



KIBABII UNIVERSITY COLLEGE

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UNIVERSITY REGULAR EXAMINATIONS

2013/2014 ACADEMIC YEAR

2ND YEAR 2ND SEMESTER EXAMINATIONS

**FOR THE DEGREE OF
BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY**

COURSE CODE: BIT 223

COURSE TITLE: DATABASEMANAGEMENT SYSTEMS

DATE: 24TH APRIL, 2014

TIME: 2:00P.M. – 5:00P.M.

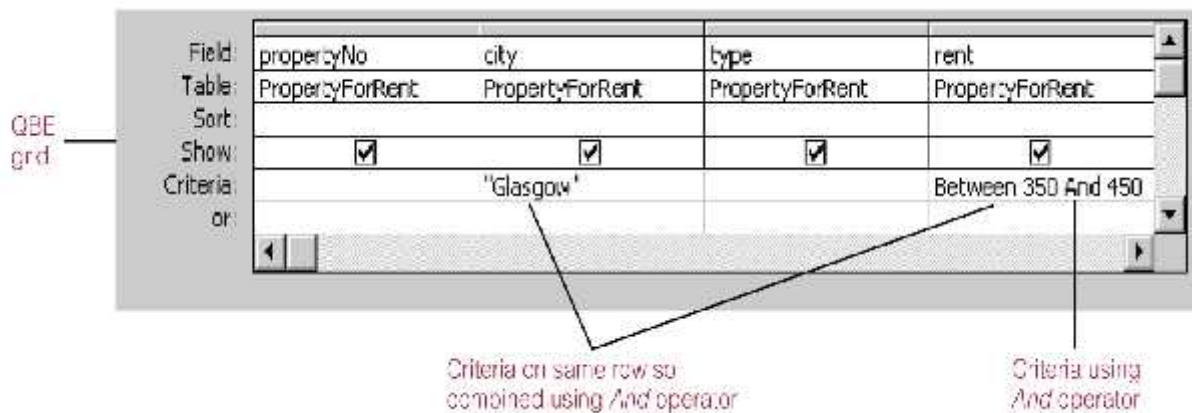
INSTRUCTIONS

- Answer **ALL** questions in section A and any **THREE** questions in section **B**
- All questions in section B carry equal marks

Section A 30 Marks Answer ALL questions in this section

Question One (30 marks)

- a)
- i). state the meaning of a data model in the context of database systems [2 marks]
 - ii). Explain the THREE components of a data model [3 marks]
 - iii). What are the three major steps of database design (data modeling) process? Define each by one sentence. [3 marks]
- b) State the meaning of the following terms as applied in the relational model [3 marks]
- i). domain
 - ii). degree of a relation
 - iii). join
- c) Explain briefly the differences between Entity Relationship modeling and Normalisation [2 marks]
- d)
- i) Distinguish between super keys, candidate keys and primary keys [3 marks]
 - ii) Determine if AC is a superkey or candidate key under $S = (A \rightarrow B, BC \rightarrow D)$ on $R=(ABCD)$ [4 marks]
- e)
- i). Compare and contrast SQL and QBE (Query by Example) [3 marks]
 - ii). Write the SQL statement equivalent to the following Microsoft access QBE [3 marks]



f) Use the following relation schema to answer the questions that follow

Sailors (sid: integer, sname: string, rating: integer, age: real)

Boats (bid: integer, bname: string, color: string)

Reserves (sid: integer, bid: integer, day: dates)

i). covert the SQL statements bellow to its QBE [2 marks]

```
SELECT *  
FROM Sailors  
WHERE rating=10
```

ii). Write a QBE to find sailors who have reserved a boat for 8/24/96 and who are older than 25, [4 marks]

Section B each question is worth 20 Marks Answer any THREE questions in this section

Question Two (20 marks)

A chain of stores wishes to create a database about its activities. Each store has a number of departments. Each store may contain several floors. A floor will only have one department on it with some departments on more than one floor. Each department is manned by several staff with a staff member manning only one department (except for security staff who are not attached to any particular department). Each department has only one manager (although some departments have no manager for periods of time) and a manager manages only one department. Store details include Store# (unique), Address & Phone#. Floor details include Floor# (unique only within a particular store), Size & Number of Exits. Department details include Department# (unique) and Department Name. Staff details include Staff Code (unique), Staff Name, Job Title & Staff Salary. Manager details include Manager# (unique), Manager Name & Manager Salary.

