Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Specialized in Cyber Security

Final Examination
Year 2, Semester 1 (2019)

IE2042 – Database Management Systems for Security

Duration: Two Hours

October 2019

Instructions to Candidates:

- ◆ This paper has FOUR (04) questions.
- ◆ Answer all questions in the booklet given.
- ◆ The total marks for the paper is 100.
- ◆ This paper contains FIVE (05) pages, including the cover page.
- ◆ Electronic devices capable of storing and retrieving text, including calculators and mobile phones are not allowed.
- ◆ This paper is preceded by a 10 minute reading period. The supervisor will indicate when answering may commence.

Question 1   (25 marks)

a) What is the relationship between database and database management system? (2 marks)

b) Name five disadvantages of File Processing Systems. (5 marks)

c) Briefly explain following four types of database management systems.

     i. Hierarchical Database Management System

     ii. Network Database Management System

     iii. Object-Oriented Database Management System

     iv. Relational Databases Management System (8 marks)

d) What is Generalization and Specialization in enhanced entity relationship modeling?

(4 marks)

e) Briefly explain the difference between Overlapping constraint and Covering Constraint with an example. (6 marks)

Question 2   (25 marks)

a) Wally Los Gatos, owner of Wally's Wonderful World of Wallcoverings, has hired you as a consultant to design a database management system based upon the following set of business rules.

     • An ATTORNEY is retained by one or more CLIENTS for each CASE.

     • Attributes of ATTORNEY are Attorney ID, Name, Address, City, State, Zip Code, Specialty (may be more than one), and Bar (may be more than one).

     • A CLIENT may have more than one ATTORNEY for each CASE.

     • Attributes of CLIENT are Client ID, Name, Address, City, State, Zip Code, Telephone, and Date of Birth.

     • A CLIENT may have more than one CASE.

• Each CASE has one or more CLIENTS and one or more ATTORNEYS.

• Attributes of CASE are Case ID, Case Description, and Case Type.

• An ATTORNEY may have more than one CASE.

• Each CASE is assigned to one and only one COURT.

• A COURT may have one or more CASES.

• Attributes of COURT are Court ID, Court Name, City, State, and Zip Code.

• Each COURT has one or more JUDGES assigned to it.

• Attributes of JUDGE are Judge ID, Name, and Years in Practice.

• Each JUDGE is assigned to exactly one court.

Draw the ER Diagram according to the given scenario using **Crow's Foot notation**. Clearly show all the details of the entity when drawing the ER such as primary key, foreign keys.

(15 marks)

b) Normalize the schema below to the BCNF. All the functional dependencies are listed below. Show all the steps when converting the schema into BCNF.

Enrollment (StudentID, courseID, course_Instructor, Student_Name, Student_Degree, Student_ADD, course_Name, Instructor_Name, Instructor_Office, Grade)

StudentSupervisor (StudentID , specialization , supervisor)

- Student_Degree is a multi-valued attribute.

- StudentID , courseID $\rightarrow$ Grade

- StudentID $\rightarrow$ Student_Name , Student_ADD

- courseID $\rightarrow$ course_Name , course_Instructor , Instructor_Name ,Instructor_Office

- courseID $\rightarrow$ course_Instructor

- course_Instructor $\rightarrow$ Instructor_Name, Instructor_Office

- supervisor $\rightarrow$ specialization

(10 marks)

Question 3 (25 marks)

a) What is a view? (2 marks)

b) The Branch table in HR schema has four columns named as branchNo, street, city and postcode whereas the Staff table in HR schema has eight columns named as staffNo, fName, lName, position, sex, DOB, salary and branchNo. Sample record set of Branch and Staff tables are given as follows.

Branch

branchNo	street	city	postcode
B005	22 Deer Rd	London	SW1 4EH
B007	16 Argyll St	Aberdeen	AB2 3SU
B003	163 Main St	Glasgow	G11 9QX
B004	32 Manse Rd	Bristol	BS99 1NZ
B002	56 Clover Dr	London	NW10 6EU

Staff

staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000	B005

Create a view named **Staff_Salary_View** for above tables to display records for staff members who are earning greater than 10,000 and users can use this view to insert data. This view has following attributes such as **STAFF_NO, FIRST_NAME, POSITION, BRANCH_NO** and **SALARY**. Rename all the column headings with above attribute names. (6 marks)

c) Write an **INSTEAD OF** trigger to insert the same record to the auditing table named **Staff_Salary_Audit** when someone trying to insert a record to the **Staff_Salary_View**. (10 marks)

d) Modify the view created in part (b) to prevent the data updating and modification. (3 marks)

e) Write SQL/PLSQL commands to grant select, insert, and update access on **Staff_Salary_View** to **Lucy**. (2 marks)

f) Write SQL/PLSQL commands to remove update access on **Staff_Salary_View** from Lucy.

(2 marks)

Question 4   (25 marks)

Pandora Pvt Ltd runs their systems using Oracle databases to store business information. Mr. Sampath is a Database Administrator (DBA) in this company and Miss Nelum is a software engineer who is working in the software development team. One day Miss Nelum wants to create two database roles for two business functions.

Account_Cleark is a database role authorized by external sources. And it has been assigned following privileges.

- Select on General_Ledger table in the Accounts Schema,
- Select, update and insert on EMP_SAL_PROCEDURE in the Finance Schema,
- Update and delete operations on INVOICE table.

a) Write commands used by Mr. Sampath to create Account_Cleark role and to assign requested privileges.   (8 marks)

b) Write SQL commands to grant Account_Cleark to Piyumi and Thisal.   (3 marks)

c) Write SQL commands to revoke the select privilege on General_Ledger table in the Accounts Schema from Account_Cleark.   (3 marks)

d) What is an audit record?   (3 marks)

e) Explain following AUDIT_TRAIL parameters values.
   a. NONE
   b. DB
   c. OS
   d. XML   (8 marks)

--- End of the Exam Paper ---