



**RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES**

**B.Sc. (General) Degree in Information Communication and Technology
First Year - Semester II Examination – Feb/Mar 2019**

ICT 1407 – DATABASE SYSTEMS

Time: Three (03) hours

Instructions to Candidates:

1. This paper contains **five (05)** questions in **four (04)** pages
 2. Answer **ALL** questions
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1.

- a) State the components of a database system environment. **(02 marks)**
- b) State and describe the typical functionalities of a DBMS. **(04 marks)**
- c) Discuss five key advantages of using a database approach. **(05 marks)**
- d) Describe the four categories of end users of a database. **(04 marks)**
- e) Define the term data model. **(02 marks)**
- f) Define five constraints on generalization and describe them briefly. **(05 marks)**

(Total Marks 22)

2.

- a) Distinguish between the Schema and the state of a database. **(01 marks)**
- b) State and discuss DBMS languages. **(02 marks)**
- c) What are the stages of a database design process. **(02 marks)**
- d) A car insurance company has customers who own one or more cars each. A customer has a unique identification number, name and an address whereas a car has a license

number and a model. Each car has associated with it zero to any number of recorded accidents. Accidents are recorded with a report number, date and the place. Each insurance policy has a policy identification number and covers one or more cars, and has one or more premium payments associated with it. Each payment is for a particular period of time, and has an associated due date, the date when the payment was received and the amount.

Correctly identify the weak entities and total participations of the relationships and construct a complete Entity Relationship diagram for the above scenario.

(13 marks)

(Total Marks 18)

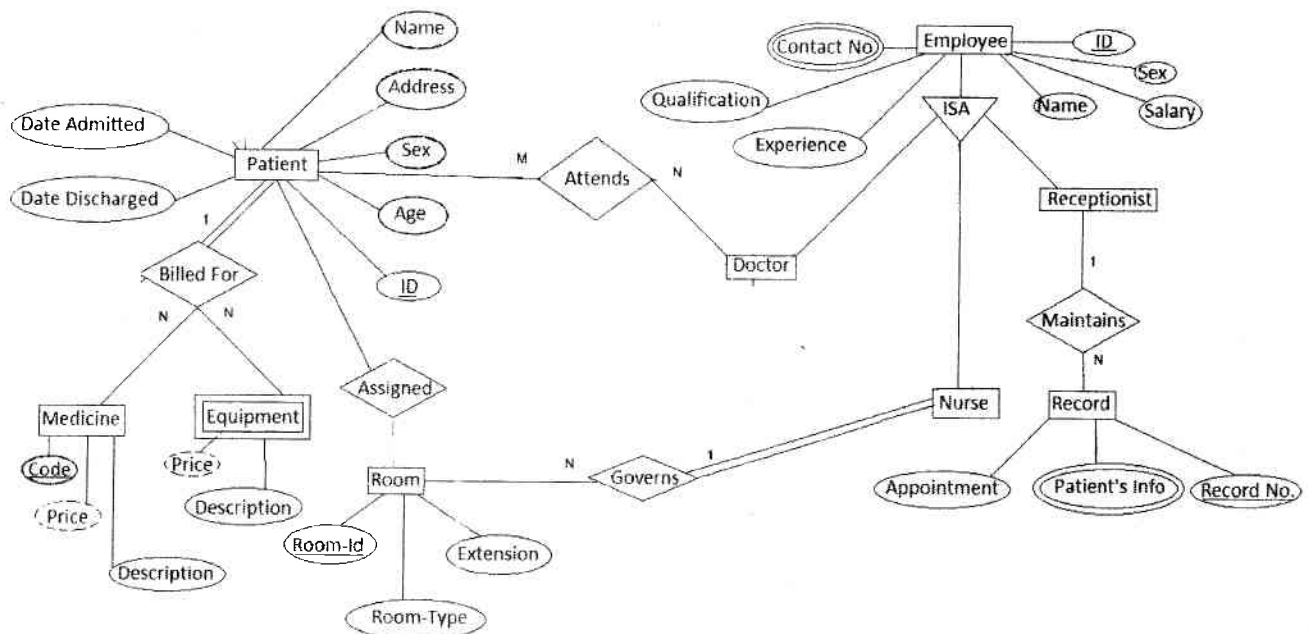
3.

a) What are the three main types of constraints in relational model? Explain them briefly.

(03 marks)

b) Map the following EER diagram in to relational schema.

(20 marks)



(Total Marks 23)

4. Consider the following relational database

Employee (*employee-name, street, city*)

Works (*employee-name, company-name, salary*)

Company (*company-name, city*)

Manages (*employee-name, manager-name*)

a) For each of the following queries, give an expression in,

- SQL and

- Relational Algebra

- i. Find the names, street address, and cities of residence for all employees who work for Affinity Bank and earn more than \$10,000
- ii. Find the names of all employees who live in the same city and on the same street as do their managers.
- iii. Find the names of all employees who earn more than every employee of Wells Fargo Assume that all people work for at most one company

(09 marks)

b) Define the term functional dependency.

(01 marks)

c) For each of the following relation:

- i. State the strongest normal form that the relation is in.
- ii. If it is not in BCNF, decompose it into a collection of BCNF relations.

$R_1(A, C, B, D, E), A \rightarrow B, C \rightarrow D$

$R_2(A, B, F), AC \rightarrow E, B \rightarrow F$

$R_3(A, D), D \rightarrow G, G \rightarrow H$

(09 marks)

(Total Marks 19)

5.

a) What are the three types of single level ordered indexes? Briefly describe each.

(03 marks)

b) Write short notes on following topics

- i. Three level architecture
- ii. Data independence
- iii. Database integration techniques

(09 marks)

c) Consider a disk with a sector size of 512 bytes, 2,000 tracks per surface, 50 sectors per track, 5 double-sided platters, and an average seek time of 10 milliseconds. Suppose that a block size of 1,024 bytes is chosen, that a file containing 100,000 records of 100 bytes each is to be stored on such a disk, and that no record is allowed to span two blocks. Answer the following questions.

- i. What is the capacity of a track in bytes?
- ii. What is the capacity of each surface?
- iii. What is the capacity of the disk?
- iv. How many cylinders does the disk have?
- v. How many records in the given file will fit onto a block?
- vi. How many blocks are required to store the entire file?
- vii. If the file is arranged sequentially on disk, how many surfaces are needed?

(07 marks)

(Total Marks 19)

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