Q.37 Which of the following languages is (are) non-regular?

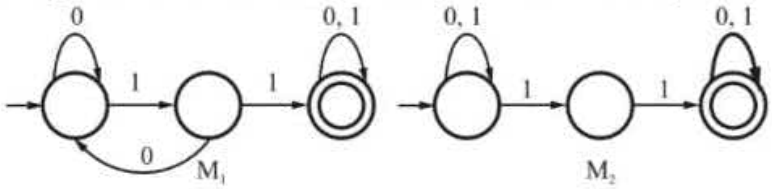
$L_1 = \{0^m1^n \mid 0 \leq m \leq n \leq 10000\}$

$L_2 = \{w \mid w$ reads the same forward and backward$\}$

$L_3 = \{w \in \{0, 1\}^* \mid w$ contains an even number of 0's and an even number of 1's$\}$ **GATE 2008**

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

Q.38 Consider the following two finite automata. M_1 accepts L_1 and M_2 accepts L_2.



Which one of the following is TRUE? **GATE 2008**

(A) $L_1 = L_2$ (B) $L_1 \subset L_2$ (C) $L_1 \cap L_2' = \emptyset$ (D) $L_1 \cup L_2 \neq L_1$

Q.39 Consider the Following regular expressions

r1 = 1(0 + 1)*

r2 = 1(1 + 0)$^+$

r3 = 11*0

What is the relation between the languages generated by the regular expressions above ?

***MOCK GATE 2017**

(A) L (r1) ⊆ L (r2) and L(r1) ⊆ L(r3) (B) L (r1) ⊇ L (r2) and L(r2) ⊇ L(r3)

(C) L (r1) ⊇ L (r2) and L(r2) ⊆ L(r3) (D) L (r1) ⊇ L (r3) and L(r2) ⊆ L(r1)

Q.40 Consider regular expression r, where r = (11 + 111)* over Σ = {0, 1}. Number of states in minimal NFA and DFA respectively are: ***MOCK GATE 2017**

(A) NFA – 3, DFA – 4 (B) NFA – 3, DFA – 3

(C) NFA – 3, DFA – 3 (D) NFA – 4, DFA – 4

Q.41 Let, init (L) = {set of all prefixes of L}, Let L = {w | w has equal number of 0's and 1's}. init (L) will contain: **GATE 1996**

(A) all binary strings with unequal number of 0's and 1's

(B) all binary strings with ε-string

(C) all binary strings with exactly one more 0's than number of 1's

(D) None of above

Q.42 Consider the regular expression (0+1)(0+1)… n times. The minimum state finite automaton that recognizes the language represented by this regular expression contains: **GATE 1999**

(A) n states (B) n+1 states (C) n+2 states (D) None of the above

Q.43 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 ? **GATE 1998**

(A) A ⊂ B (B) B ⊂ A

(C) A and B are incomparable (D) A = B

Q.44 The string 1101 does not belong to the set represented by **GATE 1998**

(A) 110* (0+1) (B) 1(0+1)* 101

(C) (10)* (01)* (00+11)* (D) (00+(11)*0)*

Q.45 Let L be the set of all binary strings whose last two symbols are same. The number of states in the minimal state deterministic finite-state automaton accepting L is **GATE 1998**

(A) 2 (B) 5 (C) 8 (D) 3

Q.46 Which of the following statement is false? **GATE 2007**

(A) Every finite subset of a non-regular set is regular

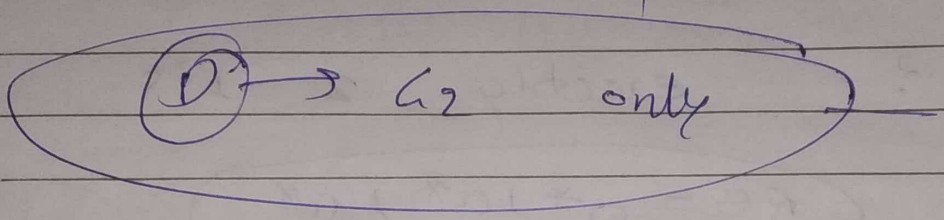
(B) Every subset of a regular set is regular

(C) Every finite subset of a regular set is regular

(D) The intersection of two regular sets is regular

37→ non-regular ?

