

KASNEB

CICT PART II SECTION 3

DATABASE SYSTEMS

WEDNESDAY: 25 November 2015.

Time Allowed: 3 hours.

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

QUESTION ONE

- (a) Explain the following terminologies as used in database systems:
- (i) Query processor. (2 marks)
 - (ii) Tombstones. (2 marks)
- (b) (i) Write a structure of a relation schema called "students" with a degree of four. (2 marks)
- (ii) Create a relation using the structure in (b) (i) above with a cardinality of two. (2 marks)
- (c) Distinguish between "discretionary access control" and "mandatory access control". (4 marks)
- (d) Using an example in each case, explain the following approaches in distributed databases:
- (i) Horizontal partitioning. (2 marks)
 - (ii) Vertical partitioning. (2 marks)
- (e) Explain four benefits of a three-tier architecture database over a two-tier architecture database. (4 marks)
- (Total: 20 marks)**

QUESTION TWO

- (a) As a database expert, you have been contracted to design a data warehouse which could help the management in decision making and provide return on investment (ROI).
- Required:**
Giving relevant examples, examine three major phases of designing the data warehouse. (6 marks)
- (b) Use the sample fuel table given below to answer the question that follows:

Fuel table

Date	Mileage (km)	Fuel (litres)	Price (Sh.)
07-09-2015	179,001		73.70
11-09-2015	270,000	170	189.70
14-09-2015	32,001	206	250.00

- Required:**
Write a structured query language (SQL) code to get the sum of column "price" for the month of September 2015. (3 marks)
- (c) Using an example, distinguish between "super key" and "primary key" in the context of database systems. (4 marks)
- (d) Use an illustration to explain how data search is done using a B-tree indexing. (3 marks)
- (e) Analyse four database design strategies that could be used to reduce occurrence of blocking, locks and deadlocks in a database. (4 marks)
- (Total: 20 marks)**

QUESTION THREE

- (a) Explain the following facilities for database recovery provided by database management system:
 - (i) Remote journaling. (2 marks)
 - (ii) Checkpoint facilities. (2 marks)
- (b) Justify why the relational model approach is preferred to navigational approaches in database development. (4 marks)
- (c) The figure below contains codes used by a database administrator:

```

Private sub btnload_Click(sender As object, e As EventArgs) Handles btnLoad.Click

    Dim com As New OleDb.OleDbConnection

    Dim dbProvider As String
    Dim dbSource As String
    Dim MyDocumentsFolder As String
    Dim TheDatabase As String
    Dim FullDatabasePath As String

    dbProvider = "PROVIDER=Microsoft.Jet.OLEDB.4.0:"

    TheDatabase = "/Supplier.mdb"
    MyDocumentsFolder = Environment.GetFolderPath(Environment.SpecialFolder.MyDocuments)
    FullDatabasePath = MyDocumentsFolder & TheDatabase

    dbSource = "Data Source = " & FullDatabasePath

    con.ConnectionString = dbProvider & dbSource

    con.Open( )
    MessageBox.Show("Database is now open")

    con.Close( )
    MessageBox.Show("Database is now Closed")
    
```

End sub

Required:

Interpret the above code statements. (6 marks)

- (d) Mr. James Oliech maintains a database of movies rented out as shown in the table below:

Full Names	Physical Address	Movies rented	Salutation	Category
Janet Mwende	First Street Plot No 4	Pirates of the Caribbean	Ms.	Action
		Clash of the Titans		Action
Robert Ouma	3 rd Street 34	Forgetting Sarah Marshal	Mr.	Romance
		Daddy's Little Girls		Romance
Robert Mwakali	5 th Avenue	Clash of the Titans	Mr.	Action

Required:

Normalise the above database table up to third normal form (3NF). (6 marks)
(Total: 20 marks)

QUESTION FOUR

- (a) Giving an example in each case, explain one merit of two leading commercial database management systems (DBMS). (4 marks)
- (b) Justify with reasons, why an organisation should adopt database approach in data management. (4 marks)
- (c) ABC Company is in the process of hiring a database administrator.

As an information technology (IT) consultant, you have been tasked to help the human resource director in preparation of the job advertisement.

Required:

Formulate specific technical skills required for the prospective database administrator. (4 marks)

- (d) Describe four strategies of leveraging on big data for competitive advantage in an organisation. (4 marks)
- (e) The following tables show employees details:

Employee	
EmpID	EmpName
13	Jason
8	Alex
3	Ram
17	Babu
25	Johnson

Location	
EmpID	EmpLoc
13	San Jose
8	Los Angeles
3	Pune, India
17	Chennai, India
39	Bangalore, India

Required:

Using the tables above, explain the difference between “inner join” and “outer join” in the context of database systems. (4 marks)

(Total: 20 marks)

QUESTION FIVE

- (a) Highlight three benefits of denormalising a database. (3 marks)
- (b) Assess two database design strategies of storing historical data. (4 marks)
- (c) Describe four computer based and three non computer based measures of protecting database from external threat. (7 marks)
- (d) Analyse the activities involved during development of a relational database in the following phases:
- (i) Conceptual modelling. (2 marks)
 - (ii) Logical modelling. (2 marks)
 - (iii) Physical modelling. (2 marks)

(Total: 20 marks)