Graphic Era HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

End Term (Odd) Semester Examination December 2024

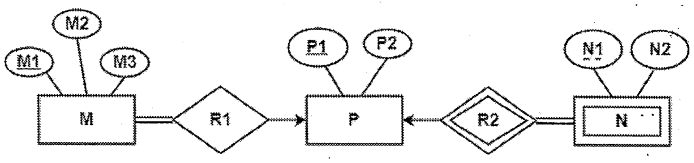
Roll no. 229038

Name of the Course and semester: B.Tech V
Name of the Paper: DBMS
Paper Code: TCS 503
Time: 3 hour Maximum Marks: 100

Note:
(i) All the questions are compulsory.
(ii) Answer any two sub questions from a, b and c in each main question.
(iii) Total marks for each question is 20 (twenty).
(iv) Each sub-question carries 10 marks.

Q1. (2X10=20 Marks)
a. Classify about applications of Database Systems? Also describe about the purpose of Database Systems?**CO2**
b. Summarize the database models and distinguish different types of client server Architecture of database? **CO2**
c. Illustrate the reason why do we need mapping between schema levels? Also correlate how do we achieve data independence with schema architecture. **CO4**

Q2. (2X10=20 Marks)
a. Analyze when the concept of a weak entity used in data modelling? Also Differentiate between weak entity and strong entity. **CO4**
b. Evaluate` the minimum number of tables required for the following ER diagram in relational model. Also mention attributes of tables. Illustrate your answer with proper explanation. **CO5**



c. 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:
• 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:
o The date on which the game is played
o The final result of the match
o 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.
o During the match, one player may substitute another player. We want to capture this substitution and the time at which it took place.
• 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. State any assumptions you have that affects your design. Make sure cardinalities and primary keys are clear. **CO5**

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Q3. (2X10=20 Marks)

a. Consider a database that has the relation schema CR(StudentName, CourseName). An instance of the schema CR is as given below.

StudentName	CourseName
SA	CA
SA	CB
SA	CC
SB	CB
SB	CC
SC	CA
SC	CB
SC	CC
SD	CA
SD	CB
SD	CC
SD	CD
SE	CD
SE	CA
SE	CB
SF	CA
SF	CB
SF	CC

The following query is made on the database.

- $T1 \leftarrow \pi_{CourseName}(\sigma_{StudentName=SA(CR)})$
- $T2 \leftarrow CR \div T1$

The number of rows in T2 is _____

Reframe your answer with proper explanation Also inspect about all relational algebra operators used here.**CO4**

b. Consider the following tables T1 and T2.

T1

P	Q
2	2
3	8
7	3
5	8
6	9
8	5
9	8

T2

R	S
2	2
8	3
3	2
9	7
5	7
7	2

In table T1, P is the primary key and Q is the foreign key referencing R in table T2 with ondelete cascade and on-update cascade. In table T2, R is the primary key and S is the foreign key referencing P

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in table T1 on-delete set NULL and on-update cascade. In order to delete record (3,8) from table T1, the number of additional records that need to be deleted from table T1 is _____.
Justify your answer with proper explanation.
Also contrast the concept of constraints in relational model. **CO3**

c. Consider the following relation X(S,Si, C) and Y(S,P, D)

X

S	Si	C
J	1	M
B	2	N
R	3	H
T	4	G

Y

S	P	D
J	S_1	CA
B	P_1	AB
R	D_1	DC
A	H_1	MD

With the help of above tables describe the concept of inner and outer join.**CO2**

Q4. (2X10=20 Marks)

a. A relation R (A , C , D , E , H) is having two functional dependencies sets F and G as shown-

Set F-
$A \rightarrow C$
$AC \rightarrow D$
$E \rightarrow AD$
$E \rightarrow H$

Set G-
$A \rightarrow CD$
$E \rightarrow AH$

Show whether Fand G are equivalent or not. **CO4**

b.State true or false with proper explanation to support your answer. **CO4**

1. A relation with only two attributes is always in BCNF.
2. BCNF decompositions preserve functional dependencies.

c.
Consider the schema R(A,B,C,D) and the functional dependencies $A \rightarrow B, C \rightarrow D$. If the decomposition is made as R1(A,B)and R2(C,D).
Inspect with proper explanation whether the decomposition is lossless or lossy and whether functional dependency preserving or not. **CO4**

Q5. (2X10=20 Marks)

a. Consider a simple checkpoint protocol and the following set of operations in the log. (start,T2); (start, T1); (write, T2, y, 4, 7); (write, T1, x, 6, 8); (commit, T2); (commit, T1); (checkpoint); (start, T3); (start, T4); (write, T4, z, 2, 4); (write, T3, z, 5, 7); (commit, T4);

If a crash happens now and the system tries to recover using both undo and redo operations, tabulate the list of contents of the undo and redo operations after crash? **CO6**

b. Outline ACID properties. Which ACID property this statement state "Once the DBMS informs the user that a transaction has been successfully completed, its effect should persist even if the system crashes before all its changes are reflected on disk". Evaluate your answer with proper explanation. **CO1, CO4**

c. Define 2PL. Strict two-phase locking protocol generates conflict serializable schedules that are also recoverable. Argue whether the statement true or false. **CO5**