

OVERALL ANALYSIS

Solution Report

All

Correct Answers

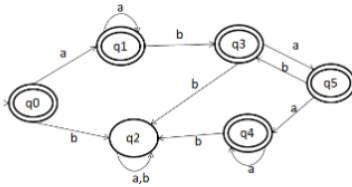
Wrong Answers

Not Attempted Questions

Q.1)

Max Marks: 1

Consider the following deterministic finite automata.



The number of states in an equivalent minimal finite automata is _____

A

4

B

5

C

6

Correct Option

Solution: (C)

Answer: C

Explanation:

Initially $\Pi = \{\{q_2\}, \{q_0, q_1, q_3, q_4, q_5\}\}$.By applying new_partition to this Π , $\Pi_{\text{new}} = \{\{q_2\}, \{q_0, q_3, q_4\}, \{q_1, q_5\}\}$ is obtained.Applying new_partition to this Π , $\Pi_{\text{new}} = \{\{q_2\}, \{q_0, q_3\}, \{q_4\}, \{q_1\}, \{q_5\}\}$ is obtained.Applying new_partition again, $\Pi_{\text{new}} = \{\{q_2\}, \{q_0\}, \{q_3\}, \{q_4\}, \{q_1\}, \{q_5\}\}$ is obtained.

Thus the number of states of the given DFA is already minimum and it can not be reduced any further.

D

None of these

Q.2)

Max Marks: 1

The minimum number of states in a DFA that accepts the language $L = \{1^n 0^m \mid n + m \text{ is an odd positive integer}\}$.

A

4

B

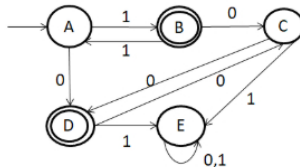
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Correct Option

Solution: (B)

Answer: B

Explanation:

Given language $L = \{1^n 0^m \mid n + m \text{ is an odd positive integer}\}$.Possible strings = $\{0, 1, 111, 000, 100, 110, \dots\}$ Odd number = $\{\text{odd} + \text{even}, \text{even} + \text{odd}\}$ 

C

6

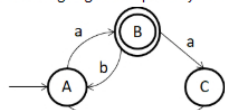
D

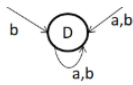
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Q.3)

Max Marks: 1

The language accepted by the given DFA is





- A** Contains all strings of a's and b's such that every string starts and ends with a
- B** Contains all strings of a's and b's such that every string contains a substring ab
- C** Contains all strings of a's and b's such that every string ends with ba
- D** None of these

Correct Option

Solution: (D)

Answer: D

Explanation:

Option A: Contains all strings of a's and b's such that every string starts and ends with a : False

The strings aa,aaa are starts and ends with a, but not accepted by the DFA

Option B: Contains all strings of a's and b's such that every string contains a substring ab False. The string 'a' is accepted by the DFA which does not contain the substring ab.

Option C: Contains all strings of a's and b's such that every string ends with ba. The string 'a' is accepted by the DFA which does not end with ba.

Q.4)

Max Marks: 1

The number of eight-bit strings beginning with either 100 or 111 is _____

Correct Answer

Solution: (64)

Answer: 64

Number of 8-bit strings beginning with 111 are 32. First 3 bits are fixed and the remaining 5 bits can be 0 or 1. So the total combinations are $2^5=32$. Same is the case with the strings starting with 101. So the total number of strings are $32+32=64$.

Q.5)

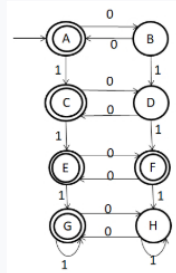
Max Marks: 1

The minimum number of states in a DFA that accepts the language $L = \{w/w \text{ contains an even number of 0's, or exactly two 1's.}\}$

- A** 5
- B** 6
- C** 7
- D** 8

Correct Option

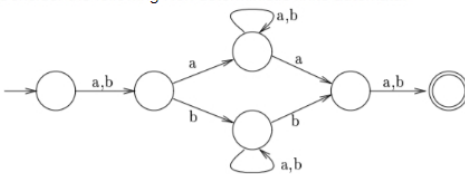
Solution: (D)



Q.6)

Max Marks: 1

Consider the following Non deterministic finite automata.



