Bachelor of Engineering In Information Technology
2nd Year 1st Semester, Supplementary Exam - 2024
Subject Name –(IT/PC/B/T/213) Database Management Systems **Full Marks=100**

CO1 [10]

Q1.
(a) What are the primary functions of a Database Administrator (DBA) in an organization.
(b) What is Referential Integrity, and why is it important in database management systems?
(c) What is the advantage of DBMS over file processing system?

Or

Explain the difference between logical data independence and physical data independence in a DBMS. [3+3+4=10]

CO2 [20]

Q2.
(a) Identify all functional dependencies that can hold on to the given instance **Work**?

Work		
Incharge	Department	Experience
S. Roy	Production	5
A. Bera	Sales	2
S. Roy	HR	5
S. Rai	Development	3
B. Mallik	Testing	4
S. Sinha	Testing	4

(b) Consider the following relational schema: **smart_phone** (name, model, manufacturer, battery).
The following functional dependencies hold:
FD1: model → name
FD2: model → manufacturer, battery
FD3: model, manufacturer → battery
Identify all candidate key(s) for the above relation.
What is the highest normal form of **smart_phone**?
(c) What is normalization, and why is it important in database design? [6+(3+3)+8=20]

CO3 [20]

Q3. (a) Consider the following schema given below:
Suppliers(sID, sName, address)
Parts(pID, pName, colour)
Catalog(sID, pID, price)
Write down the relational algebra expression equivalent to the following statement given below.
i) Find the names of suppliers who supply parts in both red and blue colours.
ii) Find the projection of the Catalog relation on attributes sID and price.
(b) Consider the following schema given below:
Emp(eid: integer, ename: string, age: integer, salary: real)
Works(eid: integer, did: integer, pct_time: integer)
Dept(did: integer, budget: real, managerid: integer)
Write down the SQL query equivalent to the following statement given below:
i. Find the names of all employees whose age is greater than 30.
ii. Find the names of employees along with the names of the departments they work in.
iii. Show the department name with the highest budget.
(c) Differentiate between **where** clause and **group by** clause using a suitable example.

Or

Describe the difference between an inner join and a full outer join. [6+9+5=20]

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CO4 [20]

Q4.

(a) Distinguish between: i) **Primary** and **Secondary indexing** with a suitable example.

(b) Let us consider the following statistics for searching for a condition in a given relation.

Number of blocks containing record of the relation (b) = 500

Time to transfer one block (t_b) = 0.5 milliseconds

Time for one seek (t_s) = 5 milliseconds

Find out the cost of selection query on a key attribute using linear search file scan.

(c) Justify this statement **"In a secondary index file, all the search key values must be presented".**

(d) Explain insertion and search operation in **B+ trees**? [6+5+4+5=20]

CO5 [20]

Q5.

(a) Consider the following schedule S involving three transactions T_1, T_2, T_3.

T_1	T_2	T_3
R(X)		
		R(Z)
		W(Z)
W(Y)		
W(X)		
		W(X)
	W(Z)	

R(X) denotes read operation on data item X by transaction T_i.

W(Y) denotes write operation on data item Y by transaction T_i.

Identify the possible number of conflict serializable schedule(s) if any and their correct order of execution of the above schedule S.

(b) Consider the following example of a log of four transactions, where an immediate database modification scheme is used.

(i) If a crash occurs just after step 10 and the recovery of the system is successfully completed, which of the following transactions need to do redo, undo and no action?

(ii) Write down the final values of X, Y, Z and P data items after completion of recovery.

steps	Details of log
1	⟨T0, start⟩
2	⟨T0, X, 300, 400⟩
3	⟨T1, start⟩
4	⟨T1, Y, 600, 200⟩
5	⟨checkpoint{T0, T1} ⟩
6	⟨T2, start⟩
7	⟨T2, Z, 500, 1500⟩
8	⟨T2, commit⟩
9	⟨T3, start⟩
10	⟨T3, P, 900, 1200⟩

(c) What is transaction? Explain the ACID Properties of transactions? [7+7+6=20]

CO6 [10]

Q6.

(a) Define Decentralized Database and Data Warehouse.

(b) Compare the Homogeneous and Heterogeneous Distributed Database. [(2+2)+6=10]

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(IT/PC/B/T/213) Database Management Systems

After completing this course the students should be able to:

CO1: Explain the basic Database concepts and different data models. (K2)

CO2: Find the available functional dependencies to apply normalization concepts in typical scenarios. (K3)

CO3: Design queries using relational algebra operations and SQL. (K3)

CO4: Explain principles of Physical Data Storage and Query Optimization. (K3)

CO5: Comprehend transaction processing and concurrency control techniques and apply them in various problems (K3)

CO6: Discuss different types of advanced databases. (K2)