Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

M.Tech Degree S1 (R,S) / S1 (WP) (R,S) Examination December 2024 (2022 scheme)

Course Code & Name: 221TCS001 ADVANCED DATABASE MANAGEMENT

Max. Marks: 60 Duration: 2.5 Hours

PART A

Answer all questions. Each question carries 5 marks Marks

1 Consider the below given SQL query (5)

```
SELECT S.Student_ID, S.Name, S.Major
FROM STUDENT S, ENROLLMENT E
WHERE S.Student_ID = E.Student_ID AND E.Course_ID = 'CS101'
```

a. Transform the given SQL query into relational algebra expression. (1 mark)

b. Draw the initial query tree based on the relational algebra expression. (2 marks)

c. Apply heuristic optimization techniques to the initial query tree and draw the optimized query tree. (2 marks)

2 Illustrate with example the granting and revoking privileges in discretionary access control (5)

3 List the two server system architectures. Draw the diagram of a typical transaction server and explain the various processes that form part of a transaction server. (5)

4 Consider the hash functions used in blooms filter are as follows (5)

$$h1(x) = x \ mod \ 5$$

$$h2(x) = (2x + 3)mod \ 5$$

With suitable example show how Bloom filter generate false positive

5 With an example explain the structure for framing an xml document (5)

PART B

Answer any 5 questions. Each question carries 7 marks

6 Given two relations Professor (ProfId, Name, DeptId), Teaching (ProfId, CrsCode, Semester) and the following metadata on the above relations. (7)

Professor

- There are 1000 records stored in 200 blocks.
- 50 departments
- A clustered index on DeptId with 2 levels

- Hash on ProfId
  Teaching
  • There are 10000 records stored in 1000 blocks
  4 semesters
  •A clustered index on Semester with 2-levels
  Hash on ProfId
  Compute the cost of the following queries
  a. $\sigma_{P.DeptId = 'CS'}$ (Professor) (compute cost when linear search, clustering index is used)
  b. Join operation Professor |X|ProfId Teaching (using nested-loop join, Professor is outer loop) Assume buffer has only 1 block.

7 Describe the different SQL injection methods. Discuss the risks associated with SQL Injection and the remedies to overcome the SQL injection attacks. (7)

8 a. For each of the three partitioning techniques, namely round-robin, hash partitioning, and range partitioning, give an example of a query for which that partitioning technique would provide the fastest response (3 marks) (7)

b. What form of parallelism (interquery, interoperation, or intraoperation) is likely to be the most important for each of the following tasks?

i. Increasing the throughput of a system with many small queries

ii. Increasing the throughput of a system with a few large queries, when the number of disks and processors is large

(4 marks)

9 Explain the strategies taken by 2PC against failures (7)

10 Draw the tree structure for the following XML document (7)

```
<?xml version="1.0" encoding="UTF-8"?>
<theater>
<film category="action">
<title lang="en"></title>
<author>GiadaDeLaurentiis</author>
<year>2005</year>
<price>30.00</price>
</book>
<book category="children">
....
</book>
</bookstore>
```

Explanation of basic components of XML document – elements and attributes

11 Differentiate XPath and XQuery with suitable examples (7)

12 Given the XML code below, find the XPath expression corresponding to the given queries. (7)

XML code:

```
<company>
<department name="CS">
<employee id="E1">
<name>Alice </name>
<position>HOD</position>
<email>cshod@example.com</email>
<salary>20000</salary>
</employee>
<employee id="E2">
<name>Bob </name>
<position>GT</position>
<email>gt@example.com</email>
<salary>15000</salary>
</employee>
</department>
<department name="EC">
<employee id="E3">
<name>Charlie</name>
<position>SFA</position>
<email>sfa@example.com</email>
<salary>18000</salary>
</employee>
<employee id="E4">
<name>Diana</name>
<position>Teacher</position>
<email>diana@example.com</email>
<salary>10000</salary>
</employee>
```

</department>

</company>

Queriers:

a)Select the name of employees of the department "CS". (1.5 marks)

b)Select the id of employees of the department "EC". (1.5 mark)

c)Select the name of employee with id="E2" (1.5 mark)

d)Select the email of employee whose position="SFA" (1.5 mark)

e)Select the employees whose salary > 18000 (1 mark)