

B.Sc. (Honours) Examination 2018
Semester-V
Computer Science
Course : BCSC-51
(Database Management System)

Time : 3 Hours

Full Marks : 40

Questions are of value as indicated in the margin

1. Answer **any five** questions : 5×2=10
- a) What is the purpose of enforcing referential integrity?
 - b) How does query optimizer work?
 - c) Write down the differences between candidate key and primary key.
 - d) Discuss the differences between the set comparison operators *some* and *all*.
 - e) What is OLAP?
 - f) Given the following set of functional dependencies, $M, M = \{A \rightarrow B, B \rightarrow C, BC \rightarrow D\}$ compute the closure of A with respect to M.
 - g) How *Left outer join* is different from the *Right outer Join*? Explain with examples.
2. Assume we have to built a database for Indian Super League which is a men's professional football league in India. In the design, we want to capture the following requirements:
- a) We have a set of teams, each team has an ID (unique identifier), name, main stadium, and to which city this team belongs.
 - b) 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.
 - c) 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.
 - d) For each match we need to keep track of the following:
 - i. The date on which the game is played.
 - ii. The final result of the match.
 - iii. The players participated in the match. For each player, how many goals he scored, whether or not he received yellow card, and whether or not he received red card.
 - iv. During the match, one player may substitute another player. We want to capture this substitution and the time at which it took place.
 - e) 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 referees.
Design an ER diagram and schema to capture the above requirements. State the assumptions you have that is required for your design. Make sure that the cardinalities and primary keys are clearly mentioned. 10
3. Consider the following relations:
- Doctor** (SSN, First Name, Last Name, Specialization, YearsOfExperience, PhoneNum)
Patient (SSN, FirstName, LastName, Address, DOB, Primary Doctor_SSN)
Medicine(TradeName, UnitPrice, GenericFlag)
Prescription(Id, Date, Doctor_SSN, Patient_SSN)
Prescription_Medicine(Prescription_ID, TradeName, NumOfUnits)
- The **Doctor** relation has attributes Social Security Number (SSN), first and last names, Specialization, the number of experience in years, and the phone number.

(2)

- The **Patient** relation has attributes SSN, first and last names, address, date of birth (DOB), and the SSN of the patient's primary doctor.
- The **Medicine** relation has attributes trade name, unit price, and whether or not the medicine is generic (True or False).
- The **Prescription** relation has attributes the prescription id, the date in which the prescription is written, the SSN of the doctor who wrote the prescription, and the SSN of the patient to whom the prescription is written.
- The **Prescription_Medicine** relation stores the medicines written in each prescription along with their quantities (number of units).

Write the relational algebra and SQL expressions for the following queries:

- List the trade name of generic medicine with unit price less than Rs.50.
 - List the first and last name of patients whose primary doctor is named 'Daenerys Targaryen'.
 - List the first and last name of doctors who are not primary doctors to any patient.
 - List the SSN of distinct patients who have 'Aspirin' prescribed to them by the doctor named 'Jon Snow'. (1.5+1)×4=10
4. a) What is a trigger?
b) With examples discuss different type of triggering events and corresponding actions.
c) Discuss single level index update mechanism for *sparse* and *dense* indices. 1+(2×3)+(1.5+1.5)=10
5. a) Suppose we have two sets of functional dependencies-
 $F = \{A \rightarrow C, AC \rightarrow D, E \rightarrow AD, E \rightarrow H\}$ and $G = \{A \rightarrow CD, E \rightarrow AH\}$. Show whether these two sets are equivalent or not.
b) Find the canonical cover of the following set of functional dependencies.
 $G = \{A \rightarrow BC, B \rightarrow CE, A \rightarrow E, AC \rightarrow H, D \rightarrow B\}$.
c) Consider a relation $R, R = \{ABCDEFGH\}$ with following functional dependencies:
 $S = \{AB \rightarrow CD, A \rightarrow B, B \rightarrow C, C \rightarrow E, BD \rightarrow A\}$. Find all the candidate keys of R. 3+3+4=10
6. Describe and illustrate the process of normalizing the relation shown in the following Figure upto 3NF. State any assumptions you make about the data shown in this relation.

CustNo	Cname	PropNo	PAddr	RntSt	RntFnsh	Rent	OwnerNo	Oname
CR76	John Kay	PG4	6 Lawence	7/1/10	8/31/06	700	CO40	Tina
		PG16	St. Elmont 5 Nova Dr. East Meadow	9/1/06	9/1/08	900	CO93	Murphy Tony Shaw
CR56	Aline Stewart	PG4	6 Lawence	9/1/02	6/10/04	700	CO40	Tina
		PG36	St. Elmont					
		PG16	2Manor Rd Scarsdate 5Nova Dr. East Meadow	8/1/04	12/1/05	750	CO93	Murphy Tony Shaw
				8/1/06	9/1/10	900	CO93	Shaw Tony Shaw

7. Write short note on the following topics (any two) 10
a) XML structure b) SQL Injection 5×2=10
c) Data Cube d) Join operation in SQL e) 4NF Decomposition