kasneb

CICT PART II SECTION 3

DATABASE SYSTEMS

WEDNESDAY: 19 May 2021. **Time Allowed: 3 hours.**

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

QUESTION ONE

(a) (i) State an advantage and a disadvantage of indexing in database systems. (2 marks)

(ii) Distinguish between "ordered" and "unordered" files as used in databases. (2 marks)

(b) Explain the terminology "scaling" as used in distributed databases. (2 marks)

(c) Describe three major steps involved in the design of a database. (6 marks)

(d) Describe the following acronyms as used in database systems:

(i) ERP. (2 marks)

(ii) OLAP. (2 marks)

(e) Distinguish between "data administration" and "database administration". (4 marks)

(Total: 20 marks)

QUESTION TWO

(a) Rewrite the following statements into relational algebra:

(i) Display the students pursuing an "MSC" course from the "student" table. (2 marks)

(ii) Display all the names of all the female students taking an "MSC" course. (3 marks)

(iii) Display all the students' names and the courses they are taking. (2 marks)

(b) Draw a well labelled diagram of the architecture of a DBMS. (6 marks)

(c) Use the database schema below to answer the questions that follows:
Casuals (name, idno, dept, pay).

(i) Write an SQL statement to display all the casuals whose department is sales. (2 marks)

(ii) Write an SQL statement to display the employees aggregating the employees from a particular department together. (2 marks)

(iii) Write an SQL statement to delete the records for all the employees from "plumbing" department. (2 marks)

(iv) Write an SQL statement to increase the pay for all the casuals by 10%. (1 mark)

(Total: 20 marks)

QUESTION THREE

(a) Explain the following terminologies as used in database systems:

(i) Dirty read problem. (2 marks)

(ii) Discretionary access control. (2 marks)

(b) Describe two roles of a database administrator (DBA). (4 marks)

(c) (i) In the normalisation process, a relation R is broken down into two or more relations. The decomposition can be either "lossy" or "lossless".

Distinguish between the two terminologies as used in database systems. (4 marks)

(ii) The table given below is a candidate of the pitfalls resulting from poor database design during the first stage of normalisation process.

Cust_Details

Cust_tranid	Amount_paid	Company_Name	Company_Address
T001	60000	WestGate	WestGate, parkroad
T002	44000	WestEnd	WestEnd, Waiyaki
T003	60500	WestLife	WestLife, Thika
T004	14500	WestEnd	WestEnd, Waiyaki
T005	35800	WestGate	WestGate, parkroad

Required:
Decompose the relation into two different relations that eliminate the pitfalls by storing customer details separately from their company addresses where the company name is to be used as a unique identifier. (4 marks)

(iii) Explain two database anomalies that exists in the original relation in (c)(ii) above. (4 marks)
(Total: 20 marks)

QUESTION FOUR

(a) Discuss the following terminologies as used in a web enabled database application:

(i) Provider. (1 mark)

(ii) Requestor. (1 mark)

(b) Draw a labelled diagram of a web service architecture. (4 marks)

(c) Explain why the table below is not normalised.

Item	Colors	Price	Tax
T-shirt	red, blue	15.00	0.16
Polo	red, yellow	15.00	0.16
T-shirt	red, blue	15.00	0.16
Sweat-shirt	blue, black	25.00	1.25

(2 marks)

(d) Convert the table in (c) above into:

(i) First Normal Form (1NF). (3 marks)

(ii) Second Normal Form (2NF). (3 marks)

(iii) Third Normal Form (3NF). (3 marks)

(e) Explain the following trends in database systems:

(i) Multimedia database technology. (1 mark)

(ii) NoSQL. (1 mark)

(iii) JDBC. (1 mark)
(Total: 20 marks)

QUESTION FIVE

(a) Differentiate between the following pairs of terms in the context of DBMS:

(i) Security and precision. (4 marks)

(ii) Database audit and audit trails. (4 marks)

(b) Consider relations sets X and Y given in the table below:

X

No	NAME	GRADE	AGE
T1	LOTHS	A	22
T4	SANDE	B	23

Y

No	NAME	GRADE	AGE
T1	LOTHS	A	22
T2	FLOCY	C	21

Required:
Use the relations to illustrate relational algebra results of the tuples for the operators:

(i) X UNION Y. (1 mark)

(ii) X INTERSECT Y. (1 mark)

(iii) X MINUS Y. (1 mark)

(iv) Y MINUS X. (1 mark)

(c) List two examples of a relational database management system. (2 marks)

(d) Discuss three reasons why it may be necessary to have serializability for long duration transactions. (6 marks)

(Total: 20 marks)

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