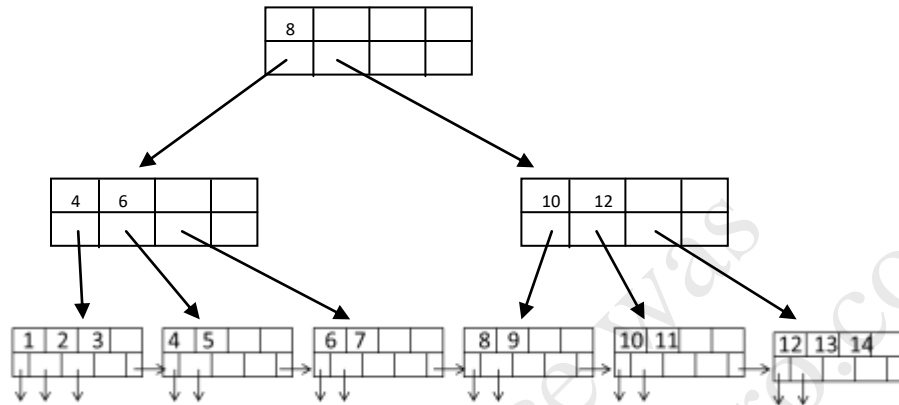


## INF 551 – Fall 2017 (Morning section)

## Quiz 10: B+-tree &amp; MongoDB (10 points), 15 minutes

1. [4 points] Suppose that we lost all the internal nodes of a B+-tree in a recent earthquake. Luckily we are able to recover all its leaf nodes as shown below. You are asked to reconstruct the internal nodes of the tree. Suppose the degree of the tree  $d = 2$ .



2. [3 points] Describe the steps for finding all keys between 5 and 10 using the B+-tree in question 1. What is the cost (# of block I/O's)?

1. Go to root. Check its value and move to left child **[1 block]**
2. Check  $4 < 5 < 6$  and go to second child in the last row **[1 block]**
3. Start from 2<sup>nd</sup> node and keep going till you find a value of 10 in a left node **[4 blocks]**

**Total Block I/O's: 6 blocks**

3. [3 points] Write an SQL query that corresponds to the following MongoDB operation:
- ```
db.person.aggregate([{$match: {age: {$gt: 25}}}, {$group: {_id: "$gender", val: {$min: "$weight"}}}, {$match: {val: {$gt: 120}}}, {$limit: 2}, {$sort: {val: -1}}])
```

**Select gender, min(weight) as val**  
**From person**  
**Where age > 25**  
**Group by gender**  
**Having val > 120**  
**Sort by val desc**  
**Limit 2;**