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**ANSWER SHEET**

**ADVANCE DATABASE**

*First Semester AY: 2020-2021*

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**MODULE 1**

**PRETEST**

1. What are the differences between row-level and statement-level active rules?

Row level triggers executes once for each and every row in the transaction. Specifically used for data auditing purpose. “FOR EACH ROW” clause is present in CREATE TRIGGER command while Statement level triggers executes only once for each single transaction. Used for enforcing all additional security on the transactions performed on the table. “FOR EACH ROW” clause is omitted in CREATE TRIGGER command.

2. What are the differences among immediate, deferred, and detached consideration of active rule conditions?

If the result of condition evaluation is true then the rule actions must be executed. Again the execution can be done in immediate, deferred, or detached manner.

3. What are the differences among immediate, deferred, and detached execution of active rule actions?

If the result of condition evaluation is true then the rule actions must be executed. Again the execution can be done in immediate, deferred, or detached manner.

4. Briefly discuss the consistency and termination problems when designing a set of active rules.

The consistency problem states that there might be a case when two or more rules contradict one another. The termination problem states that there might be a case when a set of two, or more triggers execute in a never ending (loop) cycle

5. Discuss some applications of active databases.

Active database are database systems that supports mechanisms that enable them to respond automatically to events that are taking place either inside or outside the database system itself by supporting the specification and implementation of reactive behaviour. The reactive behaviour resides on rules which integrates cause with an expected effect [Montesi and Torlone 1995]. This functionality is commonly defined in terms of event-condition-action rules (ECA-rules). These rules (mainly active rules), allow the system to monitor and react to specific events. Applications which depend on data monitoring activities such as CIM, Telecommunications Network Management, Program trading, Medical and Financial Decision Support Systems can greatly benefit from integration with active database.

6. Discuss how time is represented in temporal databases and compare the different time dimensions.

Temporal databases, time is considered to be an ordered sequence of points in some granularity that is determined by the application. Temporal data types include DATE, TIME, TIMESTAMP, INTERVAL, and PERIOD.DATE: The type date contains four digits for the year (1–9999), two digits for the month (1–12), and two digits for the date (1–31) and provided specifying Year, Month, and Day as YYYY-MM-DD), TIME: The type time contains two digits for the hour, two digits for the minute, and two digits for the second, plus optional fractional digits and provided specifying Hour, Minute, and Second as HH:MM:SS, TIMESTAMP: A temporal database stores data relating to time instances. It offers temporal data types and stores information relating to past, present and future time. Temporal databases could be uni-temporal, bi-temporal or tri-temporal while In a dimensional data modeling (star schema), these tables would be merged as a single table called TIME DIMENSION for performance and slicing data. This dimensions helps to find the sales done on date, weekly, monthly and yearly basis.

7. What are the differences among valid time, transaction time, and Bi temporal relations?

Transaction time is the time period during which a fact, represented by all the information in a row, is or was known to be in effect in the database. It models the database reality, recording when rows have been added, modified, and changed in the database. Transaction-time periods are stored in a transaction-time column:

Valid time models the real world, and denotes the time period during which a fact, represented by all the information in a row, is in effect or true. Valid-time periods are stored in a valid-time column. Valid-time columns store information such as the time an insurance policy or contract is valid, the length of employment of an employee, or other information that is important to track and manipulate in a time-aware fashion. The valid-time period is also known as the period of validity (PV) of the row.

A bi temporal relation is a relation with exactly one system supported valid time and exactly one system-supported transaction time. An alternative definition states that a bi temporal relation has one or more system-supported valid times and one or more system-supported transaction times.

8. Describe how the insert, delete, and update commands should be implemented on a valid time relation.

Insert operation is implemented by creating first version in the E\_BT table. The first tuple version is created using the insert command and makes it the current version.

In update the bitemporal databases, no attributes are physically change in any tuple except for the transaction end time attribute tret is with the value of uc (until changed).

Delete – when an employee is deleted. Tret is changed from uc to date the employee left the company.

9. Describe how the insert, delete, and update commands should be implemented on a Bi temporal relation.

Insert, delete and update commands should be implemented on a bi temporal relation because it provides one system supported function it keeps both valid and transaction time. IF insert or delete or update is in process and if it is one system supported then if the same file or database is requested for these operations then it will not be allowed.

