

APJ Abdul Kalam Technological University
Ernakulam II Cluster

Second Semester M.Tech Degree Examination April 2018

05CS6002 - MODERN DATABASES

Time : 3 hrs.

Max. Marks: 60

I.

a) Create a DTD for an XML with the following invoice details for an ecommerce application.

- i. an invoice number
- ii. date of purchase
- iii. billing address
- iv. delivery address, if different from the billing address
- v. name and company of purchase
- vi. list of items giving code number, description, quantity ordered, price, and amount due for each item in the invoice.
- vii. total amount of the order, in Rupees.

(5 Marks)

b) Describe manifest typing in SQLite. (3 Marks)

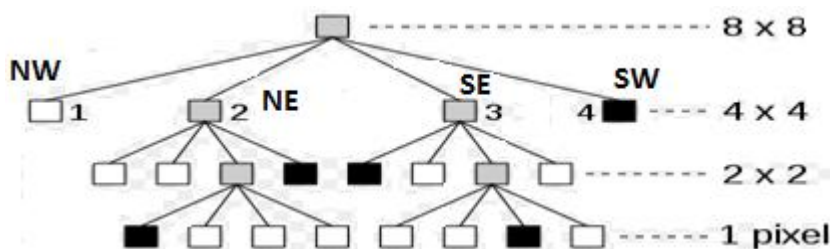
(3 Marks)

c) Discuss various features of VoltDB Database. (4 Marks)

(4 Marks)

II.

a) Consider the following Region Quad tree instance for representing an image.



Draw the image represented. (6 Marks)

(6 Marks)

b) Illustrate with an example distributed query processing using semi-join. (6 Marks)

(6 Marks)

III.

Consider a web caching system that maps a URL to the particular cache that contains it. Assume that initially a set of 3 caches numbered 0..3 exist. URL u is a bit-string that is represented by a large number. Use consistent hashing to map URL u to cache using $h(u) = u + 5 \pmod{13}$. Numbers corresponding to URLs and caches are given below.

URL1 - 3278
URL2-2000
URL3- 1890
URL4- 2999

cache 0-111
cache 1-234
cache 2-135
cache 3-127

[Hint: $x+5 \pmod{13}$ of the numbers (3278,2000,1890,2999,111,234,135,127) are (7,3,10,1,12,5,10,2) respectively.]

Show how URLs are mapped to caches

- i. initially with cache 0, cache 1 and cache 2 only
 - ii. if cache 2 is dropped
 - iii. then if cache 3 is inserted
- (12 Marks)

c) What is the use of Zookeeper in HBase? Describe the architecture of HBase. (6 Marks)

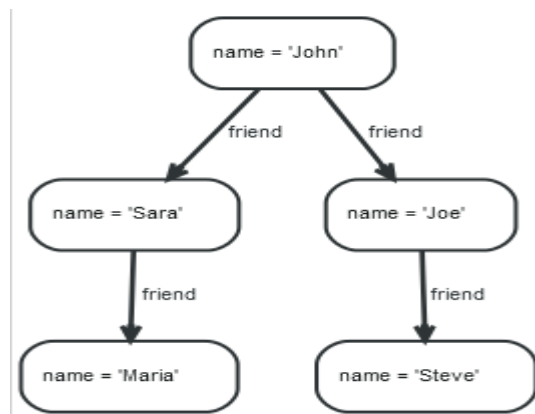
OR

IV.

- a) Describe the consistency models used in DynamoDB and Cassandra. (12 Marks)
- b) Discuss BASE transactions and eventual consistency. (6 Marks)

V.

- a) Consider the following graph
 - i. Write a Cypher query for the graph given below to find a user called John and any friends-of-friends of John that are found.
 - ii. Take a list of user names and find all nodes with names from this list, match their friends and return only those users(following) who have a name property starting with S.



(10 Marks)

- b) How nodes and relationships are represented in neo4j? Describe the meaning of the patterns
 - i. (a) $-\[:KNOWS] \rightarrow (b)$
 - ii. (user) $-\[:KNOWS] \text{ } -(friend) \text{ } -[:KNOWS]-(faof)$
- (8 Marks)

VI.

- a) What is Location dependent query ? How it is executed in a mobile environment? (8 Marks)
- b) What are the different types of processing nodes in a mobile database system? Identify the nodes that can serve as a coordinator? If not, specify the reason. (6 Marks)
- c) Discuss the effect of mobility in consistency in mobile database systems. (4 Marks)