**CS443 – Lab 5**

**Question 1:**

Use extended hashing technique to insert the employees in which their corresponding binary Empl\_IDs are shown below. Assume you can have two employees per block. Show the depth of both global and local directories. The bits should be considered from left to right as shown in the lecture..

**00001, 10000, 10100, 00111, 11011, 11101, 10010, 01111, 10101**

**Text, letter

Description automatically generated**

**Note: d represents directory size. Starts sorting from left to right.**

**Diagram

Description automatically generated**

**Diagram

Description automatically generated**

**Diagram

Description automatically generated**

**Diagram

Description automatically generated**

**Note: Since there is going to be elements to be inserted, increase the directory size by 2.**

**Diagram

Description automatically generated**

**Diagram

Description automatically generated**

**Note: Bucket 10 is full, therefore d = 3, and will reupdate the extending hashing**

**CONTINUES ON NEXT PAGE**

**Diagram

Description automatically generated**

**Diagram

Description automatically generated**

**Diagram

Description automatically generated**

**Question 2:**

Consider the following records of question 1: (Again Digits should be considered from left to right)

**00001, 10000, 10100, 00111, 11011, 11101, 10010, 01111, 10101**

Load the records into files using Dynamic Hashing Scheme. You can put two records per block. Show the directory at each step, and the global and local depths.

**Note: Sort the following digits by the front rather than the back.**

Diagram

Description automatically generated

A picture containing text, clock

Description automatically generated

Diagram

Description automatically generated

Diagram

Description automatically generated

**Note: Since another element will be inserted, and the buckets are full, it must then expand as shown below.**

**Diagram, schematic

Description automatically generated**

**Diagram, schematic

Description automatically generated**

**Extend another since another element will be inserted and there is no space available inside the buckets.**

**Diagram, schematic

Description automatically generated**

**CONTINUED**

**Extend another bucket since 01 has not been created.**

**Diagram

Description automatically generated**

**Diagram

Description automatically generated**

**Question 3:**

Insert the following into B+ tree of order **3**. Show your work step by step with proper illustration of pointers as shown in pages 47-54 in multi-way trees lecture

**90, 22, 27, 24, 28, 20, 51, 63, 8, 80, 15, 71, 35, 55**

**Table

Description automatically generated with low confidence**



**Table

Description automatically generated**



**Diagram

Description automatically generated**



**A picture containing text, clock

Description automatically generated**



**Diagram

Description automatically generated**



**Diagram

Description automatically generated**



**Diagram

Description automatically generated**



**Diagram

Description automatically generated**



**Diagram

Description automatically generated**



**Diagram

Description automatically generated**



Diagram

Description automatically generated



**-------------------------------------------------------------------------------------------------------------------**

**Diagram, rectangle

Description automatically generated**



Diagram

Description automatically generated



**Diagram

Description automatically generated**



**Question 4:**

Insert the following into B\_tree of order **3**. Show your work step by step with proper illustration of pointers as shown in pages 47-54 in multi-way trees lecture

