**Instructions**

* Do your own work
* The exam must be **submitted on Blackboard by 06/25/2020 by 11:59 pm**. No late submission will be accepted.
* **Please do not email me your work.**
* Please remember to complete the Multiple-Choice Blackboard Part of this exam too

**Question 1**

1. Explain why the following table is in 1NF, 2NF, 3NF but not in BCNF (5 points)



1. Derive BCNF from the table schema shown above (5 points)

**Question 2**

1. Explain the difference between B trees and B+ tress as indexes of the modern DBMS (5 points)
2. Show a B+ tree that result from inserting the following values 12, 10, 15, 4, 1, 17, 3, 13 8. Initially the tree is empty and has P = 3. You have to show every step of your insertions to receive full credit (10 points)

**Question 3**

1. What is two phase locking (2 PL) protocol? (5 points)
2. Two concurrent transactions T1 and T2 are shown below. Let us assume initial values X=200, Y=300.



* What would be the result of a schedule T1 followed by T2 (i.e., updated values of X, Y)? (5 points)
* What would be the result of a schedule T2 followed by T1 (i.e., updated values of X, Y)? (5 points)