MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS

2019/2020 ACADEMIC YEAR

SCHOOL OF SCIENCE AND INFORMATION SCIENCES

SECOND YEAR SEMESTER I EXAMINATIONS FOR THE BACHELOR OF SCIENCE IN COMPUTER SCIENCE

COURSE CODE: COM 2105

COURSE TITLE: DATABASE SYSTEMS

DATE: 13/12/2019 **TIME: 11.00AM-1.00PM**

INSTRUCTIONS TO CANDIDATES

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

QUESTION ONE (30 MARKS)

a. Databases have evolved over time to overcome limitations of traditional file systems. Discuss **[6 marks]**

b. What do you understand by the term 'program-data' independence? Illustrate your answer using diagrams. **[12 marks]**

c. You have been hired as a database engineer at OTMorpho SACCO, and your boss has signed a contract for the design and development of a database for their organization. Given the following key entities,

   i. The SACCO entity set, with attributes; sacco_id, sacco_name, sacco_branch
   ii. The Chief_manager entity set, with attributes; sacco_id, manager _name, manager_address.
   iii. Client users entity set, with attributes; client_id, client _name, client_cel, client_branch.

   {Assume each client is assigned at least one sacco_branch, and each branch has its own clients; }

Required:

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

QUESTION TWO (20 MARKS)

a. Any two transactions that run parallel at the same time over a shared database can cause inconsistencies in data. Use appropriate examples to design a solution to address this problem in relations to database design. **[9 marks]**

b. Mara maintains game data as follows:

Animals: The animal entity set, with attributes; animal_id, animal_name, animal_location and animal_sex

Managers: The manager entity set, with attributes; manager_id, manager_name, manager_tel, manager_section.

Warders: The warder entity set, with attributes; warder_id, warder_name (*which includes firstname, middlename and lastname*), warden_address (*which includes warder_home_address and warder_station_address*)

{Assuming each warder is assigned a section, while each section is overseen by at least one manager}

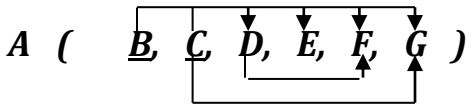
Required:
Develop an E-R-D from the above scenario and take all the relations to 3NF to represent the Mara game database above. **[11 marks]**

QUESTION THREE (20 MARKS)

a. i) Define *Normal Form* as used database design

[2 marks]

ii) Given A is a relation with attributes B, C, D, E, F and G as depicted below; transform A to 3rd NF while carefully explaining your steps:



[6 marks]

b. Illustrate the architectural composition and main components of a Database management System.

[12 marks]

QUESTION FOUR (20 MARKS)

Long Horn Publishers maintain data about their book authors in a relational database named *bintl_db_6* with the following entities;

AUTHOR *(Author_id, Firstname, Lastname, Address, Status, Speci_no);*

AREA OF SPECIALIZATION *(Speci_no, Speci _name, Author_id);*

CHAPTER *(Chapt_no, Chapt_name, Speci_no);*

WORK_ON *(Author_id, Chapt_No, Hours_worked);*

You are required to query the following from *bintl_db_6*:

i. Retrieve the names and addresses of all authors who wrote on '*business & government*' area of specialization **[4 marks]**

ii. Retrieve total hours by author, sorted in the order of the *speci-no*, alphabetically by the author's first name **[4 marks]**

iii. Retrieve the total number of authors in each area of specialization for those with less than 10 chapters. **[6 marks]**

iv. Retrieve the *chapt_no*, *chapt_name*, and *number_of_authors* who wrote the chapters in (i) above from bint_db_6 database. **[6 marks]**

//////////////////END//////////////////