# MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

SCHOOL OF SCIENCE AND INFORMATION SCIENCES

**THIRD YEAR SEMESTER I EXAMINATIONS FOR THE BACHELOR OF SCIENCE IN COMPUTER SCIENCE**

COURSE CODE: COM 318

COURSE TITLE: DATABASE SYSTEMS

DATE: 24-04-2018                    TIME: 08:30AM-10:30AM

**INSTRUCTIONS TO CANDIDATES**

- ANSWER Question **ONE** and any other **TWO**

This paper consists of 4 printed pages. Please turn over.

## QUESTION ONE (30 MARKS)

a. A database is a collection of logically related data. Explain the concept of *'database approach'* as opposed to traditional file systems (TFS)

**[6 marks]**

b. With the aid of a diagram, explain the meaning of data independence, and show how logical and physical data independence is achieved in databases.

**[12 marks]**

c. You are DBA at OT Morpho. One of your clients has signed a contract for the design and development a database for its organization. Using the following entities,

   i.   The firm entity set, with attributes; firm_id, firm_name, firm_branch

   ii.  The Coder entity set, with attributes; Coder_id, Corder_name, coder_address.

   iii. Testing engineers entity set, with attributes; Tengineer_id, tengineer_name, tengineer_cel, tengineer_level.
        *{Assume each coder is assigned at least one IT branch, and each branch has its own testing engineers}*

**Required:**

Develop a complete E-R-D and 3NF relations, showing your work flow from the above scenario. **[12 marks]**

## QUESTION TWO (20 MARKS)

a. As an expert in database design, discuss in detail the problems that may arise if and when multi-user transactional databases are used in an uncontrolled environment. Use possible examples in your discussion.

**[9 marks]**

**b.** Maasai mara game reserve maintains animal data for the following entities:

   i.   The Animal entity set, with attributes; Animal_id,Animal_name, Animal_location and Animal_gender

   ii.  Manager entity set, with attributes; manager_id, manager_name, manager_tel, manager_section.

   iii. The warden entity set, with attributes; warden_id, warden_name (which includes firstname, middlename and lastname),

warden_address (which includes warden_homeaddress and warden_stationaddress)

*{Assuming each warden is assigned a section, each section manned by at least one manager}*

**Required:**

Develop an E-R-D from the above scenario and take the relations to 3NF to represent the mara database. **[11 marks]**

## QUESTION THREE (20 MARKS)

a. i) Describe the meaning of '*normal*' form as used in database systems. **[2 marks]**

ii) G is a relation with attributes L, M, N, O, P and Q as shown below. Transform it to $3^{rd}$ normal form while carefully explaining your steps:

$$G \; ( \quad L, \; M, \; N, \; O, \; P, \; Q \; )$$
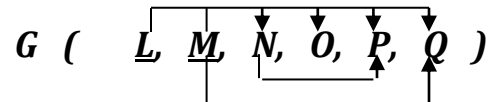
**[6 marks]**

b. Database management systems are used to store and manage a database. Using a clear diagram, explain the architectural structure and components of a database management system. **[12 marks]**

## QUESTION FOUR (20 MARKS)

Int.Robot maintains data about their robot agents in a relational database named *aintl_db_1* with the following relations;

**ROBOT** *(Robot_id, Firstname, Lastname, Address, Status, Field_no);*

**FIELD** *(Field_no, Field_name, Robot_id);*

**TOOL** *(Tool_no, Tool_name, Field_no);*

**WORK_ON** *(Robot_id, Tool_No, Hours_worked);*

Use SQL commands to query the following from aintl_db_1:

    i.    Retrieve the name and addresses of all robot agents who work in the web field **[4 marks]**

ii.     Retrieve total hours worked by robot, sorted in the order of the field number, alphabetically by the robots' last name

**[4 marks]**

iii.    Retrieve the total number of robots in each field for those fields with less than 12 robot agents          **[6 marks]**

iv.     Retrieve the tool number, tool name, and number of robots who use that tool from aint_db_1 database.

**[6 marks]**


**END//**