THE OPEN UNIVERSITY OF SRI LANKA

Faculty of Engineering Technology

Department of Electrical and Computer Engineering

Bachelor of Software Engineering

ECI4166 - Data Modeling and Database Systems

Final Examination – 2015/2016 Time Allowed: 3 hours

DATE: **11th December 2016** TIME : **09.30 a.m – 12.30 p.m**

Instructions to Candidates

1. This is a **CLOSED BOOK** examination.
2. This question paper contains six (06) questions. (SECTION A- 1 Question and SECTION B- 5 Questions)
3. The question 01 in SECTION A is **COMPULSORY** and select **any FOUR (04)** questions from SECTION B.

SECTION A

Question 01 ***(Compulsory)***

Open University of Sri Lanka has adopted a University identity card system to improve security and to restrict access to certain **groups** of people (students, lecturers, demonstrators, technical officers etc.) and at certain times and dates. A person is issued a **University Identity Card (UID)** as soon as they become part of the Open University. Each person belongs to only one group, which determines what buildings they can access.

To enter a faculty building, a person must have permission which is established when their ID card is swiped through a card reader outside the **building** they wish to enter. An **ID card reader** is located outside the door of a building users wish to access. Permission is granted only if their access credentials are successful. If access is allowed, the captured data is logged, recording the date, ID and the card readerID.

Mention any assumptions that you made, when you are answering the following questions.

i. Produce an Entity Relationship Diagram (ERD) of the above scenario using the **highlighted** keywords as Entity Types. **[12 Marks]**

ii. State the notation you used in your Entity Relationship Diagram. **[2 Marks]**

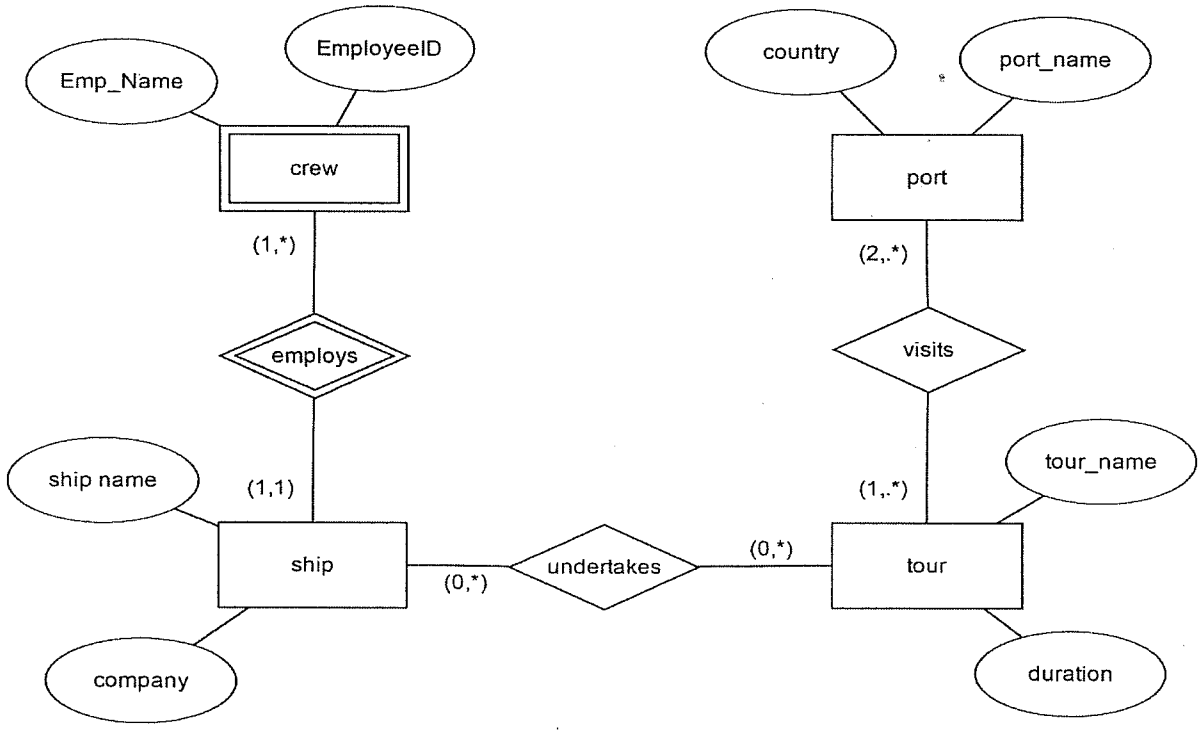
iii. Indicate appropriate cardinality and primary keys in your ERD. **[6 Marks]**

SECTION B

*Answer any **FOUR (04)** questions*

Question 02

Examine the following ERD, which is used to model the tours of ships and their movement during a tour from port to port. Answer the following questions.



a) With reference to the above ER model, explain the concept of relationship participation involving the **visits** relationship and the **employs** relationship. **[4 Marks]**

b) Explain how you would assign the following attributes to the appropriate relationships in the above ER model.

(i) VisitStartDate (ii) VisitEndDate **[2 Marks]**

c) Identify and explain the difference between a weak entity type and a strong entity type. **[4 Marks]**

d) Convert above ERD to a relational model and identify the primary keys and foreign keys for each relation. **[10 Marks]**

Question 03

The following tables belong to a large Medicinal Clinic.

