## 4.5 COPY PROPAGATION

Copy Propagation is an optimization technique in which a variable that simply copies another variable is replaced by the original variable.

It helps to remove unnecessary variable references and makes the code simpler and more efficient.

Example:

Original Code (Before Optimization):

x = y

z = x + 10

Since x contains the same value as y, we can replace x with y.

Optimized Code (After Optimization):

x = y

z = y + 10

If x is not required later, the unnecessary copy can be removed.

Further Optimized Code:

z = y + 10

**Another Example**

Before Optimization:

a = b

c = a * 5

d = c + 10

After Copy Propagation:

a = b

c = b * 5

d = c + 10

Here, a is replaced with b because both contain the same value.

**Working of Copy Propagation**

x = y

Find the uses of x

Replace x with y

Check whether x is still required

Remove unnecessary copy

**Advantages of Copy Propagation**

1. Removes unnecessary variable references.
2. Reduces the number of instructions.
3. Makes the code simpler.
4. Helps in dead code elimination.
5. Improves further optimization opportunities.