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15)

1. L = {∑, a, b, aa, ab, ba, bb}

 ∑ + a + b + aa + ab + ba + bb

 (∑+a+b) (∑+a+b)

1. L = {0, 2, 4, 6}

 Using length 2

 ((a+b)(a+b)\*

1. L = a(a+b)\*a
2. L = a(a+b)\*b + b(a+b)\*a

16)

Regular expression are used for representing certain set of strings in an algebraic fashion

 i) The symbol **λ** and the pair ( ) are regular expression

 ii) Each letter A in ∑ is a regular expression

 iii) if r is a regular expression then r\* is a regular expression

 iv) if r1 and r2 are regular expression then r1r2 is a regular expression all regular expression are

 formed that way’

17)

i) A = {a, b} Let r = L(r)

ii) r = a\*

r = a a\*

a u b\*

(aub)\*

R = (aub)\*bb

18)

 i) Consists of all B’s including **λ** (ii) Consists of all positive powers of ‘a’ excluding the empty word

 iii) Consists of ‘a’ or any word in b (iv) The language consists of all words over the given alphabet

 v) It must end with bb (vi) It consists of words in a and b

19)

 i) L1 consists of words starting with one or more B followed by two or more A

 ii) L2 consists of words starting with one or more A followed by two or more B followed by

 one A

 iii) L3 consists of words starting with one A followed by one or more B

 iv) L1 = L(r) for all I = 1,2,3

 L1 = bb\*aaa\*

 L2 = aa\*bbb\*a

 L3 = abb\*

20)

 i) It is any set represented by a regular expression (ii) The set represented by R1R2 is the union of the sets represented by R1 and R2

21)

 i) {0}{1} are represented by 1 and 0 respectively. Therefore 0 is obtained by concatenating

 1,1, and 0

 ii) This is the union of {01} and {10} then we have 01+10 (iii) This is represented by abb+a+b+bba

 iv) Is also represented as **λ**+01 (v) represented as {a}\* regular expression for this set is a\*

 vi) this is the regular expression for the set a{a}\*

22)

 i) The set {abb,a,b,baa} is represented by abb+a+b+baa

 ii) {0}{1} are represented by 1 and 0 respectively. 0 is obtained by concatenating

 1,1,0

 iii) represented as {1}\* regular expression for this set is 1\*

23)

 i) A grammar is a 4-tuple such that G = (V, T, P, S)

 V= Finite non-empty set of non-terminal

 T= Finite set of terminal symbols

 P= Finite non-empty set of production rules

 S= Start symbol

 ii) A formal grammar is a set of rules, where as a formal language is a set of strings. A regular

 grammar is a formal grammar that describes a regular language

24)

 A sentential form is any derivable from the start symbol. Thus, in the derivation of

 E = E\*E = E\*(E) = E\* (E + E)