Therapist (therapistID, therapistName, therapistPostCode,)

Treatments (TID, TName, HourlyFee)

TreatmentOfferedBy (TId, therapistID)

Appointments (appointmentID, therapistID, patientID, AppointmentDateTime)

Patients (PID, P_fname, P_sname, P_PostCode)

Patients make appointments to see a therapist who treats patients by using alternative therapy (for example acupuncture).

a) Write an SQL statement that lists which treatments are offered by which therapists.

[4 Marks]

b) Write an SQL statement that lists the details of appointments for treatment by "acupuncture" with a patient named 'Kamal Senanayaka' with a post code containing the '10250'.

[4 Marks]

c) Write the output and express the result of each of the following SQL queries

Loan Table				
LoanID	**BID**	**LoanDate**	**DueDate**	**ReturnDate**
023	874	12-23-2015	01-24-2016	01-24-2016
024	874	12-23-2015	01-24-2016	NULL
025	876	12-29-2015	01-28-2016	NULL
023	874	01-25-2016	02-21-2016	NULL

Borrower Table		
BID	**B_Fname**	**B_Lname**
874	Kamal	Perera
875	Sunil	Weerasena
876	Saman	Maligakanda
877	Mahanama	Silva

i) Query 1:

```
SELECT Count (*) B_Lname
FROM Loan, Borrower
WHERE Loan.BID = Borrower.BID
GROUP BY B_Lname
HAVING Count (*) >2
```

ii) Query2:

```
SELECT DISTINCT BID
FROM Loan
WHERE ReturnDate IS NULL
AND DueDate < getDate ()
```

Note GETDATE returns the current date which you should assume is = 01-27-2016

iii) Query3:

```
SELECT BID
FROM Borrower
WHERE BID NOT IN (SELECT BID FROM Loan)
```

[4 Marks X 3 = 12 Marks]

Question 04

a) Using your own simple examples, explain the main features and limitations of the file-based approach to data storage in software development. **[4 Marks]**

b) Describe the three-schema architecture of a database management system. **[6 Marks]**

c) Explain why three tier architecture more appropriate for the Web database. **[4 Marks]**

d) Compare and contrast the two-tier client server architecture for traditional database systems with the three-tier architecture. **[6 Marks]**

Question 05

The following table shows the money taken by films being shown at several cinemas in Colombo. Each cinema has a manager who records the amount of money taken whilst the film is shown at that location.

The following table shows sample data.

Film no	Film_name	Cno	Cname	Clocation	Mno	Mname	Takings
15	Moana	1	Majestic Cinema	Colombo04	01	Kamal	750
		2	Regal Cinema	Colombo02	01	Kamal	600
		3	Concord	Dehiwala	03	Saman	540
45	Dear Zindagi	1	Majestic Cinema	Colombo04	01	Kamal	650
		2	Regal Cinema	Colombo02	01	Kamal	500
		3	Concord	Dehiwala	03	Saman	440
		4	Savoy	Colombo06	04	Nalaka	650
71	Doctor Strange	1	Majestic Cinema	Colombo04	01	Kamal	750
		5	Liberty	Colombo03	02	Ramitha	700
78	Trolls	2	Regal Cinema	Colombo02	01	Kamal	600
		3	Concord	Dehiwala	03	Saman	540
		6	Cinecity	Maradhana	05	Maduka	400

a) Produce relation in first normal form (1NF). Identify the key attributes of the resultant relations. **[4 Marks]**

b) Normalize the above table, showing functional dependencies. (Show how you progress from 1NF through 2NF to a set of 3NF relations).

At each stage, show the primary key and any foreign keys of each relation and state assumptions that you make. **[4 Marks]**

c) Foreign keys are normally designed to protect data in tables that are in a parent-child relationship. If a column in a table is declared to be a foreign key, what integrity checks will be placed on data in the two tables involved in the foreign key definition? **[6 Marks]**

d) DBMS allow foreign keys to be defined with the CASCADE DELETE option. Explain the effect of this option on the two tables involved in the foreign key definition. **[6 Marks]**

Question 06

a) Briefly describe five (5) responsibilities of Database Administrator. **[4 Marks]**

b) Discuss advantages and disadvantages of hashing used in **direct file organization**. **[4 Marks]**

c) Consider the following XML document, bookstore.xml

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<Bookstore>
    <book category="COOKING">
        <title lang="en">Everyday Italian </title>
        <author> Giada De Laurentiis </author>
        <year> 2005 </year>
        <price> 500 </price>
    </book>

    <book category="CHILDREN">
        <title lang="en">Harry Potter </title>
        <author> J K. Rowling </author>
        <year> 2005 </year>
        <price> 290 </price>
    </book>
</Bookstore>
```

i. Write a FLWOR expression that returns the book title (title element) in bookstore.xml. Write the expected output of the FLWOR expression you wrote. **[4 Marks]**

ii. Write a FLWOR expression that returns all the book titles, author, price, year where the price is higher than 300/-. Write the expected output of the FLWOR expression you wrote. **[4 Marks]**

iii. Write a FLWOR expression that returns all the book titles in the order of titles, author, year where the price is higher than 200/-.Write the expected output of the FLWOR expression you wrote. **[4 Marks]**

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