University of Colombo, Sri Lanka

University of Colombo School of Computing

BACHELOR OF SCIENCE IN INFORMATION SYSTEMS

First Year Examination - Semester II - UCSC AY20 [held in March/April 2024]

IS1110 – Database Management

(Two (2) Hours)

Answer ALL questions

Number of Pages =12 Number of Questions = 3

To be completed by the candidate								
Index Number:								

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Important Instructions to Candidates:

I. Students should answer in the medium of English language only using the space provided in this question paper.

II. Note that questions appear on both sides of the paper. If a page or a part of this question paper is not printed, please inform the supervisor immediately.

III. Write your index number CLEARLY on each and every page of this Question paper.

IV. This paper consists of **3** questions in 12 pages (including the Cover Page).

V. **Answer ALL questions.**

VI. Calculators and any electronic device capable of storing and retrieving text including electronic dictionaries, smart watches and mobile phones **are not allowed.**

VII. Do not tear off any part of this answer book. Under no circumstances may this book, used or unused, be removed from the Examination Hall by a candidate.

To be completed by the examiners

Question No	Marks
1	
2	
3	
Total	

Index No: .....

Question 1 – Total 40 Marks

Harmony Records, a prestigious music record company, is currently undergoing a redesign of its database to enhance operational efficiency. Drawing upon your experience as a database designer, your expertise is sought to design a robust database tailored to meet the specific needs of the company.

Each musician associated with Harmony Records possesses a National Identification Card (NIC), a name, an address, and several phone numbers, with the NIC serving as the unique identifier. Musicians can be categorized as either solo artists or members of a band. Additionally, for solo artists, their age is recorded. For band members, the band name is recorded.

For the musical instruments utilized in Harmony Records' recordings, each instrument is assigned a unique identification number, a name (e.g., piano, violin, drum), and a musical key (e.g., C, B-flat, D-major). Musicians may play multiple instruments and a single instrument may be played by multiple musicians.

Songs performed by musicians are recorded with information such as a song_id, title, and author. Every song must be associated with a genre, and a genre can be linked to one or more songs. Genres are defined by a genre_id and a specific style. While a variety of genres, including 'Electronic Music,' 'Pop Music,' and 'Classical Music,' exist, each having unique attributes, it is important to note that the categorization is not exclusive. Genres may have additional attributes depending on their specific type, such as tempo for Electronic Music, subgenre for Pop Music, and duration for Classical Music.

Each song is performed by one or more musicians, and musicians can participate in multiple songs.

Albums produced under the Harmony label have a unique identification number (album_id), a title, and a copyright date. Each album comprises a set of songs, and no song can be featured on more than one album. Each album is associated with a single musician who serves as its producer. Musicians may produce multiple albums.

Each musician at Harmony Records is required to sign a contract. One contract belongs to only one musician. For band members, the entire band collectively signs a single contract. The contract includes a contract number, start date, and end date. Consequently, the duration of the contract is also recorded.

(a) Draw an EER diagram showing the necessary entities, attributes along with the primary key, and relationships for the above scenario. Specify the cardinality and participation constraints for each relationship set. Clearly state all your assumptions if any.

[20 Marks]

Index No: .....

(b) Map the EER diagram developed in (a) above to a relational data model. Underline the primary key of each relation.

[20 Marks]

Index No: .....

Question 2 – Total 30 Marks

(a) What is normalization, and how does it differ from denormalization? **[2 Marks]**

(b) Briefly describe two (02) potential benefits of having a database with minimum redundancies.

[2 marks]

(c) Briefly explain the four (04) properties of a transaction. **[4 marks]**

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(d) By Looking only at the table data determine whether they are Functional dependencies or not (State Yes/No). **[6 marks]**

RNo	Name	Marks	Dept	Course
1	a	78	CS	C1
2	b	60	EE	C1
3	a	78	CS	C2
4	b	60	EE	C3
5	c	80	IT	C3
6	d	80	EC	C2

(i) RNo → Marks : .....

(ii) Dept → Course : .....

(iii)Course → Dept : .....

(iv)Name → Marks : .....

(v) Name, Marks → Dept : .....

(vi)Name, Marks → Dept, Course : .....

(e) Consider the following relation.

