

Q.13 Which one of the following is CORRECT?

GATE 2014

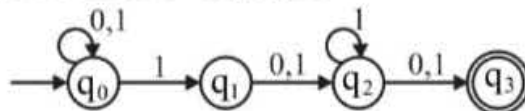
(A) The language $L = \{a^n b^n \mid n \geq 0\}$ is regular.

(B) The language $L = \{a^n \mid n \text{ is prime}\}$ is regular

(C) The language $L = \{w \mid w \text{ has } 3k+1 \text{ b's for some } k \in \mathbb{N} \text{ with } \Sigma = \{a, b\}\}$ is regular.

(D) The language $L = \{ww \mid w \in \Sigma^* \text{ with } \Sigma = \{0,1\}\}$ is regular.

Q.14 Consider the finite automaton in the following figure.



What is the set of reachable states for the input string 0011?

GATE 2014

(A) $\{q_0, q_1, q_2\}$

(B) $\{q_0, q_1\}$

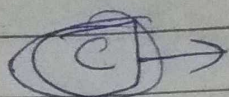
(C) $\{q_0, q_1, q_2, q_3\}$

(D) $\{q_3\}$

13 ⇒

True ?

C



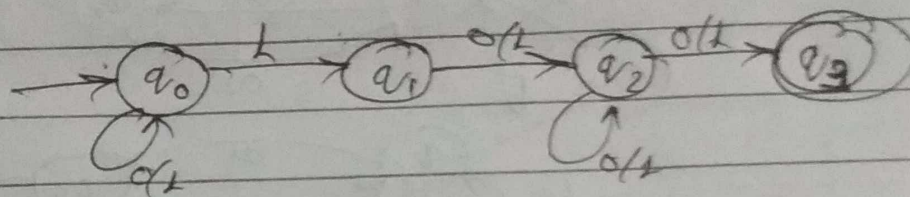
$$L = \{w \mid w \text{ has } (3k+1) \text{ b's}\}$$

Y

$$a^*b(a^*ba^*ba^*b)^+a^* \rightarrow \text{Regular}$$

14 ⇒

A



~~no~~ i/p → 00LL

0 → q0

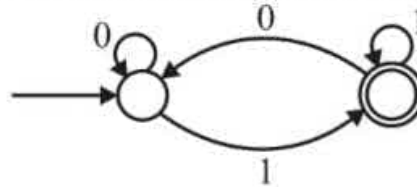
00 → q0

00L → q1

00LL → q2

A {q0, q1, q2}

Q.15 Which of the regular expression given below represent the following DFA?



1. $0^*1(1+00^*1^*)^*$
2. $0^*1^*1+11^*0^*1$
3. $(0+1)^*1$

(A) 1 and 2 only

(B) 1 and 3 only

(C) 2 and 3 only

(D) 1, 2, and 3

GATE 2014

Q.16 If $L_1 = \{a^n | n \geq 0\}$ and $L_2 = \{b^n | n \geq 0\}$, consider

(i) $L_1 \cdot L_2$ is a regular language

(ii) $L_1 \cdot L_2 = \{a^n b^n | n \geq 0\}$

Which one of the following is CORRECT?

(A) Only (i)

(B) Only (ii)

(C) Both (i) and (ii)

(D) Neither (i) nor (ii)

GATE 2014

Q.17 If s is a string over $(0+1)^*$ then let $n_0(s)$ denote the number of 0's in s and $n_1(s)$ the number of 1's in s .

Which one of the following languages is not regular?

GATE 2006

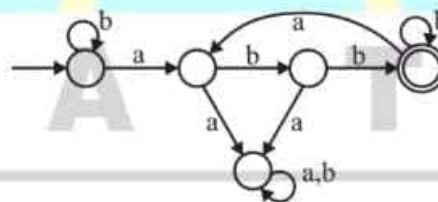
(A) $L = \{s \in (0+1)^* | n_0(s) \text{ is a 3 digit prime}\}$

(B) $L = \{s \in (0+1)^* | \text{for every prefix } s' \text{ of } s, |n_0(s') - n_1(s')| \leq 2\}$

(C) $L = \{s \in (0+1)^* | n_0(s') - n_1(s) \leq 4\}$

(D) $L = \{s \in (0+1)^* | n_0(s) \bmod 7 = n_1(s) \bmod 5 = 0\}$

Q.18 Consider the machine M :



The language recognized by M is :

GATE 2005

(A) $\{w \in \{a,b\}^* | \text{every } a \text{ in } w \text{ is followed by exactly two } b's\}$

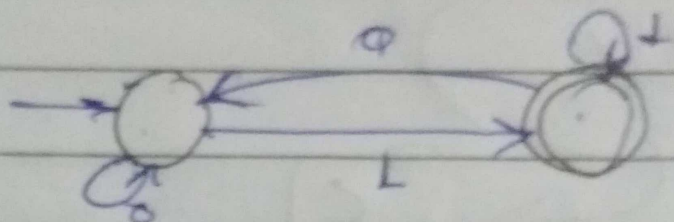
(B) $\{w \in \{a,b\}^* | \text{every } a \text{ in } w \text{ is followed by at least two } b's\}$