**2, 99, 9, 71, 16, 11, 15, 13, 91, 92, 94**

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**Diagram

Description automatically generated with low confidence**

**Table

Description automatically generated**

**Diagram

Description automatically generated**

**Shape, rectangle

Description automatically generated**

**Diagram, rectangle

Description automatically generated**

**Diagram, rectangle

Description automatically generated**

**Diagram, shape, rectangle

Description automatically generated**

**Diagram, rectangle

Description automatically generated**

**Shape, rectangle

Description automatically generated**

**Diagram

Description automatically generated**

**Diagram

Description automatically generated**

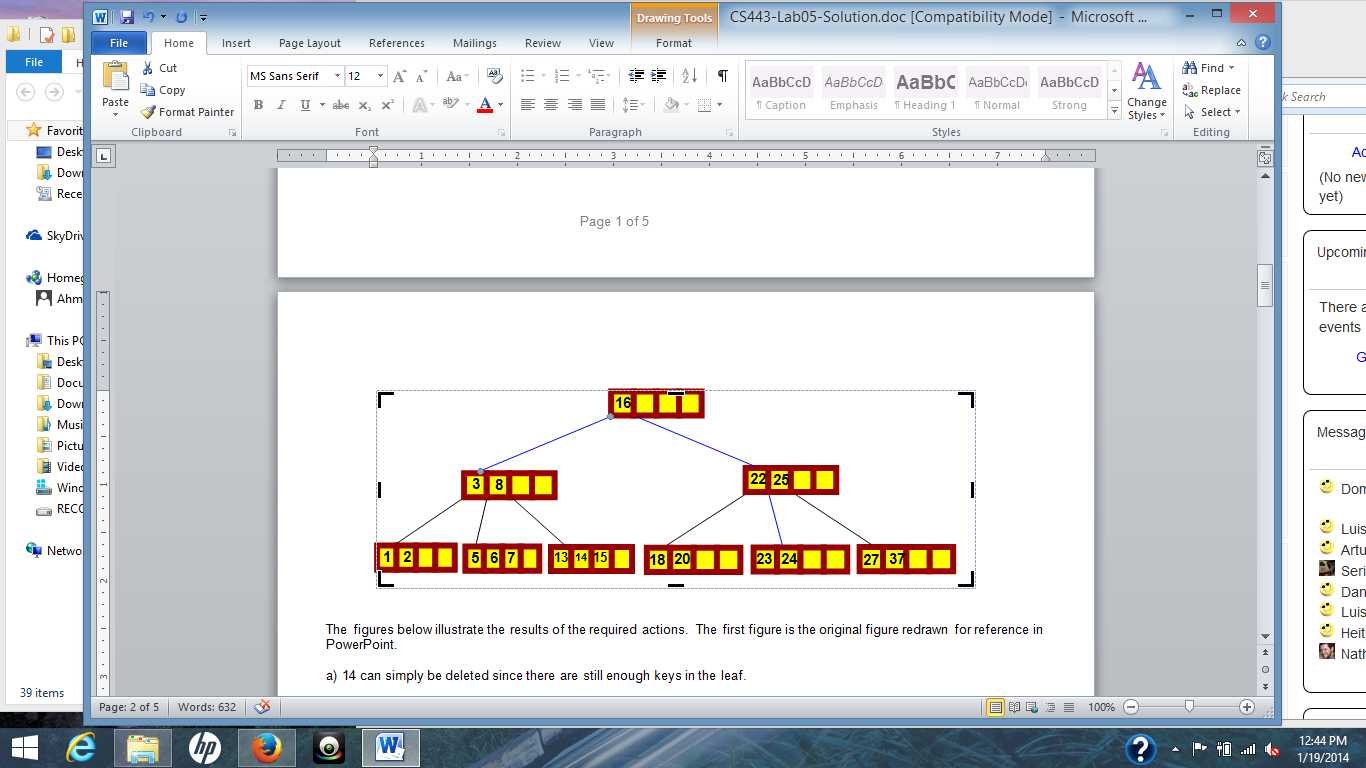
**Question 5:**

Consider the following B-tree.

a) Redraw the tree after deleting 14.

b) Again, redraw the tree after deleting 15.

c) Again, redraw the tree after deleting 25.



