



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS
DEPARTMENT OF COMPUTER SCIENCE AND SOFTWARE
ENGINEERING

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR SCIENCE IN
COMPUTER SECURITY AND FORENSICS

2ND YEAR 1ST SEMESTER 2016/2017 ACADEMIC YEAR

MAIN CAMPUS

COURSE CODE: IIT 3213

COURSE TITLE: DATABASE ADMINISTRATION AND DESIGN

EXAM VENUE:

STREAM: BSC COMP. SECURITY

DATE: APRIL 2017

EXAM SESSION:

TIME: 2.00 HOURS

INSTRUCTIONS:

- 1. Answer Question 1 (Compulsory) and ANY other two questions**
- 2. Candidates are advised not to write on the question paper**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room**

QUESTION ONE

[30 MARKS]

- (a) Define the following terms and concepts as applies to Database Design and Administration. [8 Marks]
- (i) Database Instance
 - (ii) Data Manipulation Language
 - (iii) Ternary Relationships
 - (iv) Interleaving Data
- (b) Name and explain **three** benefits of using a database management system to store and access data over using a file system. [6 Marks]
- (c) Database systems have several kinds of independence and are organized into layers. In particular the physical, logical, and conceptual layers are independent, and the software of a database system is independent of the kind of data to be stored. Explain why such independence is desirable, and whether independence have any advantages. [5 Marks]
- (d) Explain the three main objectives to consider while designing a secure database application. [3 Marks]
- (e) “There are four important properties of transactions that a Database Management System (DBMS) must ensure to maintain data in the face of concurrent access and system failure”. Discuss. [8 Marks]

QUESTION TWO

[20 MARKS]

- (a) Explain any two advantages and any two disadvantages of the following database models below. [8 Marks]
- (i) Network Database Model
 - (ii) Object-Oriented Database Model
- (b) “The Database Management Systems (DBMS) can be classified according to the number users, the database site location(s), and the expected type and extended use”. Do you agree with this statement? Explain. [4 Marks]
- (c) Consider the following relational database schema:
- Employee (employee_id, name, hire_date, pos_title*, salary, dept_name*)
 - Position (pos_title, level)
 - Department (dept_name, location, phone)

Primary keys are underlined and foreign keys are denoted by *s. each position has a level and the attribute **hire_date** uses integers to represent dates.

Express the following query in SQL and Relational Algebra. [8 Marks]

Give the name and phone number of departments that have more than 50 staff members.

QUESTION THREE

[20 MARKS]

Consider a description for a physical therapy center database below.

A database is needed to keep track of the operation of a physical therapy center. Every patient must be referred by a physician and have a prescription for physical therapy in order to receive

treatments. A patient may have different physicians at different times. The database keeps all information about the prescriptions and treatments, both past and current. When appointments are made, the information about scheduled date and time is recorded. No patients is ever scheduled for two visits on one day. The center has several physical therapists, and a patient may be treated by different physical therapist at different visits. When a patient makes a visit at an appointed time, the name of the therapist, the treatment, the date, time, and the equipment used are all recorded for that visit. Each of these has only one value for the visit. This information will be used later for insurance billing, which is not part of the database.

- (a) Draw an ER diagram for the physical therapy center database as described above. In your ER diagram, you must properly denote all applicable concepts, including weak or strong entities, and keys, composite or multi-valued attributes; relationships and their cardinality and participation constraints. [8 Marks]
- (b) Map the ER diagram developed in (a) above to a set of relations. For each relation, list the functional dependencies. Also for each relation, underline primary keys and asterisk any foreign keys, and give its normal form. [12 Marks]

QUESTION FOUR [20 MARKS]

- (a) “The Database Administrator (DBA) must be cognizant of the features of the database management systems (DBMS) in order to apply the proper techniques for optimizing the performance of the database structures”. Explain in support of this statement. [6 Marks]
- (b) “The various types of constraints that are placed on a database contribute to the degree of reliability, consistency and accuracy of the data that is stored in the database. These constraints help to ensure that the data is sensible”. Discuss. [8 Marks]
- (c) Consider the relational schema given below:
PART (PARTNO, PARTDESCR, SUPPLIERN, SUPPLIERNAME, PRICE, DATE, QTY)
State any reasonable assumptions or rules, give the functional dependencies based on your assumptions and transform the relation above into 3NF or BCNF. [6 Marks]

QUESTION FIVE [20 MARKS]

- (a) Distinguish between *conflict serializability* and *view serializability* as applies to concurrency control in distributed database system. [4 Marks]
- (b) Explain an SQL query block in the context of query optimization. [2 Marks]
- (c) Explain any two types of: [8 Marks]
 - (i) Privileges commonly provided by modern DBMS
 - (ii) Image copy back-ups as applies in database backups
 - (iii) Metadata at the fundamental level.
 - (iv) Perspectives of viewing data warehouse performance.
- (d) Use a suitable example to demonstrate how a **database view** can be defined from an existing base table. Comment on the suitability of using views in enhancing row and column level security to a database system. [6 Marks]

- END -