The language accepted by the given NFA is

- A** Language L contains all strings of a's and b's such that every string contains a substring aa or bb.
- B** Language L contains all strings of a's and b's such that every string contains a substring aa or bb and first and last character is same.
- C** Language L contains all strings of a's and b's such that every string contains the second character is equal to the second last character is same and the length of the string is exactly 4.

Correct Option

D

Language L contains all strings of a's and b's such that every string contains the second character is equal to the second last character is same and the length of the string is at least 4.

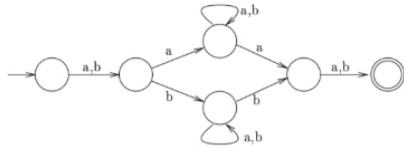
Correct Option

Solution: (D)

Answer: D

Explanation:

Given NFA is



The strings that are accepted by the given NFA is

{aaaa, aaab, baab, bbbb, abba, abbb, baab, baaa, aaababab,}

Every string contains the minimum length 4 and second symbol, second last symbol is same.

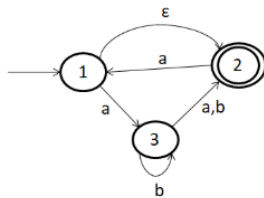
Option A: Contains aa or bb as substring. But aa or bb are not accepted by the NFA.

Option B: Incorrect, The NFA accepts the strings like aaab, baaa, abbb, ... etc

Option C: Incorrect, NFA accepts strings of length ≥ 4

Q.7)

Max Marks: 1

The minimum number of states in a DFA that is equivalent to the given ϵ -NFA

A

3

B

4

Correct Option

Solution: (B)

Answer: 4

Explanation:

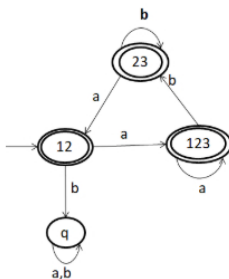
E-closure(1) = {1, 2}

Make {1, 2} as the initial state in DFA

	a	b
1	3	Φ
2	{2, 1}	Φ

	a	b
1	3	Φ
2	{2, 1}	Φ
3	2	{2, 3}

	a	b
2	1	Φ
3	2	{2, 3}



C

5

D

None of these

Q.8)

Max Marks: 1

Which of the following equivalences are True

A $\Phi^* = \Phi$ B $\Phi^* = \epsilon$

Correct Option

Solution: (B)

Answer: B

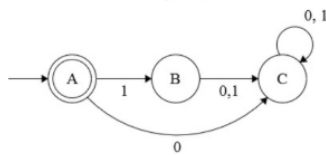
Explanation:

 $\Phi^* = \{\epsilon\}$ Option A: $\Phi^* = \Phi$ FalseOption B: $\Phi^* = \epsilon$ TrueOption C: $\Phi \cdot \epsilon = \epsilon$ False Concatenation of any string including ϵ with Φ is Φ only.Option D: $\epsilon^* = \Phi$ False $\epsilon^* = \epsilon$ C $\Phi \cdot \epsilon = \epsilon$ D $\epsilon^* = \Phi$

Q.9)

Max Marks: 1

Consider the following DFA



The language that accepted by the complement of the given DFA is

A ϵ B $(0+1)^*$ C $(0+1)^+$

Correct Option

Solution: (C)

Answer: C

Its accepting string is only $\{\epsilon\}$

Compliment of it is

 $(1+0+1(0+1))(0+1)^* = (1+0+(10+11))(0+1)^*$

Regular expression accepted by it

 $1(0+1)^* + 0(0+1)^* + (10+11)(0+1)^* = (0+1)^*$ So accepting everything other than $\{\epsilon\}$ over alphabet $\{0,1\}$

D None of these

Q.10)

Max Marks: 1

Let L be the language $L = \{w \in \{0,1\}^* \mid w \in \{0\}^* \text{ or } w \in \{1\}^*\}$. Then the minimum number of states in a DFA that accepts the given language L is _____

A 1

B 2

C 3

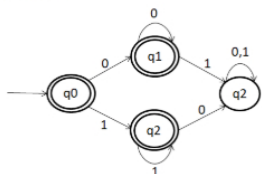
D 4

Correct Option

Solution: (D)

