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Subject   **Theory of automata**

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Q1. Using RD for Even Numbers prove that 11 is not in Even.

ANS:

Rule 1   2 is in Even
Rule 2   2+2 = 4 ◊ 4 is in Even
Rule 2   4+2 = 5 ◊ 6 is in Even
Rule 2   6+2 = 8 ◊ 8 is in Even
Rule 2   8+2 = 10 ◊ 10 is in Even
Rule 2   10+2 = 12 ◊ 12 is in even
Hence Proved

Q2. Design an RD for Palindrome and prove that the word "aba" is in Palindrome.

ANS:

1.

"aba" is in palindrome.

2:

if x is palindrome, then s(x)Rev(s) and xx will also be palindrome, where s belongs to Σ^*

3:

No strings except those constructed in above, are allowed to be in palindrome.

Q3: Using RD for Polynomials prove that $5x^3 +4y^2 -5z+12$ is in Polynomial.

ANS:

Rule 1:   5 is in Polynomial
Rule 2:   x is in Polynomial
Rule 3:   5*x is in Polynomial

Rule 3: $5x^3$ is in Polynomial $5x^3$ is in Polynomial
Rule 1:   4 is in Polynomial
Rule 3:   y is in Polynomial
Rule 1:   4*y is in Polynomial
Rule 3: $4y^2$ is in Polynomial $5x^3+ 4y^2$ is in Polynomial
Rule 1:   5 is in Polynomial
Rule 2:   z is in Polynomial $5x^3+4y^2-5z$ is in Polynomial
Rule 1:   12 is in Polynomial
Rule 3: $5x^3+4y^2-5z+12$ is in Polynomial $5x^3+4y^2-5z+12$ is in Polynomial

Q4: Design an RD for Integers and prove that -4 is in Integers.

Step1:

-4 is in integer.

Step2:

If x is in INTEGER then x-4 are also in INTEGER.

Step3:

No strings except those constructed in above, are allowed to be in INTEGER.

Q5. Theorem: (Hint: Use RD for AE)

No AE can begin or end with the symbol /.

ANS:

By Rule-1:   / is not part of any number, so it cannot be included in an AE.

By Rule-2:   As x does not contain /, so as (x) or (-x) cannot contain /.

By Rule-3:   As neither x nor y can contain /, so any of the expressions defined by Rule-3 can also not contain /.

Therefore: the character / can never get into an AE.