



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)

University Examinations 2013/2014

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

**FIRST YEAR FIRST SEMESTER EXAMINATION FOR DEGREE IN BACHELOR OF
SCIENCE IN INFORMATION TECHNOLOGY**

SIT 111: INTRODUCTION TO DATABASES

Date: 9/12/2014

Time: 8:30 – 1: 00 pm

INSTRUCTIONS

Answer all questions in section A and any two questions from section B

Section A (30 Marks)

Question 1

Answer the following questions from the Kids Database Model in appendix 1.

α) Identify the following

- Which of the relationships in the Kids Database Model are relations?
- Which are functions?
- Which are injections?

(3 Marks)

b) Which of the four relationships are to be used in prefix form and which are to be used in infix form.

(2 Marks)

c) Evaluate the following complex sentences.

- Not (Kylie plays golf)
- (Room (Emma)=sleepout) and (age(Emma) = 12)
- (age(Tim) >= age(Mathew)) or (sex(Kylie)=M)

(3 Marks)

- δ) formalize the following sentences and determine if each sentence is true or false.
- i. Kylie and Emma are both girls who like playing tennis although Emma is older than Kylie
 - ii. The boys are not allowed the sleepout Room. (2 Marks)
- ε) Explain **any two** of the three forms of set comprehension, while giving an example of each from the Club Model in appendix 1 (4 Marks)
- φ) Express the following sets using set comprehension
- i. the rooms in which the girls sleep
 - ii. the set of children over 10 years old (2 Marks)
- γ) Using the Subjects Database in appendix 2, explain **any three** operations that are associated with relational algebra while giving an example in each (6 Marks)
- η) The major features of the Structured Query Language (SQL) are divided into four groups. Explain **any three** groups that describe these features while giving an example of each (6 Marks)
- ι) Name and explain **any two** operations that can be performed on a set (2 Marks)

Section B (40 Marks)

QUESTION 2 (20 MARKS)

Answer the following questions from the Subjects Database in appendix 2.

- α) Write an SQL query that
- i. displays the names and the marks of those people who failed the final exam? A mark of less than 50 is a fail. (4 Marks)
 - ii. Display the results of the SQL Query from the database (1 Marks)
- β) Write an SQL query that
- i. displays the contribution of the final exam to each student's overall total? (4 Marks)
 - ii. Display the results of the SQL Query from the database (1 Marks)
- χ) Write an SQL query that
- i. displays the names of the students who were late in submitting their first assignment? (4 Marks)
 - ii. Display the results of the SQL Query from the database (1 Marks)
- δ) Write an SQL query
- i. that will list, in order of merit, the final totals for each student. (4 Marks)
 - ii. Display the results of the SQL Query from the database (1 Marks)

QUESTION 3 (20 MARKS)

Answer the following questions from the men and women sets in appendix 3.

- α) using set operations, evaluate the following questions
 - i) is Sam a man? (2 Marks)
 - i i) How many poor (non-rich) people are there? (5 Marks)
 - i i i) Are there more poor men than rich women (5 Marks)
 - i v) who is smart or rich? (3 Marks)
 - v) Who are the not-so-smart women? (3 Marks)
 - v i) Who are the Rich Men? (2 Marks)

QUESTION 4 (20 MARKS)

Answer the following questions from the Subjects Database in appendix 2.

- α) Write an SQL query that
 - i. displays the the Id of the student who got the lowest mark in the first assignment? (4 Marks)
 - ii. displays the names of the students who did better in the first assignment than in the second? (4 Marks)
 - iii. displays the names of the students who failed to submit any work for assessment (4 Marks)
 - iv. Lists the results for assignment 1, and give zero to any student who did not submit any work at all. (5 Marks)
 - v. Defines a view containing the results of the first assignment. (3 Marks)

QUESTION 5 (20 MARKS)

Design a suitable Database for the Kenyatta University Entity-Relation Model in appendix 4. Ensure that the design takes into consideration the following

- i. Entity types
- ii. Dependent entity types
- iii. the relationships and
- iv. the set-valued attributes

Appendix 1

The Kids Database Model -

```
Kids    = {Kylie, Tim, Matthew, Emma}
Sexes   = {F, M}
Rooms   = {sleepout, back, front}
Sports  = {tennis, hockey, golf}
N       = {0, 1, 2, 3, ...}
```

$\text{age} : \text{Kids} \rightarrow N$

```
age = {
    (Kylie, 14),
    (Tim, 12),
    (Matthew, 4),
    (Emma, 8)}
```

$\text{sex} : \text{Kids} \rightarrow \text{Sexes}$

```
sex = {
    (Kylie, F),
    (Tim, M),
    (Matthew, M),
    (Emma, F)}
```

$\text{room} : \text{Kids} \rightarrow \text{Rooms}$

```
room = {
    (Kylie, sleepout),
    (Tim, back),
    (Matthew, front),
    (Emma, sleepout)}
```

$\text{plays} : \text{Kids} \leftrightarrow \text{Sports}$

```
plays = {
    (Kylie, tennis),
    (Kylie, hockey),
    (Tim, golf),
    (Tim, hockey),
    (Emma, tennis)}
```

Appendix 2

The Subject Database - The database is used to keep track of student assessment for a subject at the Quilpie Institute of Theft. The subject is called an Introduction to Crime.

Students				Results			
Id	First	Last		Item	Id	Submitted	Mark
871	Hans	Zupp		1	871	0908	80
862	Bill	Board		1	862	0907	60
869	Rip	Orff		1	854	0908	70
854	Ann	Dover		1	872	0910	55
831	Hans	Orff		1	868	0906	90
872	Betty	Kahn		1	869	0909	70
868	Will	Gambol		2	871	1021	70
				2	869	1022	80
				2	872	1021	65
				2	862	1022	70
				2	868	1021	75
				3	869	?	95
				3	872	?	45
				3	862	?	40
				3	868	?	50
				3	871	?	60
				3	854	?	65

Assess			
Item	Description	Weight	Due
1	Petty Theft	10	0908
2	Tax Evasion	30	1021
3	Extortion	60	?

Appendix 3

The Men and Women sets-

Men = {Bob, Alan, Ivan, Mark}
 Women = {Sue, Sam, Ann}
 Rich = {Bob, Alan, Ann}
 Smart = {Sue, Alan}

Appendix 4

The Kenyatta University - is a large institution with several campuses. Academically, the University is also divided, consisting of a number of faculties, such as the Arts Faculty, the Science Faculty, and so on. Some of the faculties operate on a number of campuses. Faculties, in turn, are divided into schools. The Diagram below is an Entity-Relationship Diagram for the University.