Answer: 4

Explanation:



Q.11)

Max Marks: 2

Number of states in DFA for the language $L = \{ w \in \Sigma^* \mid n_a(w) \geq 2, n_b(w) \leq 1 \}$ is _____

Correct Answer

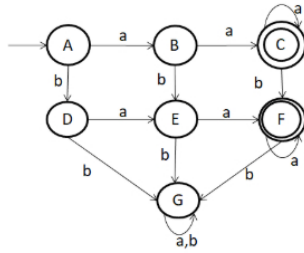
Solution: (7)

Answer: 7

Number of a's are at least 2 and b's are at most 1

Possible strings in the language = {aa, aaa, aba, baa, aab, aaab, abaa,}

If we are getting more than one b DFA will enter into the Dead state.



Q.12)

Max Marks: 2

Consider the following finite state machines M1 and M2.



The language accepted by the deterministic finite state machine which accepts the language L contains the intersection of M1 and M2.

- ☒ A The language contains all the strings of a's and b's where each string contains number of b's divisible by 3
- ☐ B The language contains all the strings of a's and b's where each string contains number of a's divisible by 3
- ☐ C The language contains all the strings of a's and b's where each string contains either number of a's divisible by 3 or either number of b's divisible by 3
- ☒ D The language contains all the strings of a's and b's where each string contains number of a's divisible by 3 and number of b's divisible by 3

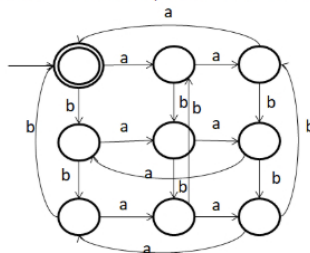
Correct Option

Solution: (D)

Answer: D

Explanation:

The resultant DFA that accepts the intersection of both M1 and M2 is



The language contains all the strings of a's and b's where each string contains number of a's divisible by 3 and number of b's divisible by 3

Q.13)

Max Marks: 2

The number of final states in a DFA that accepts the language $L = \{ w \mid w \text{ is any string except } 11 \text{ and } 111 \}$

- ☒ A 1
- ☐ B 2
- ☒ C 3

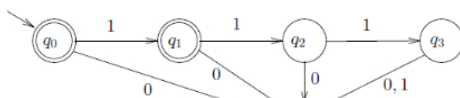
Correct Option

Solution: (C)

Answer: C

Explanation:

The possible strings in the language = $\{ \epsilon, 0, 1, 10, 00, 01, 000, 001, 100, 101, \dots \}$





D

4

Q.14)

Max Marks: 2

Number of states in a minimal DFA that accepts all strings whose binary value (e.g.: 101 is '5') is divisible by 5, but not by 10.

Correct Answer

Solution: (6)

DFA that accepts all binary strings that are divisible by 5, but not by 10 is

The numbers that are divisible by 5 but not divisible by 10 is {5,15,25,35,45,.....}

= {101,1111,11001,100011,.....}

Transition table: q0 is the initial state and q5 is the final state

	0	1
→ q0	q0	q1
q1	q2	q3
q2	q4	q5
q3	q6	q7
q4	q8	q9
*q5	q0	q1
q6	q2	q3
q7	q4	q5
q8	q6	q7
q9	q8	q9

After applying the minimization

	0	1
→ q0	q0	q16
q16	q27	q38
q27	q49	q5
q38	q16	q27
q49	q38	q49
*q5	q0	q16

Minimum number of states in the DFA is 6

Q.15)

Max Marks: 2

Minimum number of states in a DFA that accepts all the strings that either begin or end (or both) with 01 over the alphabet {0,1}

A

3

B

4

C

5

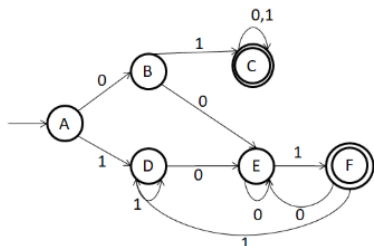
D

6

Correct Option

Solution: (D)

Valid strings in the language = {01,010,001,101,0101,0111101,.....}



close