Outlet_ID	Outlet_Location	Item_Code	Description	Qty_Available	Unit_Price
R1001	King Street, Hyderabad, 540001	I1001	Gold Marie	25	1600
R1002	Rajaji Nagar, Bangalore, 600341	I1106	Cookies	58	1289
R1003	MVP Colony, Visakhapatnam, 500021	I1200	Best Rice	22	2000
R1001	King Street, Hyderabad	I1309	Dhal	20	1500

(i) Briefly describe update anomalies and provide an example for each type of update anomaly using the given relation. **[6 mark]**

(ii) If the above relation is not in 3NF then decompose it into 3NF. Clearly indicate all your intermediate steps. State all your assumptions (if any). **[10 marks]**

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Question 3 – Total 30 Marks

(a) What's an SQL statement, and briefly describe different SQL statement types. **[5 marks]**

(b) Refer to the data in the tables below to build SQL statements for the queries listed below. Please take note that,

- The foreign key established in table "Bonus" with a reference to the WORKER_ID field in table "Worker" is shown as WORKER_REF_ID. Condition is cascade delete.
- The foreign key established in table "Title" with a reference to the WORKER_ID field in table "Worker" is shown as WORKER_REF_ID. Condition is cascade delete.
- B_ID, T_ID, WORKER_ID fields are primary keys which are auto-incrementing.

Bonus Table

B_ID	WORKER_REF_ID	BONUS_DATE	BONUS_AMOUNT
1	1	2023-02-20 00:00:00	5000
2	2	2023-06-11 00:00:00	3000
3	3	2023-02-20 00:00:00	4000
4	1	2023-02-20 00:00:00	4500
5	2	2023-06-11 00:00:00	3500

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Title Table

T_ID	WORKER_REF_ID	WORKER_TITLE	AFFECTED_FROM
1	1	Manager	2023-02-20 00:00:00
2	2	Executive	2023-06-11 00:00:00
3	8	Executive	2023-06-11 00:00:00
4	5	Manager	2023-06-11 00:00:00
5	4	Asst. Manager	2023-06-11 00:00:00
6	7	Executive	2023-06-11 00:00:00
7	6	Lead	2023-06-11 00:00:00
8	3	Lead	2023-06-11 00:00:00

Worker Table

WORKER_ID	FIRST_NAME	LAST_NAME	SALARY	JOINING_DATE	DEPARTMENT
1	Monika	Arora	100000	2021-02-20 09:00:00	HR
2	Niharika	Verma	80000	2021-06-11 09:00:00	Admin
3	Vishal	Singhal	300000	2021-02-20 09:00:00	HR
4	Amitabh	Singh	500000	2021-02-20 09:00:00	Admin
5	Vivek	Bhati	500000	2021-06-11 09:00:00	Admin
6	Vipul	Diwan	200000	2021-06-11 09:00:00	Account
7	Satish	Kumar	75000	2021-01-20 09:00:00	Account
8	Geetika	Chauhan	90000	2021-04-11 09:00:00	Admin

(i) Write an SQL query to retrieve details of the Workers whose SALARY lies between 100000 and 500000. **[1 mark]**

(ii) Write an SQL query to fetch "FIRST_NAME" from the Worker table in upper case where the DEPARTMENTis Admin. **[1 mark]**

(iii)Write an SQL query to fetch details of the Workers whose FIRST_NAME ends with 'h' and contains six characters.. **[1 mark]**

(iv) Write SQL statement to insert the first row given in the "Worker" table. **[2 marks]**

(v) Write SQL statement to create the table named "Bonus". **[7 marks]**

(vi) Write an SQL query to retrieve all the details of the Workers who joined in Feb 2021. **[2 marks]**

(vii) Write an SQL query to fetch worker names (print the FIRST_NAME and LAST_NAME into a single column) with salaries >= 50000 and <= 100000. **[2 marks]**

(viii) Write an SQL query to fetch the number of workers for each department in descending order. **[2 marks]**

(ix) Write an SQL query to fetch the list of employees with the same salary. **[2 marks]**

(x) Write an SQL query to fetch the departments which have less than five workers. **[2 marks]**

(xi) Write an SQL query to fetch details of the Workers who are also Managers. **[3 marks]**

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