

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2130703

Date: 02/06/2017

Subject Name: Database Management Systems

Time: 10:30 AM to 01:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 Short Questions 14

- 1 Write advantages of Database System.
- 2 The number of tuples in a relation is known as
A. degree B. relation C. attribute D. cardinality
- 3 Give an example of a relation schema R and a set of dependencies such that R is in BCNF but is not in 4NF.
- 4 What is locking? Define each types of locking.
- 5 What will be the output of following SQL statement?
select substr('123456789',instr('abcabcabc','b'), 4) from dual;
A. 6789 B. 2345 C. 56789 D. 456789
- 6 _____ is an attribute, or set of attributes, that uniquely identifies a tuple within a relation
A. Foreign key B. Superkey
C. Matching key D. None of above
- 7 List out any three properties of MVD.
- 8 What is serialisability? what is its objective?
- 9 TO_CHAR function is used
A. To convert any character literal to character datatype
B. To convert ascii to character datatype
C. To convert date and number datatype to character datatype
D. Both (A) and (B)
- 10 Which of the following aspects of data is the concern of a relational database model?
A. data manipulation B. data integrity
C. data structure D. all of these
- 11 Considering functional dependency, one in which removal from some attributes must affect dependency is called
A. full functional dependency B. partial dependency
C. prime functional dependency D. transitive dependency
- 12 What is Index? List type of index and write syntax to create an index.
- 13 Define wait-Die & wound-wait.
- 14 Define Constraint. List out constraints.

- Q.2**
- (a) Define view. What are the types of view? Write syntax to create view of each type. Give an example of view. **03**
- (b) Define Transaction. List out properties of transaction. Explain two-phase commit protocol. **04**
- (c) In academic world, A researcher can either be employed as a professor or a lab assistant. There are three kinds of professors: Assistant, associate, and full professors. The following should be stored: **07**
- For each researcher, his/her name, year of birth, and current position (if any).
 - For each institution, its name, country, and inauguration year.
 - For each institution, the names of its schools (e.g. School of Law, School of Business, School of Computer Science, . . .). A school belongs to exactly one institution.
 - An employment history, including information on all employments (start and end date, position, and what school).
 - Information about co-authorships, i.e., which researchers have co-authored a research paper. The titles of common research papers should also be stored.
 - For each researcher, information on his/her highest degree (BSc, MSc or PhD), including who was the main supervisor, and at what school.
 - For each professor, information on what research projects (title, start date, and end date) he/she is involved in, and the total amount of grant money for which he/she was the main applicant.

Draw an ER diagram for the data set described above. Make sure to indicate all cardinality constraints specified above. The ER diagram should not contain redundant entity sets, relationships, or attributes. Also, use relationships whenever appropriate.

OR

- (c) **07**
- (I) In college database, we have following:
- A college contains many departments
 - Each department can offer any number of courses
 - Many instructors can work in a department
 - An instructor can work only in one department
 - For each department there is a Head
 - An instructor can be head of only one department
 - Each instructor can take any number of courses
 - A course can be taken by only one instructor
 - A student can enroll for any number of courses
 - Each course can have any number of students

Draw an ER diagram for the data set described above. Make sure to indicate all cardinality constraints specified above. The ER diagram should not contain redundant entity sets, relationships, or attributes. Also, use relationships whenever appropriate.

- (II) A weak entity set can always be made into a strong entity set by adding to its attributes the primary-key attributes of its identifying entity set. Outline what sort of redundancy will result if we do so.

- Q.3** (a) In Estimating Statistics of Expression Results, Explain Selection Size **03**

- Estimation.
- (b) Consider the following relational database, where the primary keys are underlined. Give an expression in the relational algebra to express each of the following queries: 04
- employee (ssn, name, dno, salary, hobby, gender)
department (dno, dname, budget, location, mgrssn)
works_on (ssn, pno)
project (pno, pname, budget, location, goal)
1. List all pairs of employee names and the project numbers they work on.
 2. List out department number, department name and department budget.
 3. List all projects that Raj Yadav works on by project name.
 4. List the names of employees who supervise themselves.
- (c) 07
- (I) Compute the closure of the following set F of functional dependencies for relation schema r (A, B, C, D, E).
- $A \rightarrow BC$
 $CD \rightarrow E$
 $B \rightarrow D$
 $E \rightarrow A$
- List the candidate keys for R.
- (II) Write a PL/SQL block using explicit cursor that will display the customer name, the fixed deposit number and the fixed deposit amount of the first 5 customers holding the highest amount in fixed deposits.
- Use following database:
- cust_mstr (custno, name, occupation)
fd_dtls (fd_ser_no, fd_no, type, period, opndt, duedt, amt, dueamt)
acct_fd_cust_dtls (acct_fd_no, custno)