(a) State the entity types with their identifiers and all details of relationships (name, degree and relevant membership classes) [9 marks]

(b) Draw an Entity Relationship diagram and use the relational mapping rules to create a linked relational schema. [7 marks]

(c) Explain what is meant by an optional membership class and give an example. [4 marks]

Question Three (20 marks)

Use the following tables for a Factory database to answer

FACTORY

Factory Code	Location	Manager	ManagerPhone#
A	Belfast	J. Small	90377241
B	Ballymena	G. McCoy	82322122

PART

Part#	Colour	Price(£)	Factory Code
11	Red	10-50	B
11	Blue	10-50	B
12	White	7-00	A
12	Red	7-00	A
12	Blue	7-00	A
13	Green	10-50	B
13	Red	10-50	B

- g) State the primary key of the PART table in the Factory database. [1 marks]
- h) Express the following as relational algebra queries using the Factory database:
- i). Get the part numbers and prices of all red parts. [2 marks]
 - ii). Get the colour of parts made in factories located in Belfast [3 marks]
- i) Comment on whether the Factory table is in third normal form (3NF) and if it is not show how it might be further decomposed. [4 marks]

Question Four (20 marks)

Given the following relational schema for a zoo database:
KEEPER(Keeper#, KeeperName, Grade, Salary, YearsOfService)
LOOKSAFTER(Keeper#, AnimalName)
ANIMAL(AnimalName, Type, Age, EnclosureName)
State the following queries in standard SQL

- a)
- i). Get the names of keepers who are 'senior' grade or have more than 20 years of service. [2 marks]
 - ii). How many animals of type 'Baboon' are in the enclosure named 'Monkey'? [3 marks]
 - iii). What are the names of the animals looked after by the keeper named 'Andy Morris'? [3 marks]
 - iv). Add a new record to the animal table with the values 'Guy', 'Gorilla', 3, 'Monkey'. [3 marks]
 - v). How many of each type of animal are there? [3 marks]
 - vi). How many gorillas have an above average age for gorillas? [3 marks]
 - vii). Express in words the meaning of the following query:


```
SELECT COUNT (Keeper#)
FROM Keeper
WHERE Grade IN (SELECT Grade
FROM Keeper
GROUP BY Grade
HAVING AVERAGE(Salary)> 20000)
```

 [3 marks]

Question Five (20 marks)

a) Consider the following relational schema and briefly answer the questions that follow:

Emp(*eid*: integer, *ename*: string, *age*: integer, *salary*: real)

Works(*eid*: integer, *did*: integer, *pct time*: integer)

Dept(*did*: integer, *budget*: real, *managerid*: integer)

- i) Write an SQL statement to create table Work showing all the necessary constraints [2 marks]
 - ii) Write an SQL statement to create table Emp and define a table constraint on Emp that will ensure that every employee makes at least \$10,000 [4 marks]
 - iii) Write SQL statement to create table Dept and define a table constraint on Dept that will ensure that all managers have age > 30 [4 marks]
- b) Given a set α of attributes of R and a set of functional dependencies F, explain what is meant by the closure of the set of attributes α [2 marks]
- c) Compute the closure for relational schema $R=\{A,B,C,D,E\}$ under the set of functional dependencies $F= \{A\rightarrow BC, CD\rightarrow E, B\rightarrow D, E\rightarrow A\}$. Hence determine all the candidate keys of R. [8 marks]