Mahindra University Hyderabad

École Centrale School of Engineering

Minor–II

Program: B. Tech. Branch: CSE/AI/ECM/CM Year: III Semester: I
Subject: Database Management Systems (CS/AI 3103)

Date: 24/10/2024 **Start Time: 10.00 AM**
Time Duration: 1.5 Hours **Max. Marks: 50 Marks**

Instructions:

1) All parts of a question should be answered consecutively.
2) Mobile phones and computers of any kind should not be brought inside the exam hall.
3) Use of any unfair means will result in severe disciplinary action.
4) Do not write using Pencil.

Q1. Answer the following. Wrong answer carries Negative mark of 1. [5*2=10M]

1.1. A relation in which every non-key attribute is fully functionally dependent on the primary key and which has no transitive dependencies is in __ NF
a. BCNF **b.** 3NF **c.** 2NF **d.** 4NF

1.2. Given any instance of the relation R(ABCD)

A	B	C	D
a1	b1	c1	d1
a1	b2	c2	d2
a2	b2	c2	d3
a3	b3	c4	d3

a. AB -> D and D->A **b.** AB -> C and B->D
c. AB -> C and B->C **d.** AB -> D and A->D

1.3. Let R(A,B,C,D) be a relation schema and F={A->BC,AB->D,B->c} be the set of functional dependencies defined over R. Which of the following represents the closure of the attribute set {B}
a. {A,C,D} **b.** {B,C} **c.** {A,B,C} **d.** {B}

1.4. Consider the relation X(P,Q,R,S,T,U) with the following set of functional dependencies F={ PR->ST, PSU->QP}. Which of the following is the trivial functional dependency in F+, if F+ is the closure of F?
a. PR->ST **b.** PR->RT **c.** PS->S **d.** PSU->Q

1.5. Relation R has eight attributes ABCDEFGH. Fields of R contain only atomic values. F={ CH->G, A->BC, B->CFH, E->A, F->EG} is a set of functional dependencies (FDs) so that F+ is exactly the set of FDs that hold for R. How many candidate keys does the relation R have?
a. 3 **b.** 4 **c.** 5 **d.** 6

Q2. Relational Algebra **[5*2=10M]**

Consider the Sailors-Boats-Reserves DB described in the text.
s (sid, sname, rating, age)
b (bid, bname, color)
r (sid, bid, date)
Write each of the following queries in RA

2.1. Find the colors of boats reserved by Albert.
2.2. Find all sailor id's of sailors who have a rating of at least 8 or reserved boat 103.
2.3. Find the names of sailors who have not reserved a red boat.
2.4. Find the sailor id's of sailors with age over 20 who have not reserved a red boat.
2.5. Find the sailor id's of sailors with the highest rating.

Q3. Functional Dependencies & Normal Forms **[25M]**

3.1. Compute the canonical cover F_C for the R ={A, B, C, D} and FDs = {A->BC, B->C, AB->C, AC->D} [10M]
3.2. Suppose you are given a relation R with four attributes ABCD. For each of the following set of FDs assuming those are the only dependencies that hold. For R, the following [15M]
a. Identify the candidate keys for each function dependency set
b. Identify in which normal form that R is in (1NF, 2NF, 3NF) for each functional dependency set. Decompose every given FD's into 2NF.

i. FD1 = {C->D, C->A, B->C}
ii. FD2 = {B->C, D->A}
iii. FD3 = {ABC->D, D->A}
iv. FD4 = {A->B, BC->D, A->C}
v. FD5 = {AB->C, AB->D, C->A, D->B}

Q4. Define the concept of aggregation. Give two examples of where this concept is useful. [5M]

******ALL THE BEST******