a. Delete 14

Diagram

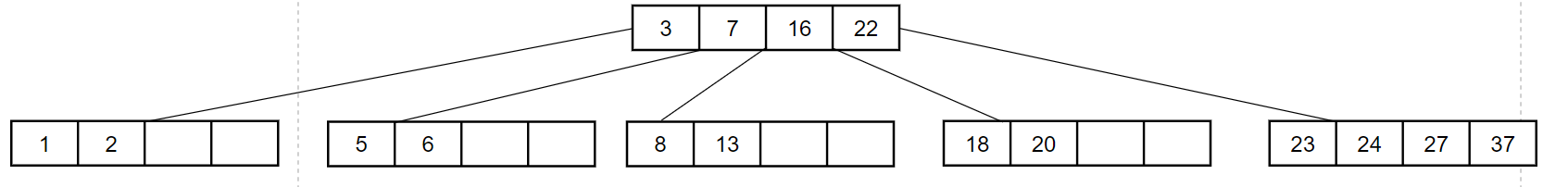
Description automatically generated

b. Delete 15

Diagram

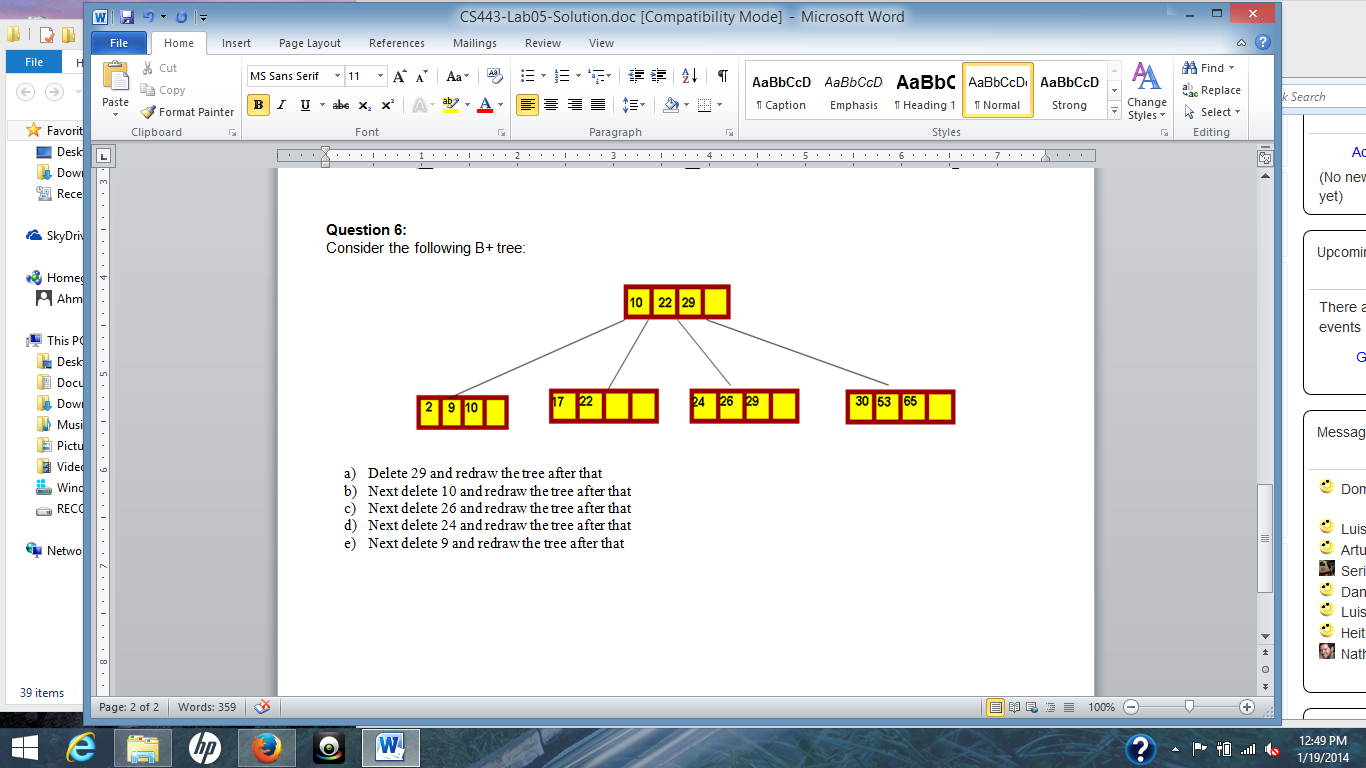
Description automatically generated

c. Delete 25



**Question 6:**

Consider the following B+ tree:



1. Delete 29 and redraw the tree after that

Diagram

Description automatically generated

1. Next delete 10 and redraw the tree after that

Diagram

Description automatically generated

1. Next delete 26 and redraw the tree after that

Diagram

Description automatically generated with medium confidence

1. Next delete 24 and redraw the tree after that

Shape

Description automatically generated with low confidence

1. Next delete 9 and redraw the tree after that

**Shape, rectangle

Description automatically generated**