

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

**FOURTH YEAR EXAMINATION FOR THE AWARD OF BACHELOR OF
SCIENCE IN COMPUTER SCIENCE**

COMP 401: DATABASE SYSTEMS

STREAMS: (BSC COMPUTER SCIENCE)

TIME: 2 HOURS

DAY/DATE: TUESDAY 04/12/2018

8.30 A.M – 10.30 A.M

INSTRUCTIONS:

- Answer question **ONE** and **TWO** other questions
- Sketch maps and diagrams may be used whenever they help to illustrate your answer
- Do not write anything on the question paper
- This is a **closed book exam**, No reference materials are allowed in the examination room
- There will be **No** use of mobile phones or any other unauthorized materials
- Write your answers legibly and use your time wisely

SECTION A-COMPULSORY: 30 MARKS

QUESTION ONE

- a) Differentiate between a candidate key and the primary key for a given relation. (2 marks)
- b)
 - i. Outline four typical components of database systems. (2 marks)
 - ii. Differentiate between DDL and DML as used in SQL. (2 marks)
- c) Differentiate between the following terms as applied in distributed database architectures: (6 marks)
 - i. Shared memory and shared disk
 - ii. Shared nothing and hierarchical
- d) Explain the difference between logical and physical data independence. (4 marks)
- e) Using relevant examples differentiate between horizontal and vertical fragmentation (4 marks)
- f) Using relevant example describe a schema as used in databases. (4 marks)

- g) Describe the ACID properties in distributed database systems. (6 marks)

Section B: Attempt Any Two Questions: 40 MARKS

QUESTION TWO: 20 MARKS

- a) Write the result of the following SQL operation and the tables given below : (2 marks)

Select S.name, E.cid
 From Students S.sid, Enrolled E
 WHERE S.sid=E.sid AND E. grade= 'B'

sid	cid	grade
53831	Carnatic101	C
53831	Reggae203	B
53650	Topology112	A
53666	History105	B

sid	name	login	age	gpa
53666	Jones	jones@cs	18	3.4
53688	Smith	smith@ee	18	3.2

- b) Bob would like to model the entity relationships in a procurement system. Outline the steps he could use to achieve his objective. (8 marks)

- c) A table called tblEmployee has the following fields: –

Employee ID, First Name, Second Name, Date of Birth, Gender, Marital Status, Religion and Salary.

Write SQL statements to do each of the following;

- i. Retrieve all records [include all fields] from the table. (2marks)
- ii. Retrieve the Employee ID, First Name, Second Name, Date of Birth, Gender and Marital Status. First Name and Second Name should be combined and assigned the caption Employee Name. (3 marks)
- iii. Retrieve Employee ID, First Name, Second Name, Salary, Allowance and Gross from the table. NB: The allowance is 35% of the Salary and the Gross is the sum of salary and Allowance. (4 marks)
- iv. Give the full name for the Acronym SQL. (1 mark)

QUESTION THREE: 20 MARKS

- a) An Engineering student in a technical college was tasked with designing a distributed database for his graduation project instead of a centralized one, in his problem he identified various goals that his project is geared to achieve; describe three of this goals. (6 marks)
- b) Describe the various steps that are followed when designing a database. (6 marks)
- c) There are two constraints used to describe a relationship in a database one to one and one to many, describe these terms. (4 marks)
- d) Describe the following database concepts: (4 marks)
 - i. Entity

ii. Relationship

QUESTION FOUR: 20 MARKS

- a) Briefly explain four levels of normalizing a database. (4 marks)
- b) With the aid of a diagram, outline the typical database architecture. (4 marks)
- c) By first outlining the procedure, test whether the following schedules are conflict serializable (6 marks)
- i.) Read_Item(T1, X), Read_Item (T2, X), Write_Item (T1, X)
Write_Item (T2, X), Commit (T1), Commit (T2)
- ii.) Read_Item (T1, X), Write_Item (T1, X), Read_Item (T2, X)
Write_Item (T2, X), Commit (Ti), Commit (T2)
- d) Briefly describe 3 types of relationships used in database. (6 marks)

QUESTION FIVE: 20 MARKS

- a) Briefly describe what a Transaction is as used in databases. (2 marks)
- b) Explain three ways of securing distributed database transactions. (4 marks)
- c) Design a conceptual schema for Chuka University and draw an ER diagram for your schema. The following information describes the situation that the Chuka university database must model. Be sure to indicate all key and cardinality constraints and any assumptions you make. Chuka University Records has decided to store information about musicians who record songs in their studio in a database. The University has wisely chosen to hire you as a database designer. (14 marks)
- I. Each musician that records at Chuka University has an SSN, a name, an address, and a phone number. SSN uniquely identifies a musician.
- II. Each instrument used in songs recorded at Chuka University has a unique identification number, a name (e.g., guitar, synthesizer, and flute) and a musical key (e.g., C, B-flat, E-flat).
- III. Each song recorded at Chuka University has a title and a date. A song is uniquely identified by a song id.
- IV. There are two types of musicians recording a song: singers (vocalists) and instrumentalists.
- V. Each instrumentalist may play several instruments, and a given instrument may be played by several instrumentalists. Each instrumentalist plays at least one musical instrument. Each instrument must be played by some instrumentalist.
- VI. Each song is performed by one or more musicians, and a musician may perform a number of songs.

- VII. Each musician who performs a song receives a stipend.
 - VIII. Each song must be performed by some musician.
 - IX. A singer has a type, (e.g., baritone, tenor, and soprano).
 - X. Singers do not play any instrument.
 - XI. The set of singers and the set of instrumentalists are disjoint.
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