OR

- Q.3 (a) Explain Heuristics in Optimization. 03
- (b) Consider the following relational database, where the primary keys are underlined. Give an expression in the relational algebra to express each of the following queries: 04
- course (course-id, title, dept_name, credits)
instructor (id, name, dept_name, salary)
section (course-id, sec-id, semester, year, building, room_no, time_slot_id)
teaches (id, course-id, sec-id, semester, year)
1. Find the name of all instructors in the physics department.
 2. Find all the courses taught in the fall 2009 semester but not in Spring semester.
 3. Find the names of all instructors in the Comp. Sci. department together with the course titles of all the courses that the instructors teach.
 4. Find the average salary in each department.
- (c) 07
- (I) In the BCNF decomposition algorithm, suppose you use a functional dependency $\alpha \rightarrow \beta$ to decompose a relation schema r (α , β , γ) into $r_1(\alpha , \beta)$ and $r_2(\alpha , \gamma)$.
1. What primary and foreign-key constraint do you expect to hold on the decomposed relations?
 2. Give an example of an inconsistency that can arise due to an erroneous update, if the foreign-key constraint were not enforced on the decomposed relations above.
 3. When a relation is decomposed into 3NF, what primary and foreign key dependencies would you expect will hold on the decomposed

- schema?
- (II) A stored function is created to perform the acct_no check operation. f_ChkAcctNo() is the name of function which accepts a variable acct_no from the user and returns value 0 if acct_no does not exist or 1 if acct_no exists. Write a PL/SQL block that performs transaction(i.e., deposit/withdrawal) on account. If account exists, change balance depending on the transaction amount to be deposited or withdrawal. Assume account table with fields – account number, name, type and balance.

- Q.4 (a) What is difference between authorization and authentication? Explain the use of audit trail. 03
- (b) A college maintains details of its lecturers' subject area skills. These details comprise: Lecturer Number, Lecturer Name, Lecturer Grade, Department Code, Department Name, Subject Code, Subject Name, Subject Level 04

Assume that each lecturer may teach many subjects but may not belong to more than one department. Subject Code, Subject Name and Subject Level are repeating fields.
Normalise this data to Third Normal Form.

- (c) Consider the following employee database, primary keys are underlined : 07
- employee (employee-name, street, city)
works (employee-name, company-name, salary)
company (company-name, city)
manages (employee-name, manager_name)
- Give an expression in SQL for each of the following queries:
1. Find the names of all employees who work for First Bank Corporation.
 2. Give all employees of First Bank Corporation a 10-percent raise.
 3. Find the names and cities of residence of all employees who work for First Bank Corporation.
 4. Find the names, street addresses, and cities of residence of all employees who work for First Bank Corporation and earn more than \$10,000.
 5. Find all employees in the database who live in the same cities as the companies for which they work.
 6. Find all employees in the database who do not work for First Bank Corporation.
 7. Find the company and number of employees in company that has more than 30 employees.

OR

- Q.4 (a) Write & explain two rules in the Bell-LaPadula model for mandatory access control. 03
- (b) A software contract and consultancy firm maintains details of all the various projects in which its employees are currently involved. These details comprise: Employee Number, Employee Name, Date of Birth, Department Code, Department Name, Project Code, Project Description, Project Supervisor 04

Assume the following:

- Each employee number is unique.
- Each department has a single department code.
- Each project has a single code and supervisor.
- Each employee may work on one or more projects.
- Employee names need not necessarily be unique.
- Project Code, Project Description and Project Supervisor are repeating fields.

- Normalise this data to Third Normal Form.
- (c) Consider the following Hotel database, primary keys are underlined : 07
- hotel (hotel-no, name, address)
 - room (room-no, hotel-no, type, price)
 - booking (hotel-no, guest-no, date-from, date-to, room-no)
 - guest (guest-no, name, address)

Give an expression in SQL for each of the following queries:

1. List the names and addresses of all guests in London, alphabetically ordered by name.
2. List out hotel name and total number of rooms available.
3. List the details of all rooms at the Grosvenor Hotel, including the name of the guest staying in the room, if the room is occupied.
4. List all guests currently staying at the Grosvenor Hotel.
5. List the rooms that are currently unoccupied at the Grosvenor Hotel.
6. List the number of rooms in each hotel in London.
7. List out all guests who have booked room for three or more days.

- Q.5 (a) Explain database system architecture levels. 03
- (b) What is materialized view? Explain Query optimization with materialized view. 04
- (c) Explain three concurrency problem. How does the strict two-phase locking protocol solve three problems of concurrency? explain with example. 07

OR

- Q.5 (a) Explain tasks of DBA. 03
- (b) Explain Query Processing steps. 04
- (c) Explain two phase locking protocol in detail. 07
