UNIVERSITY OF RUHUNA

BACHELOR OF COMPUTER SCIENCE (GENERAL) DEGREE LEVEL I (SEMESTER II) EXAMINATION

NOVEMBER/DECEMBER 2016

COURSE UNIT: CSC 1213 (Database Management Systems) Duration: 2 Hours

*Answer **All** Questions.*

1.

a)

(i) What do you mean by a *Database* and a *Database Management System (DBMS)?*

(ii) What are the advantages and disadvantages of a database approach?

b)

(i) Explain briefly three schema architecture and data independence.

(ii) Why do we need mappings between schema levels?

c) Explain the difference between a *database schema* and a *database state*.

2. A university wishes to setup a database to keep the following details:

- Professors have an SSN (unique value), a name, an age, a rank, and a research specialty.
- Projects have a project number (unique value), a sponsor name (e.g., NSF), a starting date, an ending date, and a budget.
- Graduate students have an SSN (unique value), a name, an age, and a degree program (e.g., MSc. or PhD).
- Each project is managed by one professor (e.g. Principal Investigator).
- Each project is worked on by one or more professors.
- Professors can manage and/or work on multiple projects.
- Each project is worked on by one or more graduate students.
- Graduate students can work on multiple projects.
- Departments have a department number (unique value), a department name, and a main office.
- Departments have a professor who runs the department.
- Professors work in one or more departments, and for each department that they work in, a time percentage is associated with their job.
- Graduate students have one major department in which they are working on their degree.
- Each graduate student has another senior graduate student (e.g. student advisor) who advises him or her on what courses to take.
- Each professor may have many job history entries. Each job entry has job titles they worked, details of job history, and a number of years worked per each job title.

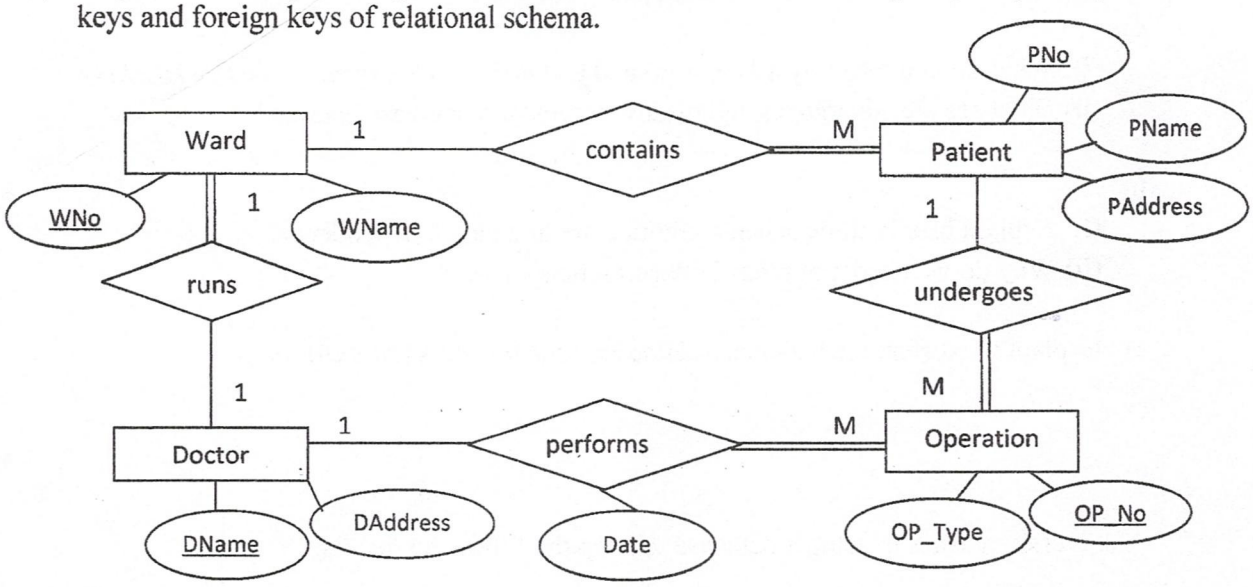
*Contd...*

a) Identify entities, attributes of each entity, and key attribute(s) for each entity (if any).

b) Design an ER diagram for the above requirements. Sate clearly all your assumptions, if any.

3.

a) Map the following ER diagram into a relational database schema. Specify all primary keys and foreign keys of relational schema.




b) The following table shows the details of the staff members. Assume the followings:

Staff members are rotated among the branches.
Each branch can be uniquely identified by the branch code.
Each staff member can be uniquely identified by staff number.
The salary is directly identified by the position of a staff member.

| S# | SName | SAdd | Position | Salary | BCode | BRank | BAdd | Hours_ Worked |
|---|---|---|---|---|---|---|---|---|
| S01 | Himal | Colombo | Manager | 30000 | B2 | A | Matara | 5 |
| | | | | | B5 | B | Galle | 10 |
| S05 | Namal | B'wela | Ass.Mgr. | 24000 | B1 | C | R'pura | 2 |
| | | | | | B2 | A | Matara | 12 |
| | | | | | B4 | A | K'Galle | 5 |
| S06 | Udeni | Galle | Auditor | 16000 | B3 | B | Gampaha | 10 |
| | | | | | B5 | B | Galle | 8 |

(i) Is the above data table in 1st Normal Form? Justify your answer.

(ii) Transform the above data table into 3rd normal forms (3NF) by describing problems in each step. Use functional dependency diagram where necessary.

*Contd....*

4.

a)

(i) Discuss the importance of Extended Entity Relationship (EER) Modeling.

(ii) Describe the two main constraints that apply to a specialization/generalization relationship.

b) Consider the following relations:

BUYER(Buyer_ID, Buyer_phone, Buyer_rating)
PURCHASE_ORDER(PO#, Part#, PO_value, Part_qty)
SUPPLIER(Supplier#,Supplier_name, Supplier_city, Status)
PART(Part#,Part_name, Part_type, Part_size)
SUPPLY(Part#,Supplier#,Buyer_ID)

Express the following queries in *Relational Algebra* and *Tuple Calculus*.

(i) Get buyers' phone numbers.

(ii) Get the names of parts whose size is 'Small'.

(iii) Get the names of parts purchased on PO# is 1234.

(iv) Get the names of parts supplied by suppliers in Colombo.

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