10. Describe how the insert, delete, and update commands should be implemented on a valid time relation.

11. What are the main differences between tuple versioning and attribute versioning?

Tuple-versioning (also called point-in-time) is a mechanism used in a relational database management system to store past states of a relation. Normally, only the current state is captured.Using tuple-versioning techniques, typically two values for time are stored along with each tuple: a start time and an end time. These two values indicate the validity of the rest of the values in the tuple.Typically when tuple-versioning techniques are used, the current tuple has a valid start time, but a null value for end time. Therefore, it is easy and efficient to obtain the current values for all tuples by querying for the null end time.A single query that searches for tuples with start time less than, and end time greater than, a given time (where null end time is treated as a value greater than the given time) will give as a result the valid tuples at the given time while

12. How do spatial databases differ from regular databases?

Spatial Database has the ability to store and access both Location/Spatial Information and Attributes/Non-Spatial Information while Non-Spatial Database has the ability to store and access only Attributes/Non-Spatial Information.

13. What are the different types of spatial data?

There are two primary types of spatial data models. Vector data represents features as discrete points, lines, and polygons and Raster data represents features as a rectangular matrix of square cells (pixels).

14. Name the main types of spatial operators and different classes of spatial queries?

Main types of spatial operators:

1. Topological operators are hierarchically structured in many levels. The base level offers operators, ability to check for detailed topological relations between regions with a broad boundary. The higher levels offer more abstract operators that allow users to query uncertain spatial data independent of the geometric data model.

2. Projective operators, like convex hull are used to establish predicates regarding the concavity convexity of objects.

3. Metric operator’s task is to provide a more accurate description of the geometry of the object. They are often used to measure the global properties of singular objects, and to measure the relative position of different objects, in terms of distance and direction.

4. Dynamic operations changes the objects upon which the operators are applied. Create, destroy, and update are the fundamental dynamic operations.

There are mainly three types of spatial queries:

1. Nearness queries:

It request objects that present near a specified location. A query to find all Hotels that lie within a given distance of a given point is an example of a nearness query. The nearest-neighbor query requests the object that is nearest to a specified point.

For example, we may want to find the nearest Railway station. Note that this query does not have to specify a limit on the distance, and hence we can ask it even if we have no idea how far the nearest Railway station lies.

2. Region queries:

It deal with spatial regions. For example, a query can ask for objects. That is present partially or completely within a fixed region. A query to find all medicine shops within the geographic boundaries of a given town or we can find all the available school in a particular city.

3. Union/Intersection:

In this type of queries, we may also request intersections and unions of regions. For example, given region information, such as annual rainfall and population density, a query may request all regions with a low annual rainfall as well as a high population density.

15. What are the properties of R-trees that act as an index for spatial data?

The properties of R-trees are:

* Consists of a single root, internals nodes and leaf nodes.
* Root contains the pointer to the largest region in the spatial domain.
* Parent nodes contains pointers to their child nodes where region of child nodes completely overlaps the regions of parent nodes.
* Leaf nodes contains data about the MBR to the current objects.
* MBR-Minimum bounding region refers to the minimal bounding box parameter surrounding the region/object under consideration.

16. Describe how a spatial join index between spatial objects can be constructed.

A spatial index is a data structure that allows for accessing a spatial object efficiently. It is a common technique used by spatial databases. Without indexing, any search for a feature would require a "sequential scan" of every record in the database, resulting in much longer processing time. In a spatial index construction process, the minimum bounding rectangle serves as an object approximation. Various types of spatial indices across commercial and open-source databases yield measurable performance differences. Spatial indexing techniques are playing a central role in time-critical applications and the manipulation of spatial big data.

17. What are the different types of spatial data mining?

The spatial features in Oracle Spatial and Graph consist of a set of object data types, type methods, and operators, functions, and procedures that use these types. A geometry is stored as an object, in a single row, in a column of type SDO\_GEOMETRY. Spatial index creation and maintenance is done using basic DDL (CREATE, ALTER, DROP) and DML (INSERT, UPDATE, DELETE) statements.

18. State the general form of a spatial association rule. Give an example of a spatial association rule.

A spatial association rule is a rule indicating certain association relationship among a set of spatial and possibly some nonspatial predicates. A strong rule indicates that the patterns in the rule have relatively frequent occurrences in the database and strong implication relationships.

19. What are the different types of multimedia sources?

The different types of multimedia are Text Materials, Photographs and Other Still Images, Audio Files, Video Presentations and GIFs and Other Forms of Animation.

20. How are multimedia sources indexed for content-based retrieval?

Content-based multimedia information retrieval (IR) provides new models and methods for effectively and efficiently “searching” through the huge variety of media that are available in different kinds of repositories (digital libraries, Web portals, social networks, multimedia databases, etc.). In this chapter, we will review the current state of the art of content-based multimedia information retrieval, including the most promising browsing and search paradigms for the several types of multimedia data, and show some cultural heritage applications.

