

CICT PART II SECTION 3
DATABASE SYSTEMS

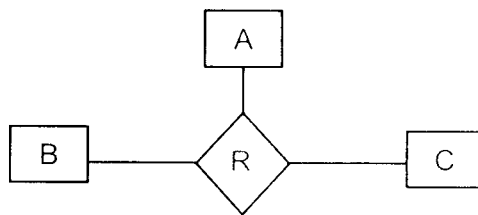
WEDNESDAY: 28 November 2018.

Time Allowed: 3 hours.

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

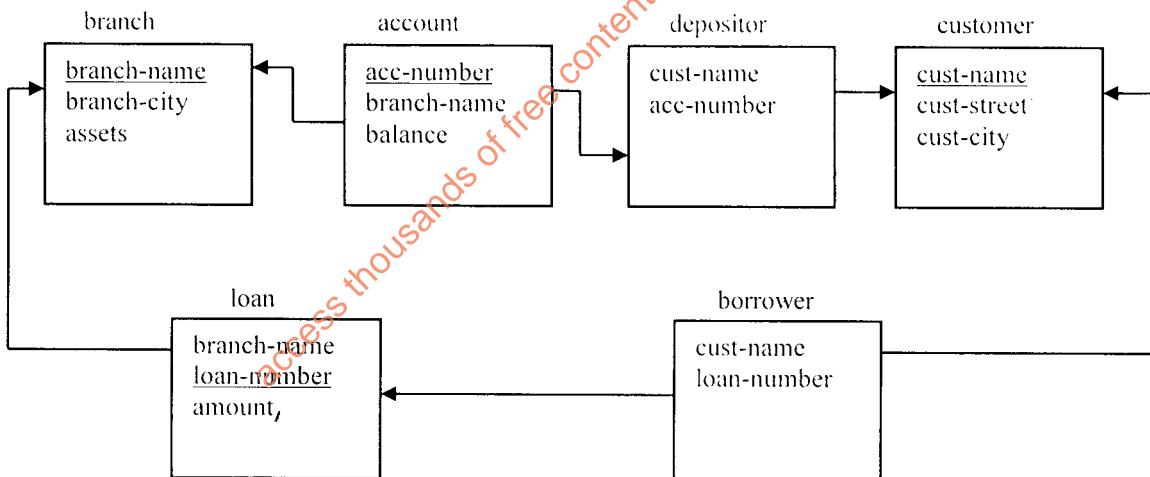
QUESTION ONE

- (a) Distinguish between “transaction manager” and “transaction coordinator” in the context of distributed databases. (2 marks)
- (b) Consider the following non-binary relationship between entity sets A, B and C:



Required:

- (i) Describe the procedure for converting the given relationship into binary form. (6 marks)
- (ii) Using a diagram, illustrate the final binary relationship in (b) (i) above. (3 marks)
- (c) Consider the following database schema:



Write structured query language (SQL) statement to:

- (i) Find non-duplicate names of all branches in the loan relation. (1 mark)
- (ii) Find all loan numbers for loans made at XYZ branch with loan amount greater than Sh.1,000. (4 marks)
- (iii) Find the names of all branches that have greater assets than some branches located at ABC. (4 marks)

(Total: 20 marks)

QUESTION TWO

(a) Parallel processing and concurrency execution is a technique employed to optimise the performance of databases.

Required:

- (i) Distinguish between “inter-query” and “intra-query” parallelism. (2 marks)
- (ii) Explain how the “parallel join” operation might improve the normal join operation. (2 marks)
- (iii) State three reasons why the “inter-query” parallelism is more complicated to implement on shared-disk or shared nothing architectures. (3 marks)

(b) Consider the following relations:

loan

loan-num	branch-name	amount
L -- 170	X	3000
L -- 230	Y	4000
L -- 260	Z	1700

borrower

cust-name	loan-num
A	L -- 170
B	L -- 230
C	L -- 155

Required:

Determine the data drawn by the following operations:

- (i) Inner join: loan \bowtie borrower. (4 marks)
- (ii) Left outer join: loan $\leftarrow \bowtie$ borrower. (4 marks)

(c) Consider the following entity sets:

Customer = {cust _ id, cust _ name, cust _ street, cust _ city}

Loan = {loan _ no, loan _ amt}

Required:

Taking ‘borrower’ to be a relationship set between customer and loan, draw the corresponding entity relationship (E – R) diagram. (5 marks)

(Total: 20 marks)

QUESTION THREE

(a) You are tasked to design a Cinema Ticketing Software (CTS) with the assistance of other stakeholders. The CTS is logically organised in such a way that ticket sellers book tickets for customers to watch a specific movie screened in a specific cinema hall at a particular time slot of day. Each time slot has a unique id and name. Each movie has a unique id and name. Movies to be screened are scheduled in a schedule table. Each record in the schedule table has an id, time slot, date, cinema hall, price and movie id. All ticket sellers have a unique id, name, date of birth, address and phone number. When a ticket seller books a ticket to a customer, he/she captures a customer’s name, id, date of birth, movie preferred, time slot and date.

Required:

- (i) Justify the importance of capturing ticket sellers and customer details with regard to date of birth and not age. (2 marks)
- (ii) Sketch an Entity Relationship Diagram for the Cinema Ticketing Software. (10 marks)
- (iii) Database managers are encouraged to come up with Entity Relationship Diagrams in database design phase. Describe four reasons why this is important. (4 marks)

(b) Rewrite the following relational algebra statement into structured query language (SQL) equivalent:

- (i) σ age < 30 (boys). (2 marks)
- (ii) π name (σ bid = 001(boys \bowtie cid = 54 club)). (2 marks)

(Total: 20 marks)

QUESTION FOUR

- (a) (i) Explain the meaning of a transparent database management system (DBMS). (2 marks)
- (ii) Explain two ways in which stored procedures improve transparency in DBMS. (2 marks)
- (iii) Describe two advantages of using stored procedures in DBMS. (2 marks)
- (b) Explain the following terms in context of DBMS:
- (i) Lock. (2 marks)
- (ii) Shadow paging. (2 marks)
- (iii) Basic timestamp ordering. (2 marks)
- (c) From time to time, the database has inbuilt mechanisms for recovery using checkpointing. Outline the steps that define a checkpoint operation. (4 marks)
- (d) Explain two main stages that assist database administrators understand how data in the warehouse changes. (4 marks)
- (Total: 20 marks)**

QUESTION FIVE

- (a) Assess the application of each of the following technology to a large commercial enterprise:
- (i) Internet of things. (2 marks)
- (ii) Big data. (2 marks)
- (b) Explain two database modelling techniques that might be used to establish a corporate database. (4 marks)
- (c) Describe file-oriented approach to information processing. (2 marks)
- (d) Discuss the level of involvement that is necessary to utilise recovery and concurrency control services provided by a DBMS. (4 marks)
- (e) Describe the importance of creating and using a data dictionary with a large corporate database. (2 marks)
- (f) Explain the following terminologies as used in database systems:
- (i) Write Ahead log (WAL). (2 marks)
- (ii) Structured data. (2 marks)
- (Total: 20 marks)**
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