(C) $\{w \in \{a,b\}^* | w \text{ contains the substring 'abb'}\}$

(D) $\{w \in \{a,b\}^* | w \text{ does not contain 'aa' as a substring}\}$

153

B



✓ (1) $0^* 1 (1 + 00^* 1^*)^* -$

X (2) $0^* 1^* 1 + 1^* 0^* 1$

✓ (3) $(0 + 1)^* 1$

(B) is of III only

L67

$$L_1 = \{a^n \mid n \geq 0\}$$

$$L_2 = \{b^n \mid n \geq 0\}$$

(A)

(i) $L_1 \cdot L_2 \rightarrow \text{regular}$

(ii) $L_1 \cdot L_2 = \{a^n b^n \mid n \geq 0\}$

(A) only ∇

L78

string — $(0+1)^*$

$n_0(S) \rightarrow 0's$ (Total)

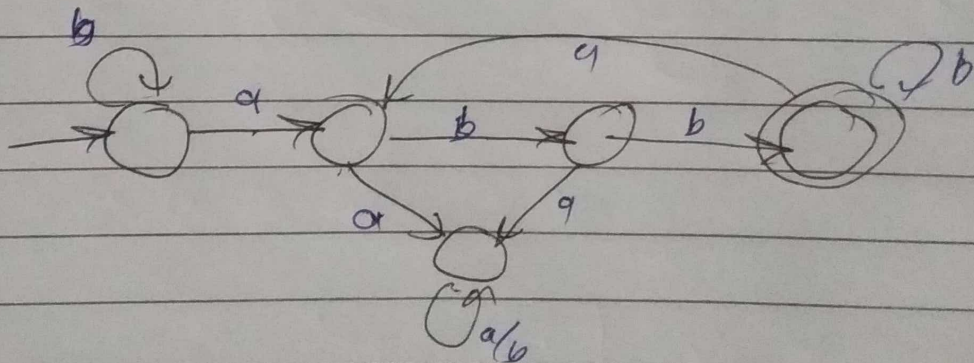
$n_1(S) \rightarrow 1's$ (Total)

(C)

Not Regular

$$L = \{s \in (0,1)^* \mid n_0(s) - n_1(s) \leq 2\}$$

\rightarrow not regular

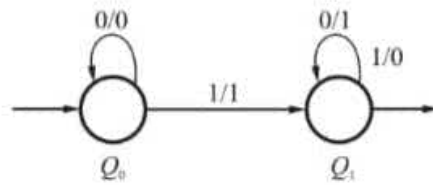


L87

(B)

$$(C) \rightarrow \{w \in \{a,b\}^* \mid w \text{ contain substring 'abb'}\}$$

Q.19 The following diagram represents a finite state machine which takes as input a binary number from the least significant bit.

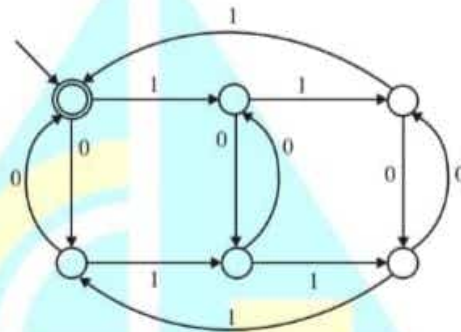


Which one of the following is TRUE?

GATE 2005

- (A) It computes 1's complement of the input number
- (B) It computes 2's complement of the input number
- (C) It increments the input number
- (D) It decrements the input number

- Q.20** The following finite state machine accepts all those binary strings in which the number of 1's and 0's are respectively GATE 2004



- (A) Divisible by 3 and 2
- (B) Odd and even
- (C) Even and odd
- (D) Divisible by 2 and 3

- Q.21** Let S and T be languages over $\Sigma = \{a, b\}$ represented by the regular expressions $(a + b^*)^*$ and $(a + b)^*$, respectively. Which of the following is true? GATE 2000

- (A) $S \subset T$
- (B) $T \subset S$
- (C) $S = T$
- (D) $S \cap T = \phi$

- Q.22** Consider the DFAs M and N given above. The number of states in a minimal DFA that accepts the language $L(M) \cap L(N)$ is _____. GATE 2015



- (A) 0
- (B) 1
- (C) 2
- (D) 3

- Q.23** Which of the following languages is /are regular? GATE 2015

$L_1 : \{wxw^R \mid w, x \in \{a, b\}^*, |w|, |x| > 0, w^R \text{ is the reverse of string } w\}$

$L_2 : \{a^n b^m \mid m \neq n \text{ and } m, n \geq 0\}$

$L_3 : \{a^p b^q c^r \mid p, q, r \geq 0\}$

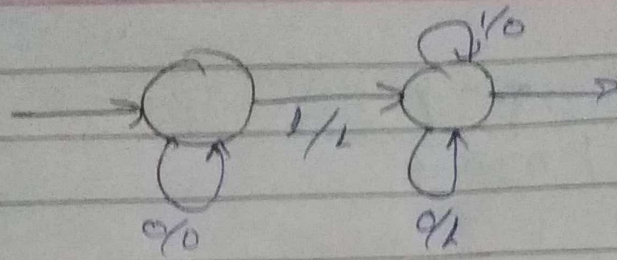
- (A) L_1 and L_3 only
- (B) L_2 only
- (C) L_2 and L_3 only
- (D) L_3 only

