JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

M.Tech-I Semester (Data Science)

COURSE CODE(CREDITS): 22M11CI111(3)          MAX. MARKS: 35

COURSE NAME: Advanced Data Structures

COURSE INSTRUCTOR: Maneet Singh          MAX. TIME: 2 Hours

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*Note: (a)All questions are compulsory.*

*(b)Marks are indicated against each question in square brackets.*

*(c) The candidate is allowed to make Suitable numeric assumptions wherever required for*

*solving problems*

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**Q1.** What is the split problem in R-Tree? Explain the quadratic cost based approach to resolve the split problem.          [CO2]   [5]

**Q2.** Justify the statement: *"Suffix Trees are more efficient than Suffix Arrays"*.          [CO3]   [5]

**Q3.** How does histogram serve as a synopsis for representing massive data? Explain different bucketing schemes of histograms.          [CO9]   [5]

**Q4.** Explain Count-Min Sketch Algorithm with the help of a suitable example.          [CO9]   [5]

**Q5.** What do you mean by lazy update? Explain it in the context of buffer trees.          [CO6]   [4]

**Q6.** Differentiate between cache-aware and cache oblivious algorithms. Explain the cache oblivious implementation of large matrix multiplication.          [CO7]   [5]

**Q7.** Consider a hash table consisting of M = 11 slots, and suppose nonnegative integer key values are hashed into the table using the hash function h1():

```
int h1 (int key) {
    int x = (key + 7) * (key + 7);
    x = x / 16;
    x = x + key;
    x = x % 11;
    return x;
}
```

Insert the following keys are to be inserted into an empty hash table

**43, 23, 1, 0, 15, 31, 4, 7, 11, 3**

Suppose that collisions are resolved by using quadratic probing, with the probe function: $(j^2 + j)/2$. Show the home slot (the slot to which the key hashes, before any probing), the probe sequence (if any) for each key. [CO8] [6 marks]