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University Examinations 2024/2025

SECOND YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE BACHELOR OF EDUCATION ARTS, BACHELOR OF SCIENCE IN DATA SCIENCE, BACHELOR OF SCIENCE IN COMPUTER SCIENCE, BACHELOR OF SCIENCE IN COMPUTER TECHNOLOGY, BACHELOR OF SCIENCE IN COMPUTER SECURITY AND FORENSICS, BACHELOR OF SCIENCE IN MATHEMATICS AND COMPUTER SCIENCE, BACHELOR OF SCIENCE IN MATHEMATICS, BACHELOR OF EDUCATION SCIENCE

CIT 3201: DATABASE SYSTEMS

DATE: JANUARY 2025 **TIME: 2 HOURS**

INSTRUCTIONS: *Answer question **one** and any other **two** questions*

QUESTION ONE (30 MARKS)

a) Define each of the following terms as used in database design:
   i) Entity (2 marks)
   ii) Tuple (2 marks)
   iii) Relation (2 marks)

b) SQL commands are often categorized based on the type of operation they perform within a database. Outline the FOUR types of these commands. (4 marks)

c) Normalization is an essential process in database design. Outline two main objectives of database normalization. (2 marks)

d) Distinguish between degree and cardinality of a relation as used in entity relationship modelling. (4 marks)

e) Use SQL statements to implement the following database security concepts.
   i) Create user (2 marks)

ii) Revoke privilege (2 marks)

f) In database design, relationships are used between different tables to represent how the data in one table is related to the data in another. Using relevant examples, outline two types of database relationships. (4 marks)

g) In the context of a database, differentiate between *relation schema* and *relation instance*. (4 marks)

h) Outline two properties of a primary key. (2 marks)

QUESTION TWO (20 MARKS)

a) A database transaction terminates successfully after attaining "acidity". Describe the ACID properties of a database transaction. (8 marks)

b) Study the following scenario then attempt the question part that follow:
"*Mombasa Port Services is a company that maintains first-hand information on the processing and current whereabouts of each shipped goods. The shipped goods are recorded in a computerized system at specific retail centers. The shipped goods have characteristics such as unique item number, weight, dimensions, insurance amount, destination, and expected delivery date. The retail centers are categorized by their center type (vehicles, electronic, clothing, etc), center number, and location. Shipped goods are transported to their main destination by the use of transportation services. The transportation services are characterized by a unique schedule number, a delivery type (e.g, flight, truck, rail etc.), and a delivery route. Create an Entity Relationship diagram that captures this information.*"

(12 marks)

QUESTION THREE (20 MARKS)

a) Distinguish between logical database design and a physical database design. (4 marks)

b) Outline six functions of a database management system. (6 marks)

c) XYZ WoodMart stores details of various furniture items in database with table named *furniture*. The follow is a snapshot of the first six items in the table.

itemcode	**itemname**	**quantity**	**itemprice**	**status**
F0001	Beds	300	2200	excess
F0010	Tables	200	2000	excess
F0003	Sofa sets	100	25000	excess
F0011	Ward robe	50	18000	reorder
F0014	Computer desks	145	4000	excess
F0002	Chairs	45	1200	reorder

Write SQL statements to;

(i) List the item names and prices of items whose item name starts with letter c.

(2 marks)

(ii) List the item names and the total value of each item (in a field named total cost). (2 marks)

(iii) List the names and prices of items whose price is greater than 15000 and name ends with an s. (2 marks)

(iv) Retrieve all items sorted according to *itemcode* in ascending order. (2 marks)

(v) Delete the item whose *itemcode* is F0014 from the table. (2 marks)

QUESTION FOUR (20 MARKS)

a) Securing a database aims to achieve the following objectives Briefly discuss each of the objectives, giving at least ONE database security control that can be implemented to achieve the objective.

i) Data Confidentiality (3 marks)

ii) Data Integrity (3 marks)

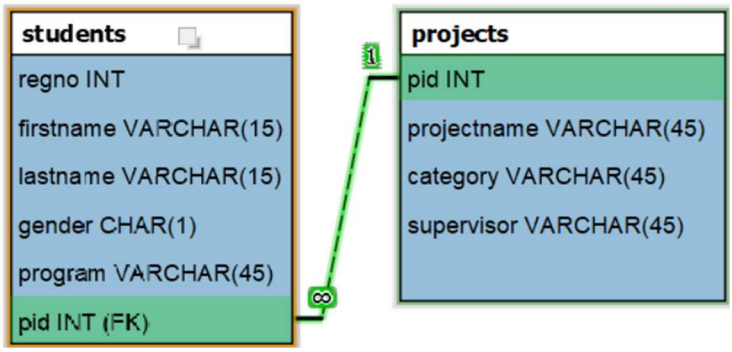
iii) Availability (3 marks)

b) While working as an intern in Kitui county, you have been requested to design a database to facilitate the assigning of farmers into various subcounty offices. A farmer can only be assigned to only one subcounty. In addition, a farmer must have a National ID. Two different farmers should not have the same National ID number. Describe the three constraints that you should enforce to ensure consistency of data. (6 marks)

c) A database management system (DBMS) consists of several key components that work together to organize, manage, and access data efficiently. Outline the five components of a DBMS. (5 marks)

QUESTION FIVE (20 MARKS)

a) In XYZ University, third year students undertake a group project whereby a single project is done by several students. Consider the following ERD depicting a section of the database used to coordinate the projects;



Write SQL statements to:

i. Create the students table. (3 marks)

ii. Update the first name of a student whose registration number is 10019 to Eric. (3 marks)

iii. Count the number of female students in taking 'BCS' (ie. program). (3 marks)

iv. Output the names of all student and the names of the projects they are working on. (3 marks)

b) Database design methodology involves a systematic approach to ensure that the database structure meets the requirements of an organization or application. Discuss the three main phases of database design methodology. (6 marks)

c) Indexing is powerful technique that is used by database management systems. Outline two advantages of having indexed tables in a relational database management system. (2 marks)