21. What important features of images are used to compare them?

Image features, such as edges and interest points, provide rich information on the image content. They correspond to local regions in the image and are fun- dental in many applications in image analysis: recognition, matching, recon- traction, etc. The extraction of an image feature can be classified into two categories: global features which describe the visual content of the entire image by a single vector. They represent the texture, color, shape information which are the most popular for image representation.

22. What are the different approaches to recognizing objects in images?

Object recognition is a computer vision technique for identifying objects in images or videos. Object recognition is a key output of deep learning and machine learning algorithms. When humans look at a photograph or watch a video, we can readily spot people, objects, scenes, and visual details. The goal is to teach a computer to do what comes naturally to humans: to gain a level of understanding of what an image contains.

23. How is semantic tagging of images used?

Semantic tagging will help you tag your photos even faster and more accurately giving your photos an additional boost to be discovered.

24. What are the difficulties in analyzing audio sources?

The classical problem of blind source separation (BSS) consists in recovering a number of unknown “source” signals from the observation of several “mixture” signals, by only assuming that the source signals are mutually independent. Independent component analysis (ICA) is a classical approach for solving this problem, when the mixture is linear instantaneous and (over-)determined. However, in the field of audio source separation, several challenging issues remain: for instance, the mixture is convolute because of reverberation, and it is often under-determined and time-varying; source signals are non-stationary, and they often overlap in the time-frequency domain. Therefore audio source separation cannot be performed without exploiting some a priori knowledge about the source signals and about the mixture.

25. What are deductive databases?

A Deductive Database is a type of database that can make conclusions or we can say deductions using a sets of well defined rules and fact that are stored in the database. In today’s world as we deal with a large amount of data, this deductive database provides a lot of advantages. It helps to combine the RDBMS with logic programming. To design a deductive database a purely declarative programming language called Datalog is used.

The implementations of deductive databases can be seen in LDL (Logic Data Language), NAIL (Not Another Implementation of Logic), CORAL, and VALIDITY.

26. Define the clausal form of formulas and Horn clauses.

In clausal form, the formula is made up of a number of clauses, where each clause is composed of a number of literals connected by OR logical connectives only.

A formula can have the following quantifiers:

Universal quantifier –It can be understood as – “For all x, P(x) holds”, meaning P(x) is true for every object x in the universe for example All trucks has wheels.

Existential quantifier –It can be understood as – “There exists an x such that P(x)”, meaning P(x) is true for at least one object x of the universe for example Someone cares for you.

While A Horn clause is either a definite clause or an integrity constraint. That is, a Horn clause has either false or a normal atom as its head.

27. What is theorem proving, and what is proof-theoretic interpretation of rules?

Automated theorem proving is a subfield of automated reasoning and mathematical logic dealing with proving mathematical theorems by computer programs. Automated reasoning over mathematical proof was a major impetus for the development of computer science while Proof-theoretic semantics is an alternative to truth-condition semantics. It is based on the fundamental assumption that the central notion in terms of which meanings are assigned to certain expressions of our language, in particular to logical constants, is that of proof rather than truth.

28. What is model-theoretic interpretation and how does it differ from proof theoretic interpretation?

**Model**-**theoretic** semantics is a formal account of the **interpretations** of legitimate expressions of a language. It is increasingly being used to provide Web markup languages with well-defined semantics while Proof-theoretic semantics is an approach to the semantics of logic that attempts to locate the meaning of propositions and logical connectives not in terms of interpretations, as in Tarskian approaches to semantics, but in the role that the proposition or logical connective plays within the system of inference.

29. What are fact-defined predicates and rule-defined predicates?

A **fact** is a **predicate** expression that makes a declarative statement about the problem domain. Whenever a variable occurs in a Prolog expression, it is assumed to be universally quantified. Note that all Prolog sentences must end with a period and predicate is defined by a collection of clauses. A clause is either a rule or a fact. The clauses that constitute a predicate denote logical alternatives:

30. What is a safe rule?

The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule, issued today by NHTSA and EPA, sets tough but feasible fuel economy and carbon dioxide standards that increase 1.5% in stringency each year from model years 2021 through 2026. These standards apply to both passenger cars and light trucks, and will continue our nation’s progress toward energy independence and carbon dioxide reduction, while recognizing the realities of the marketplace and consumers’ interest in buying vehicles that meet all of their diverse needs.