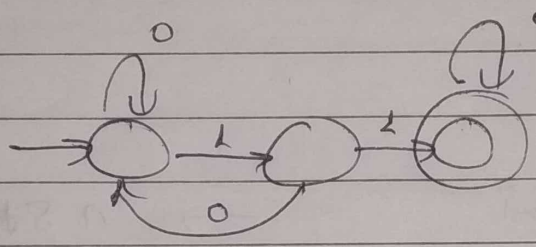
(D) L_2 is non-regular.
It is CFG.
$S \to aSa \mid \cdots \mid SZ \mid$



38→

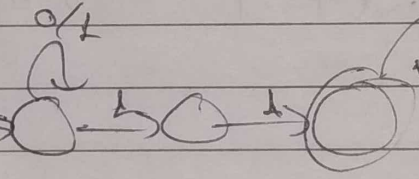
A → C

$L_1 \Rightarrow$



$\Rightarrow M_1$

$L_2 \Rightarrow$



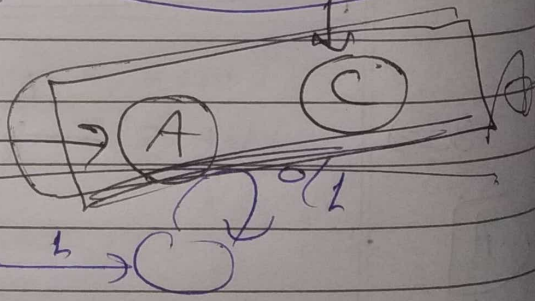
$\Rightarrow M_2$

M_1 accept L_1
also M_2 accept L_2

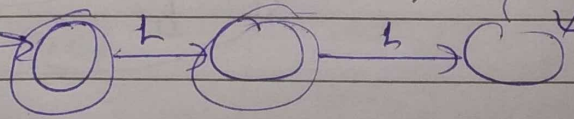
$M_1 = M_2$

Set $L_1 = L_2$

$L_1 \wedge L_2' = \phi$



M_2'



accept L_2'

L_2

with ε → $r_1 = 1(0+1)^*$ | $L(r_1) = \{10, 11, 1 \ldots\}$

without ε → $r_2 = 1(1+0)^*$ | $L(r_2) = \{10, 11 \ldots\}$

$r_3 = 11^*0$ | $L(r_3) = \{110, 1110, 10 \ldots\}$

39 ⇒

r_1 can generate r_2 & r_3

r_2 can generate r_3

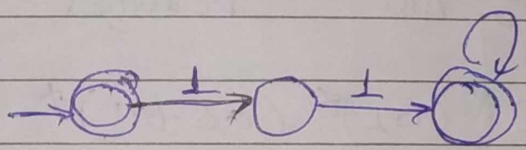
$L(r_1) \supseteq L(r_2)$ & $L(r_1) \supseteq L(r_3)$

$L(r_2) \supseteq L(r_3)$ ~~$L(r_2) \subseteq L(r_3)$~~

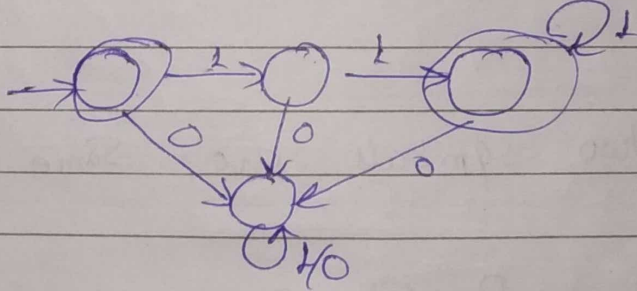
40 ⇒ $R = (11+111)^*$ $\Sigma = \{0, 1\}$

(A)

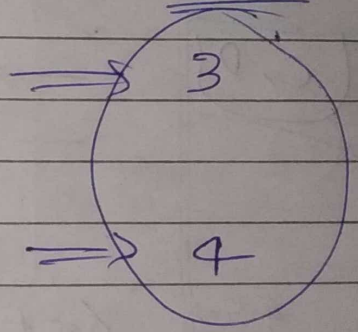
NFA



DFA



States



41 ⇒

(B) $L = \{w | w$ has equal number of 0's & 1's$\}$

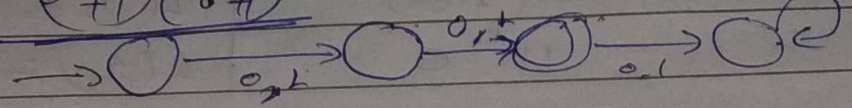
$init(L) = \{$set of all predix of $L\}$, init(L) contain

(A) ~~Set of~~ all binary strings with ε - string

42⇒ RE = (0+1)(0+1)---n times , minimum state = ?