- Q.24** The number of states in the minimal deterministic finite automaton corresponding to the regular expression $(0 + 1)^*(10)$ is _____ GATE 2015

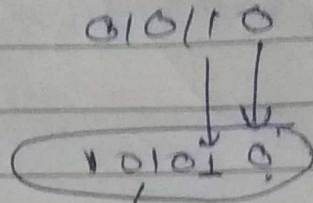
- (A) 2
- (B) 3
- (C) 4
- (D) 5

193

B



i/p →



→ 2's complement

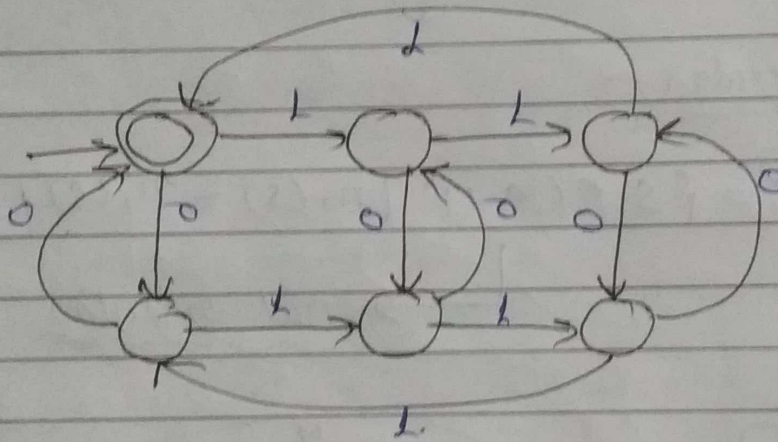
i/p	o/p
0	0
1	1
1	0
0	1

B

2's complement of the i/p

203

A



i/p - 111 → ~~for~~ accepted.
11111 → accepted

A

→ divisible by 3 & 2

21)

RE

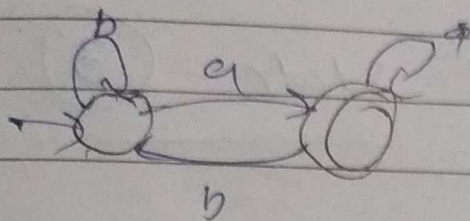
$(a+ab^*)$

\downarrow
S

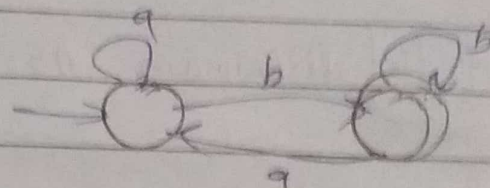
$\& (a+ab)^*$
 \downarrow
T

$\boxed{C} \quad S = T$

22)

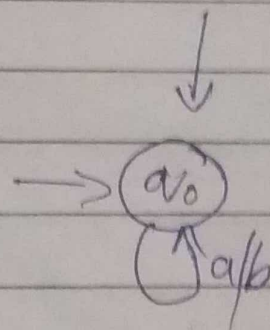


\boxed{M}



\boxed{N}

$$L(M) \cap L(N) = (a+ab)^*a \cap (a+ab)^*b = (a+ab)^*$$



$\boxed{B} \rightarrow L$

23)

Regular?

$L_1: \{w x w^R \mid w, x \in (a, b)^+ \mid |w|, |x| \geq 0\}$

$L_2: \{a^n b^m \mid m \neq n \& m, n > 0\}$

$L_3: \{a^p b^q c^r \mid p, q, r \geq 0\}$

$\boxed{A} \rightarrow L_1 \& L_3$ are Regular.

Teacher's Signature

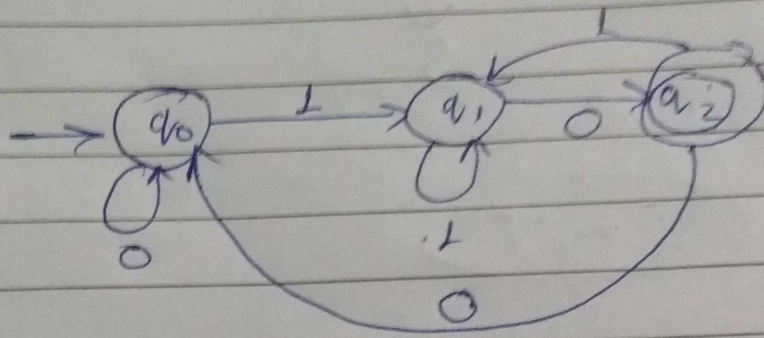
29-8

$RG = (0 + 1)^* (10)$

state (No.) = ?

(B)

Solⁿ



(B) \Rightarrow Minimum no. of state = (3)