

## Assignment - 2

1.  $L = \{w \in \{0,1\}^* \mid \text{each string begin and ending with } 1\}$

→ Regular Expression:  $1(0/1)^*1$

2.  $L = \{w \in \{0,1\}^* \mid \text{each string ending with } 00\}$

→ Regular Expression:  $(0/1)^*00$

3.  $L = \{w \in \{0,1\}^* \mid \text{each string contain at least three consecutive } 1's\}$

→ Regular Expression:  $(0/1)^*111(0/1)^*$

4.  $L = \{w \in \{0,1\}^* \mid \text{each string contain at least three } 1's\}$

→ Regular Expression:  $(0/1)^*1(0/1)^*1(0/1)^*1(0/1)^*$

5.  $L = \{w \in \{0,1\}^* \mid \text{each string contain substring '110'}\}$

→ Regular Expression:  $(0/1)^*110(0/1)^*$

6.  $L = \{w \in \{0,1\}^* \mid \text{each string contain at least 3 character \& third character is } 0\}$

→ RE:  $(0/1)(0/1)0(0/1)^*$

7.  $L = \{w \in \{0,1\}^* \mid \text{each string has no. of } 0's \text{ is multiple of } 3 \text{ or divisible by } 3\}$

→ RE:  $(1^*01^*01^*01^*)^*$

8.  $L = \{w \in \{0,1\}^* \mid \text{each string contain starting and ending symbol is same}\}$

→ RE:  $0(0/1)^*0 \mid 1(0/1)^*1$

9.  $L = \{w \in \{0,1\}^* \mid \text{each string contain odd length}\}$

→ RE:  $(0/1)(0/1)^*(0/1)$

10.  $L = \{w \in \{0,1\}^* \mid \text{each string starting with } 0 \text{ and has odd length or starting with } 1 \text{ and has even length}\}$



→ RE :  $0(01)(01)^* / 1(01)(01)(01)^*$

11.  $L = \{w \in (0,1)^* \mid \text{each string contain even no. of 1's}\}$   
 → RE :  $(1^* 01^* 01^*)^*$

12.  $L = \{w \in (0,1)^* \mid \text{each string contain exactly two 1's}\}$   
 → RE :  $(0)^* 1(0)^* 1(0)^*$

13.  $L = \{w \in (0,1)^* \mid \text{each string length is at least 1 and at most 3}\}$   
 → RE :  $(01) / (01)(01) / (01)(01)(01)$

14.  $L = \{w \in (0,1)^* \mid \text{each string does not contain substring '110'}\}$   
 → RE :  $(01)^* ( ? / 110 ) (01)^*$

15. Design RE for a language, accepting all combination of a's except the null string over,  $\Sigma = \{a\}$   
 → RE :  $a^+$

16. Describe given RE in language from,  $RE = (a + ab)^*$   
 → The language consists of repetitions of a or ab.  
 • possible strings :  $\epsilon, a, ab, aa, aab, abab, aqa, ababab$ .

17.  $\Sigma = \{a, b\}^*$  such that third character from right end of the string is always 'a'.  
 → RE :  $(01)^* a (01)(01)$

18.  $\Sigma = \{0,1\}^*$  string that do not end with '01'.  
 →  $(01)^* (01) ( ? / 1 ) ?$

19.  $\Sigma = \{0,1\}^*$  string with odd no. of 1's.  
 →  $(0^* 10^* 1)^* 0^*$



20. Recognize language for given RE  $= (00+1)^*(10)^*$   
→ strings containing any combination of 00 and 1, followed by one or more 10.

21. Recognize language for given RE  $= 0001^*0^*11$   
→ strings that starts with 000, followed by any no. of 1's, followed by any no. of 0's, & ending with 11.

22. Design RE for  $L = \{w \in (a,b)^* \mid 'aa' \text{ is not a substring of any } w\}$   
→  $b^*(ab^*)^*$

23. Write a regular expression for all string  $\{0,1\}^*$  without two consecutive 0's  
→  $1^*(01^*)^*$

24. Design RE for  $L = \{w \in (0,1)^* \mid w \text{ end with 1 and does not contain substring '00'}\}$   
→  $(01)^*1$

25. Write RE for a string  $\Sigma = \{0,1\}^*$  with next to last symbol is '0'.  
→  $(0|1)^*0(0|1)$

26. string start with 'a' followed by any no. of b.  
→  $ab^*$

27. string contain only odd no. of a's.  
→  $b^*(ab^*ab^*)^*$

28. string must start end with 'a' in between any would using 'b'.  
→  $a(b^*)a$



29. Describe language from  $RE = a^*b^*$   
 $\rightarrow \epsilon, a, aa, aaa, b, bb, bbb, ab, aab, aabb$

30. Justify  $RE a^*b^*$  is equal to  $(ab)^+$ ?  
 $\rightarrow$  Not equal  
 $a^*b^*$  allows all a's before b's (ex: aaa, bbb, aaabb), but  $(ab)^+$  only allows repetitions of ab.

31.  $RE$  from  $L = \{a, c, ab, cb, abb, cbb, abbb, cbbb, \dots\}$   
 $\rightarrow (a/c)(b^+)$

32. Design  $RE$  from given set  $L = \{aaa, aab, aba, abb, baa, bab, bba, bbb\}$   
 $\rightarrow (a/b)(a/b)(a/b)$

33. Design  $RE$  from string which contain at least one 'a'.  
 $\rightarrow (0/1)^* a (0/1)^*$

34. At least one '0' followed by at least one '1' followed by at least one '2'.  
 $\rightarrow 0^+1^+2^+$

35. Describe language from given  $RE = (1+10)^+$   
 $\rightarrow$  strings formed by any no. of 1 or 10 sequences  
 ex:  $\epsilon, 1, 10, 11, 101, 110, 1010$

36.  $\Sigma = \{a, b\}^+$  string contain at least one a & one b  
 $\rightarrow (a/b)^* a (a/b)^* b (a/b)^*$

37. Design  $RE$  which represents the set of all strings of a's & b's containing at least one combination of double letters.  
 $\rightarrow (0/1)^+ ((00/11)(0/1)^+)^*$



38. If  $L = \{ \epsilon, x, xx, xxx, xxxx, \dots \}$  what is  $|L|$ ?  
→  $\infty$

39.  $\Sigma = \{a, b\}^*$  contain exactly one occurrence of double letter like  $aa$  or  $bb$ .  
→  $(a|b)^* (aa|bb) (a|b)^*$

40.  $\Sigma = \{a, b\}^*$  every string does not contain any occurrence of double letters.  
→  $(b|ab|ba|a)^*$

~~20/2~~

~~August 1~~