(B)

For $\overbrace{(0+1)(0+1)}$



(B) → Total (n+1) states required

43⇒ A = (01+1)* , B = ((01)*1*)*

(D)

(D) → A = B

44⇒ 1101 does not belongs -

(C, D)

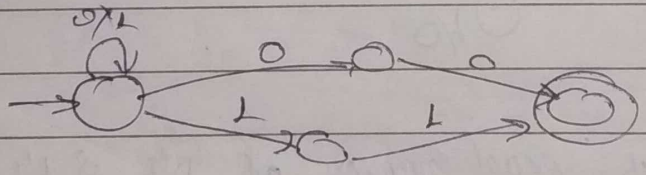
→ (10)*(01)*(00+11)*

→ (00+(11)*0)*

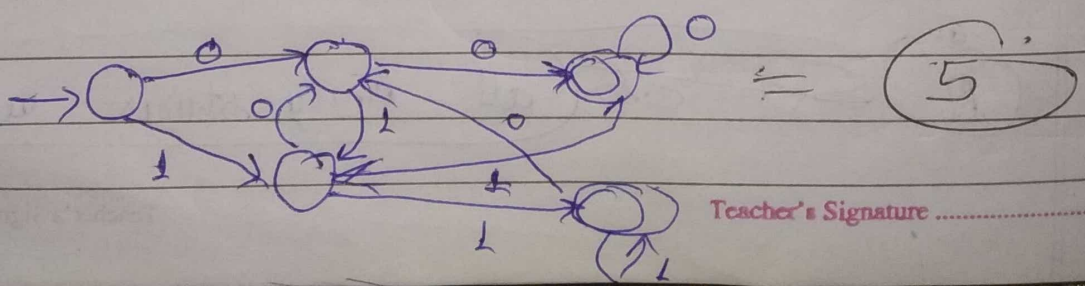
45⇒ Last two symbols are Same.

(B)

NFA



DFA



= 5

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96) False ?

(B) (B) → Every subset of a regular set is regu

Q.47 Which one of the following regular expressions over {0, 1} denotes the set of all strings not containing 100 as a substring? **GATE 1997**

(A) 0* (1+0)* (B) 0*1010* (C) 0*1*01* (D) 0*(10+1)*

Q.48 Which two of the following four regular expressions are equivalent? (ε is the empty string).

(i). (00)*(ε+0)

(ii). (00)*

(iii). 0*

(iv). 0(00)* **GATE 1996**

(A) (i) and (ii) (B) (ii) and (iii) (C) (i) and (iii) (D) (iii) and (iv)

Q.49 Let $L \subseteq \sum^*$ where $\sum = \{a, b\}$. Which of the following is true ? **GATE 1996**

(A) L = { x | x has an equal number of *a*'s and *b*'s } is regular

(B) L = { $a^n b^n$ | n ≥ 1 } is regular

(C) L = { x | x has more *a*'s than *b*'s } is regular

(D) L = { $a^m b^n$ | m ≥ 1, n ≥ 1 } is regular

Q.50 Consider the following languages :

(I) $\{a^n b^m \mid n > m \vee n < m\}$

(II) $\{a^n b^m \mid n \geq m \vee n \leq m\}$

(III) $\{a^n b^m \mid n > m \wedge n < m\}$

(IV) $\{a^n b^m \mid n \geq m \wedge n \leq m\}$

Which of the following languages are regular? **MOCK GATE 2018**

(A) Only (I) and (IV) (B) Only (II) and (III)

(C) Only (II), (III) and (IV) (D) None of the above

Q.51 A regular expression is ambiguous when there exists a string which can be constructed in two different ways from the regular expression. Which of the following regular expressions are unambiguous? **MOCK GATE 2018**

(A) a((ab)*cd)* ∪ a(ababcb*)*a* (B) aab*(ab)* ∪ ab* ∪ a*bba*

(C) aaba* ∪ aaaba ∪ aabba* ∪ a (D) None of these

Q.52 Let δ denote the transition function and α denote the extended transition function of the ε – NFA whose transition table is give below :

δ	ε	a	b
→ q_0	$\{q_2\}$	$\{q_1\}$	$\{q_0\}$
q_1	$\{q_2\}$	$\{q_2\}$	$\{q_3\}$
q_2	$\{q_0\}$	ϕ	ϕ
q_3	ϕ	ϕ	$\{q_2\}$

Then $\alpha(q_2, aba)$ is **GATE 2017**

(A) ϕ (B) $\{q_0, q_2, q_3\}$ (C) $\{q_0, q_1, q_2\}$ (D) $\{q_0, q_2, q_3\}$

47⇒ not contain 100

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

48⇒ RE are equivalent -

(c) (i) $(00)^*(\varepsilon+0) = (00)^*.\varepsilon + (00)^*.0 = 0^*$

(ii) $(00)^*$

(iii) 0^* $= 0^*$

(iv) $0(00)^*$

(c) (i) & (iii) are equivalent.

