S, W, T, C, L, N, Y, M (10 Marks)

b) Delete 46, 36, and 66 from the given B+ tree of order 3. (5 Marks)
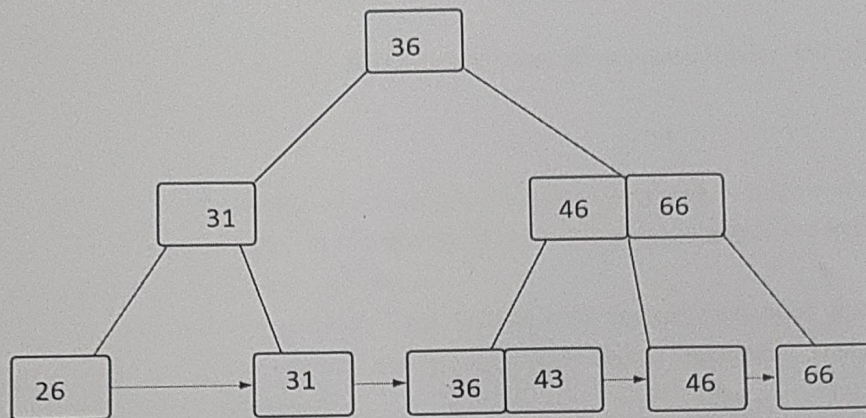
08. a) Consider Transaction T1 is holding data items A and B. Transaction T3 is requesting Data item A and T2 requests Data item B. Draw a wait-for graph to find whether deadlock occurs or not. Justify your answer. (4 Marks)

b) Include necessary locks (Exclusive/Shared locks) and unlocks in the following transactions wherever required to avoid rollback and deadlocks? Find the growing phase, shrinking phase, and locking point in each of the transactions T1 and T2 if it follows a two-phase locking protocol(2PL). Provide the variants of 2PL for the same schedule.

(11 Marks)

T1	T2
R(A) A=A-500 W(A)	
	R(C) R(D) Display(C+D)
R(B) B=B+50 W(B)	

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