**1.Prove that MPCP reduces to PCP**

**PROOF:**

Assume that is a solution to the given MPCP instance with lists A and B. We know that, according to MPCP

Replace w’s be y’s and x’s by z’s. Then we have the strings like

and The only difference is that the first string would be missing a \* at the beginning and the second string would be missing a \* at the end.

\* =

Using the construction rule,Put and = .

Then fix the initial \* by replacing the first index by 0.

= \*

Append the index k+1, i.e. = $ and = \*$

=

Thus 0, , k+1 is a solution to the instance of PCP.

For MPCP, is a solution. If we remove the \*’s and the final $ from the

string , we get the string

If we remove \*’s and $ from the string, , we get

So for PCP

=

which follows that

Thus a solution to the PCP instance implies a solution to the MPCP instance. Thus there is a reduction of MPCP to PCP, which confirms that if PCP were decidable, PCP would also be decidable.

**Post Correspondence Problem**

The Post Correspondence Problem (PCP), introduced by Emil Post in 1946, is an undecidable decision problem. The PCP problem over an alphabet ∑ is stated as follows −

Given the following two lists, M and N of non-empty strings over ∑ −

M = (x1, x2, x3,………, xn)

N = (y1, y2, y3,………, yn)

We can say that there is a Post Correspondence Solution, if for some i1,i2,………… ik, where 1 ≤ ij ≤ n, the condition xi1 …….xik = yi1 …….yik satisfies.

Example 1

Find whether the lists

M = (abb, aa, aaa) and N = (bba, aaa, aa)

have a Post Correspondence Solution?

Solution

x1 x2 x3

M Abb aa aaa

N Bba aaa aa

Here,

x2x1x3 = ‘aaabbaaa’

and y2y1y3 = ‘aaabbaaa’

We can see that

x2x1x3 = y2y1y3

Hence, the solution is i = 2, j = 1, and k = 3.

Example 2

Find whether the lists M = (ab, bab, bbaaa) and N = (a, ba, bab) have a Post Correspondence Solution?

Solution

x1 x2 x3

M ab bab bbaaa

N a ba bab

In this case, there is no solution because −

| x2x1x3 | ≠ | y2y1y3 | (Lengths are not same)

Hence, it can be said that this Post Correspondence Problem is undecidable.