TOC

1. Give a regular expression over the alphabet { 0, 1} to denote the set of proper non-null substrings of the string 0110.

[GATE 1987]

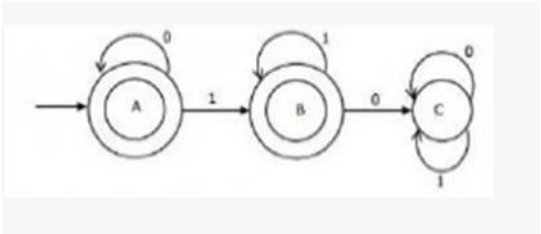
2. Choose the correct alternatives (more than one may be correct) and write the corresponding letters only.
Let $r = 1(1 + 0)^*, s = 11^* 0$ and $t = 1^* 0$ be three regular expressions. Which one of the following is true?
(A) $L(s) \subseteq L(r)$ and $L(s) \subseteq L(t)$
(B) $L(r) \subseteq L(s)$ and $L(s) \subseteq L(t)$
(C) $L(s) \subseteq L(t)$and $L(s) \subseteq L(r)$
(D) $L(t) \subseteq L(s)$ and $L(s) \subseteq L(r)$
(E) None of the above

[GATE 1991]

3. Choose the correct alternatives (more than one may be correct) and write the corresponding letters only:
Which of the following regular expression identities is/are TRUE?
(A) $r^{(*)} = r^*$
(B) $(r^* s^*) = (r + s)^*$
(C) $(r + s)^* = r^* + s^*$
(D) $r^* s^* = r^* + s^*$

[GATE 1992]

4. The regular expression for the language recognized by the finite state automaton of figure is _____



[GATE 1994]

5. In some programming language, an identifier is permitted to be a letter followed by any number of letters or digits. If L and D denote the sets of letters and digits respectively, which of the following expressions defines an identifier?
(A) $(L + D)^+$
(B) $(L. D)^*$
(C) $L(L + D)^*$
(D) $L(L. D)^*$

[GATE 1995], [ISRO 2017]

6. Which two of the following four regular expressions are equivalent? (ε is the empty string).
   i. $(00)^* (\varepsilon + 0)$
   ii. $(00)^*$
   iii. 0^*
   iv. $0(00)^*$
   (A) (i) and (ii)
   (B) (ii) and (iii)
   (C) (i) and (iii)
   (D) (iii) and (iv)

[GATE 1996]

7. Which one of the following regular expressions over {0, 1} denotes the set of all strings not containing 100 as substring?
   (A) $0^*(1 + 0)^*$
   (B) $0^*\ 1010^*$
   (C) $0^*\ 1^*\ 01^*$
   (D) $0^*\ (10 + 1)^*$

[GATE 1997]

8. The string 1101 does not belong to the set represented by
   (A) $110^*\ (0 + 1)$
   (B) $1(0 + 1)^*\ 101$
   (C) $(10)^*\ (01)^*\ (00 + 11)^*$
   (D) $(00 + (11)^*0)^*$

[GATE 1998]

9. If the regular set A is represented by $A = (01 + 1)^*$ and the regular set B is represented by $B = ((01)^*\ 1^*)^*$, which of the following is true?
   (A) $A \subset B$
   (B) $B \subset A$
   (C) A and B are incomparable
   (D) $A = B$

[GATE 1998]

10. Give a regular expression for the set of binary strings where every 0 is immediately followed by exactly k 1's and preceded by atleast k 1's (k is a fixed integer)

[GATE 1998]

11. Let S and T be languages over $\sum = \{a, b\}$ represented by the regular expressions $(a + b^*)^*$ and $(a + b)^*$, respectively. Which of the following is true?
(A) $S \subset T$
(B) $T \subset S$
(C) $S = T$
(D) $S \cap T = \emptyset$

[GATE 2000]

12. The regular expression $0^*(10^*)^*$ denotes the same set as
(A) $(1^*0)^*\ 1^*$
(B) $0 + (0 + 10)^*$
(C) $(0 + 1)^*\ 10(0 + 1)^*$
(D) None of the above

[GATE 2003]

