



kasneb

CICT PART II SECTION 3

DATABASE SYSTEMS

TUESDAY: 26 November 2019.

Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question.

QUESTION ONE

- (a) Database management systems functionally have similarities with operating systems in certain aspects.

Explain two such similarities.

(4 marks)

- (b) Data may be defined according to the amount of time they reside on the memory from time to time.

Describe two categories of data based on this criteria.

(4 marks)

- (c) Consider the following database structure:

author (author-id, first-name, last-name)  
author-pub (author-id, pub-id, author-position)  
book (book-id, book-title, month, year, editor)  
pub (pub-id, title, book-id)

Required:

- (i) Write a relational algebra expression that would return the number of authors that are not book editors. (3 marks)
- (ii) Use a relational algebra expression to return the names of all authors who are book editors. (3 marks)
- (iii) Write a relational algebra that returns all authors who authored a publication (pub) that was published in January. (3 marks)
- (iv) Formulate a relational algebra expression that returns the names of all authors who have at least one publication in the database. (3 marks)

(Total: 20 marks)

QUESTION TWO

- (a) An organisational database typically integrates to multiple applications.

Describe two applications that are integrated with databases.

(4 marks)

- (b) Explain two file organisation schemes used by database files to map onto the storage blocks.

(4 marks)

- (c) Describe four vulnerabilities that need to be addressed in order to secure an organisation database.

(4 marks)

- (d) Study the database table below where the primary key is Proj-Num.

PROJ-NUM	PROJ-NAME	EMP-NUM	EMP-NAME	JOB-CLASS	CHG-HOUR (KES)	NO. OF HOURS
15	Skylap	103	John	Elec.Eng	180.00	15.3
		101	Peter	Database D.	250.00	20.5
		103	Mary	Database D.	150.00	30.7
		106	Andrew	Programmer	150.00	11.3
		102	Mary	Programmer	75.00	12.6
		107	Rose	Systems An.	100.00	27.5

**Required:**

Discuss problems with the table above.

(4 marks)

(e) Using an example, explain the term derived attribute as used in database systems.

(2 marks)

(f) Explain two types of failures that could occur in a distributed system.

(2 marks)

**(Total: 20 marks)****QUESTION THREE**

(a) Consider the scenario below.

A PAINTER paints many PAINTINGS; an EMPLOYEE learns many SKILLS; an EMPLOYEE manages a STORE.

**Required:**

(i) Using a notation of your choice, draw entity-relationship diagrams for the above scenario.

(3 marks)

(ii) Highlight three advantages of an entity-relationship model in data management systems.

(3 marks)

(b) (i) Explain two pitfalls of lock-based protocol.

(4 marks)

(ii) Describe two phases of locking protocol.

(4 marks)

(c) Suggest two situations that could necessitate database administrators to revoke a privilege.

(4 marks)

(d) Describe three heuristics that should be applied to improve the processing of a query.

(2 marks)

**(Total: 20 marks)****QUESTION FOUR**

The tables below are extracted from a high school selection system.

**STUDENTS**

Student Index No.	First-and-Middle-Name	Surname	Score
2343	John Lapona	Olepoi	342
2344	Kennedy Lichek	Shitanda	453
3456	Christine Shelin	Johnson	323

**SCHOOL**

School-code	School-Name	Location	Min-entry	Max-entry
0909	Green school	Nairobi	400	500
8799	Rift valley school	Nakuru	350	410
9099	Deans school	Kitale	280	350
6766	Brightone school	Nyeri	300	350

**POSTAL-ADDRESS**

School-code	Postal-Address
0909	P.O. Box 6788 Nairobi
8799	P.O. Box 901 Nakuru
9099	P.O. Box 231 Kitale
6766	P.O. Box 767, Nyeri

**Required:**

(a) Giving proper explanation, normalise the tables to BCNF.

(5 marks)

(b) Write a Structured Query Language (SQL) statement to create the table in (i) above.

(5 marks)

(c) Write a Structured Query Language (SQL) that will list all students and the school they are admitted.

(4 marks)

(d) Write SQL that will give a merit list of the students displaying student index no, first and middle name, surname and score.

(3 marks)

(e) Write SQL that will give the mean score, with an alias 'mean-score' of all students.

(3 marks)

**(Total: 20 marks)**

**QUESTION FIVE**

- (a) Discuss three functionalities of a data warehouse. (6 marks)
- (b) Distributed database management systems (DDBMS) have become common in the modern world of data management.

**Required:**

Describe two DDBMS's that you could propose to an organisation that has limited computing resources. (4 marks)

- (c) Explain the following types of constraints used to facilitate maintenance of the accuracy and integrity of data in a database:
- (i) Domain constraints. (2 marks)
- (ii) Entity constraints. (2 marks)
- (iii) Referential integrity constraints. (2 marks)
- (d) Information communication technology (ICT) presents major security challenges. Security and control should be a top priority for any organisation's database management system.

Summarise four computer crimes that could pose serious threats to integrity, safety and survival of a database system. (4 marks)

**(Total: 20 marks)**

.....

access thousands of free content on [www.freekcepastpapers.com](http://www.freekcepastpapers.com)