THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY – DICT10M
(YR 2 SEM 1)

EIT 2204: DATABASE MANAGEMENT SYSTEMS I

END OF SEMESTER EXAMINATIONS

SERIES: AUGUST/SEPTEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination

- *Answer booklet*

This paper consists of **TWO** sections **A** & **B**
Question **ONE** is **COMPULSORY**. Answer any other **TWO** questions from Section **B**
This paper consists of **THREE** printed pages

SECTION A (COMPULSORY)

Question 1 (30 marks)

a) Explain the term 'database system' (2 marks)

b) List **FOUR** significant differences between a file-based system and a DBMS. (4 marks)

c) With the aid of a diagram, describe the components of a database system (7 marks)

d) Explain the meaning of the following terms as used in database systems
   i) OLAP
   ii) OLTP (4 marks)

e) Explain the difference between external, internal and conceptual schemas. Explain how these different layers are related to the concepts of logical and physical data independence (7 marks)

f) Consider the relational database given below, where the primary keys are underlined. Give an expression in the relational algebra to express each of the following queries.

   a) Find the names of all employees who work for First Bank Corporation
   b) Find the names and cities of residence of all employees who work for First Bank Corporation
   c) Find the names, street address, and cities of residence of all employees who work for First Bank Corporation and earn more than $10,000 per annum. (6 marks)

Employee (person-name, street, city)
Works (person-name, company-name, salary)
Company (company-name, city)
Managers (person-name, manager-name)

SECTION B (40 MARKS) – Answer any TWO questions from this section

Question 2 – (20 marks)

a) Name **FIVE** critical success factors in database design (5 marks)

b) Name and define the **FIVE** basic (primitive operators) relational algebra operations. (5 marks)

c) With aid of diagrams, describe the differences in meaning between the terms relation and relation schema. (3 marks)

d) Explain, why the relational model, is more popular than the other database models. (2 marks)

e) In a relational database, there are **THREE** main integrity constructs.
   - Key constraints
   - Entity constraints
   - Referential constraints

Indicate which of these constraints should be checked when an update modifies an attribute that is part of :

i) A primary key
ii) A foreign key
iii) Neither a primary key or a foreign key. (5 marks)

Question 3 - (20 marks)

a) Explain **TWO** main characteristics of database technology (4 marks)

b) With the aid of a diagram, explain the THREE levels ANSI/SPARC database architecture with its significance. (6 marks)

c) Briefly explain major steps in database development life cycle (6 marks)

d) Explain with examples, how primary key and foreign key concepts is useful in relational data model (4 marks)

Question 4 - (20 marks)

a) Define a data model (2 marks)

b) Explain the historical evolution of database models (10 marks)

c) A university registrar's office maintains data about the following entities: courses, including number, title, credits, syllabus and prerequisites; (b) course offerings, including course number, year, semester, section number, instructor(s), timings, and classroom; (c) student including student Id, name and program (d) instructors including identification number, name and department and title. Further the enrolment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled. Construct an ER Diagram and document all your assumptions.

Question 5 - (20 marks)

a) Explain any **THREE** Codd's commandment of Relational database (8 marks)

b) List the all the relational algebra operators (4 marks)

c) List **TWO** reasons why null values might be introduced into the database (4 marks)

d) Let $R=(A,B,C)$, and let $r1$ and $r2$ both be relations on schema R. Give an expression in the domain relational that is equivalent to each of the following (4 marks)

(a) $\Pi A(r1)$

(b) $r1 \cup r2$

(c) $r1 \cap r2$

(d) $r1 - r2$