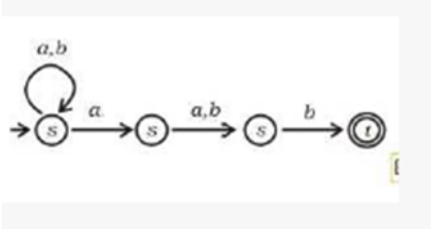
13. Which one of the following regular expressions is NOT equivalent to the regular expression $(a + b + c)^*$?
(A) $(a^* + b^* + c^*)^*$
(B) $(a^*b^*c^*)^*$
(C) $((ab)^* + c^*)^*$
(D) $(a^*b^* + c^*)^*$

[GATE 2004] [IT]

14. Which of the following statements is TRUE about the regular expression 01^*0?
(A) It represents a finite set of finite strings
(B) It represents an infinite set of finite stings.
(C) It represents a finite set of infinite strings.
(D) It represents an infinite set of infinite strings.

[GATE 2005]

15. Which regular expression best describes the languages accepted by the non-deterministic automaton below?



(A) $(a + b)^*\ a\ (a + b)b$
(B) $(abb)^*$
(C) $(a + b)^*\ a(a + b)^*\ b(a + b)^*$
(D) $(a + b)^*$

[GATE 2006]

16. Consider the regular expression $R = (a + b)^* (aa + bb)(a + b)^*$
Which one of the regular expressions given below defines the same language as defined by the regular expression R ?
(A) $(a(ba)^* + b(ab)^*)(a + b)^+$
(B) $(a(ba)^* + b(ab)^*)^*(a + b)^*$
(C) $\big(a(ba)^*(a + bb) + b(ab)^*(b + aa)\big)(a + b)^*$
(D) $\big(a(ba)^*(a + bb) + b(ab)^*(b + aa)\big)(a + b)^+$

[GATE 2007][IT]

17. Which of the following regular expressions describes the language over {0,1} consisting of strings that contain exactly two 1's?
(A) $(0 + 1)^* 11(0 + 1)^*$
(B) $0^* 110^*$
(C) $0^* 10^* 10^*$
(D) $(0 + 1)^* 1(0 + 1)^*1(0 + 1)^*$

[GATE 2008][IT]

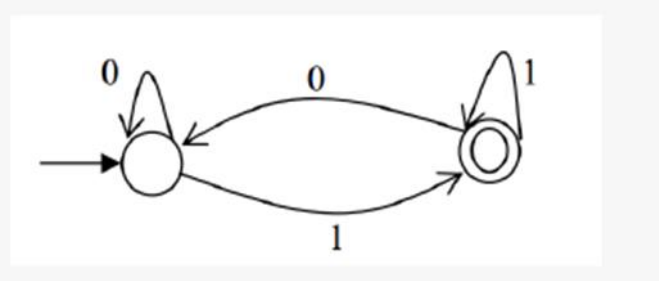
18. Which one of the following languages over the alphabet $\{0, 1\}$ is described by the regular expression: $(0 + 1)^* 0(0 + 1)^*0(0 + 1)^*$?
(A) The set of all strings containing the substring 00
(B) The set of all strings containing at most two 0's
(C) The set of all strings containing at least two 0's
(D) The set of all strings that begin and end with either 0 or 1

[GATE 2009]

19. Let $L = \{w \in (0 + 1)^* | \text{ w has even number of 1s}\}$. i.e., L is the set of all the bit strings with even numbers of 1s. Which one of the regular expressions below represents L?
(A) $(0^* 10^* 1)^*$
(B) $0^* (10^* 10^*)^*$
(C) $0^* (10^* 1)^* 0^*$
(D) $0^*1(10^*1)^* 10^*$

[GATE 2010]

20. Which of the regular expressions given below represents the following DFA?



I. $0^*\,1(1+00^*1)^*$
II. $0^*1^*1+11^*\,0^*\,1$
III. $(0+1)^*\,1$
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

[GATE 2014]

21. The length of the shortest string NOT in the language (over $\sum = \{a, b\}$) of the following regular expression is _____.

$$a^*\,b^*\,(ba)^*a^*$$

[GATE 2014]

22. Which one of the following regular expressions represents the language: the set of all binary strings having two consecutive
0's and two consecutive 1's?
(A) $(0+1)^*\,0011(0+1)^*+(0+1)^*1100(0+1)^*$
(B) $(0+1)^*(00(0+1)^*11+11(0+1)^*00)\,(0+1)^*$
(C) $(0+1)^*00(0+1)^*+(0+1)^*11(0+1)^*$
(D) $00(0+1)^*\,11+11(0+1)^*00$

[GATE 2016]