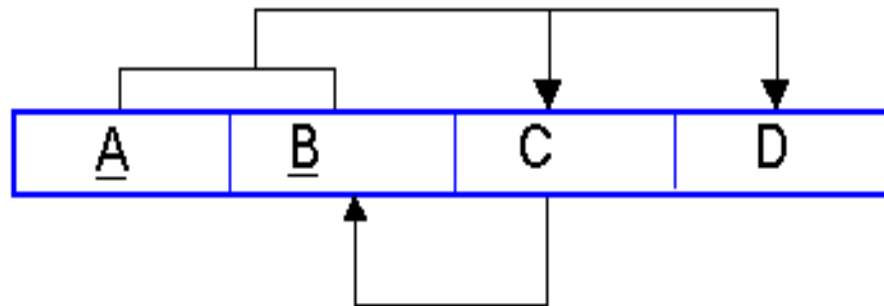


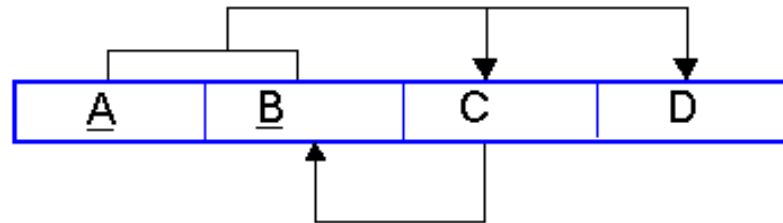
BCNF

# BCNF

- **Boyce Codd Normal Form (BCNF)** is considered a special condition of third Normal form. **A table is in BCNF if every determinant is a candidate key.** A table can be in 3NF but not in BCNF. This occurs when a non key attribute is a determinant of a key attribute.
- The dependency diagram may look like the one below



# BCNF



- The table is in 3NF. A and B are the keys and C and D depend on both A and B.
- The table is not in BCNF because a dependency exists between C and B. In other words if we know the value of C we can determine the value of B.
- We can also show the dependencies as
$$A B \rightarrow C D$$
$$C \rightarrow B$$

# Example

- | <u>S_Num</u> | <u>T_Code</u> | Subject_id | Exam Date  |
|--------------|---------------|------------|------------|
| 123599       | FIT104        | 01764      | 2nd March  |
| 123599       | PIT305        | 01765      | 12th April |
| 123599       | PIT107        | 01789      | 2nd May    |
| 346700       | FIT104        | 01764      | 3rd March  |
| 346700       | PIT305        | 01765      | 7th May    |

An example table from the University Database might be as follows:

If we know the **Student Number** and **Teacher Code** we know the subject ID the student is in. We also know the exam date.

# Example

- | <u>S_Num</u> | <u>T_Code</u> | Subject_id | Exam Date  |
|--------------|---------------|------------|------------|
| 123599       | FIT104        | 01764      | 2nd March  |
| 123599       | PIT305        | 01765      | 12th April |
| 123599       | PIT107        | 01789      | 2nd May    |
| 346700       | FIT104        | 01764      | 3rd March  |
| 346700       | PIT305        | 01765      | 7th May    |

The table is not in BCNF as if we know the subject ID we know who the teacher is. Assume each subject can only have one teacher!

Subject-Id  $\rightarrow$  T\_Code

A non key attribute (**Subject-Id**) is a determinant.

# Example

- | <u>S_Num</u> | <u>T_Code</u> | Subject_id | Exam Date  |
|--------------|---------------|------------|------------|
| 123599       | FIT104        | 01764      | 2nd March  |
| 123599       | PIT305        | 01765      | 12th April |
| 123599       | PIT107        | 01789      | 2nd May    |
| 346700       | FIT104        | 01764      | 3rd March  |
| 346700       | PIT305        | 01765      | 7th May    |

If we look at the table we can see a combination of T\_Code and subject\_id is repeated several times. Eg FIT104 and 01764.

# Converting to BCNF

- The situation is resolved by following the steps below
  - The determinant, subj\_id becomes part of the key and the dependant attribute T\_Code, becomes a non key attribute. So the Dependency diagram is now

S\_Num, subj\_id } → T\_Code, exam Date

→ There are problems with this structure as T\_Code is may not dependant on any part of the key . This violates the rules for 2NF

# Converting to BCNF

- So the table needs to be divided with the partial dependency becoming a new table. The dependencies would then be
  - $S\_Num, Subj\_id \rightarrow exam\ Date$
  - $Subj\_id \rightarrow T\_Code$

StudentExam

<u>S Num</u>	<u>Subj id</u>	Exam Date
123599	01764	2nd March
123599	01765	12th April
123599	01789	2nd May
346700	01764	3rd March
346700	01765	7th May

subj\_teacher

<u>Subj id</u>	T_Code
01764	FIT104
01765	PIT305
01789	PIT107

The original table is divided into two new tables. Each is in 3NF and in BCNF.