49⇒ $L \subseteq \Sigma^*$, $\Sigma = \{a, b\}$, true?

(d) (p) → $L = \{a^m b^m \mid m \geq 1, n \geq 1\}$ is regular.

Regular ?

50 ⇒ (B)

(I) $\{a^n b^m \mid n > m, \vee n < m\}$

(II) $\{a^n b^m \mid n \geq m, \vee n \leq m\}$

(III) $\{a^n b^m \mid n > m \wedge n < m\}$

(IV) $\{a^n b^m \mid n \geq m \wedge n \leq m\}$

(B) → II & III

51 ⇒ RE are unambiguous ?

(C) → (C) → aaba* ∪ aaaba ∪ aabba* ∪ a

52 ⇒ (C)

δ	ε	a	b
→q_0	$\{q_2\}$	$\{q_1\}$	$\{q_0\}$
q_1	$\{q_2\}$	$\{q_2\}$	$\{q_3\}$
q_2	$\{q_0\}$	ϕ	ϕ
q_3	ϕ	ϕ	$\{q_2\}$

$Q(q_2, aba) = \{$

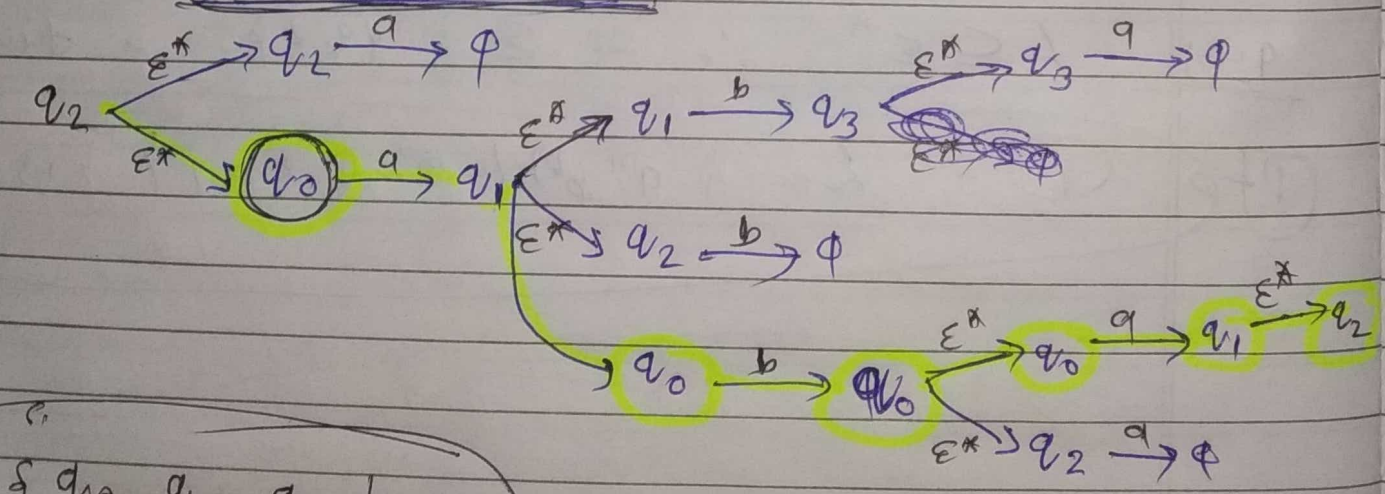
$\varepsilon^* q_0 = \{q_0 q_2\}$

$\varepsilon^* q_1 = \{q_1 q_2 q_0\}$

$\varepsilon^* q_2 = \{q_2 q_0\}$

$\varepsilon^* q_3 = \{q_3\}$

$\varepsilon^* a \varepsilon^* b \varepsilon^* a$



$\{q_0, q_1, q_2\}$

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