# KASNEB

## CICT PART II SECTION 3

## DATABASE SYSTEMS

**WEDNESDAY: 25 May 2016.** **Time Allowed: 3 hours.**

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

**QUESTION ONE**

(a) Explain two characteristics of a mobile database. (4 marks)

(b) Highlight five reasons for implementing distributed processing system. (5 marks)

(c) Use the tables below to answer the questions that follow:

**Students**

| Number | Name | Address | City | Date of Birth | Employer |
|---|---|---|---|---|---|
| 001 | Muchiri Peter | 26384-00100 | Nairobi | 05-01-85 | 01 |
| 002 | Joseph Oloo | 28462-01100 | Kisumu | 06-02-91 | 02 |
| 003 | Julius Simiyu | 786-00200 | Mombasa | 07-12-74 | 03 |
| 004 | Keneth Oyoo | 9463-01000 | Nairobi | 31-11-64 | 04 |

**Employers**

| Number | Name | Address | City | Phone |
|---|---|---|---|---|
| 01 | James Onyango | 60485-01000 | Kisumu | 123456 |
| 02 | Fidel Castro | 6234-00100 | Nairobi | 78565 |
| 03 | Peter Cheruiyot | 46321-5627 | Eldoret | 460272 |

Use "Students" and "Employers" tables above to illustrate the output of the statements below:

(i) Find Πnumber, name, Employer(Students). (2 marks)

(ii) Find Πcity(Students) I Πcity(Employers). (2 marks)

(iii) Find name, address (σcity = Nairobi(Students)). (2 marks)

(iv) Find Πcity(Students) – Πcity(Employers). (2 marks)

(d) Describe the operations of a timestamp based protocol in the context of databases. (3 marks)

**(Total: 20 marks)**

**QUESTION TWO**

(a) Using an illustration, explain the life of a database transaction. (6 marks)

(b) Discuss three application areas of data mining technologies. (6 marks)

(c) Using a real life example in each case, explain the following as used in database systems:

(i) Two-tier architecture. (4 marks)

(ii) Three-tier architecture. (4 marks)

**(Total: 20 marks)**

**QUESTION THREE**

(a) (i) Explain the term "functional dependencies" as used during the normalisation process. (2 marks)

(ii) ABC Consultant Ltd. maintains details of various projects in which its employees are currently involved. These details comprise of: Employee number, Employee name, Date of birth, Department Code, Department name, Project code, Project description and Project supervisor.

Each employee number, department code and project code is unique.

An employee may work on one or more projects.

**Required:**
Normalise the above data to third normal form (3NF). (6 marks)

(b) Describe four causes of failure in databases and for each, suggest a possible recovery method. (6 marks)

(c) Summarise the activities which are performed in each stage of the database development life cycle. (6 marks)

**(Total: 20 marks)**

**QUESTION FOUR**

(a) Define the term "commit point" in the context of transaction processing systems. (2 marks)

(b) You are a database administrator for XTZ football team and have been given the following details to develop a database:

- XTZ football team has many players,
- The team has a name, a city, a coach, a captain and a set of players, registered date and a training centre,
- Each player belongs to only one team,
- Each player has a name, a playing position, a skill level, age, salary,
- A team captain is also a player.

**Required:**
Draw an entity relationship "ER" diagram for the XTZ football team. (6 marks)

(c) Citing an example in each case, explain three criteria for classifying database management systems (DBMS). (6 marks)

(d) In each case, state two examples of software you would use when developing a web enabled database application for the following parts:

(i) Business logic. (2 marks)

(ii) Database. (2 marks)

(e) Highlight two instances when a database developer should avoid using indexes. (2 marks)

**(Total: 20 marks)**

**QUESTION FIVE**

(a) Write structured query language (SQL) statements that would perform the following task:

(i) Create a table called STUDENT with the fields RegNo, SurName, FirstName and Date of birth. (4 marks)

(ii) Include an extra field called fees_bal to the table STUDENT. (3 marks)

(iii) Add a complete record to the table STUDENT. (3 marks)

(b) Explain four main classes involved in accessing a data source in Visual Basic, Java, C++ or Python programming languages. (4 marks)

(c) It is inevitable not to use a database in a dynamic application. Several techniques exist for including database interaction in an application program.

Discuss three techniques of including database interaction in an application program. (6 marks)

**(Total: 20 marks)**

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