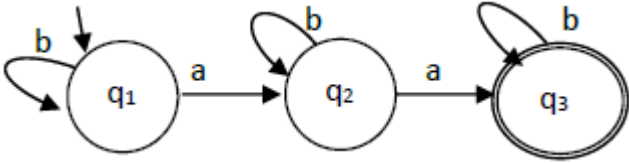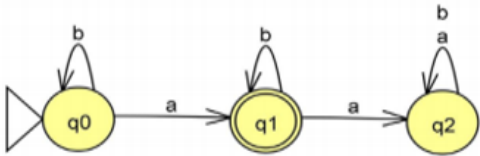| Automata – Revision (1) – 2021 - Set Operations |
|---|

1.	**Example(1)** Let: U = { a, b, c, d, e, f, g, h, i, j}, A = {a, b, c}, B = {a, f, g}, C = {h, i, f}, Find:

- A U B = {a, b, c, f, g}
- A ∩ C = {}
- A –B = {b, c}
- A' U B' = {d, e, f, g, h, i, j } U {b, c, d, e, h, i, j} = {b, c, d, e, f, g, h, i, j }
- (A U B) ' = {d, e, h, i, j}
- |B| = 3, |U| = 10
- P(A) = { Φ , {a}, {b}, {c}, {a, b}, {a, c}, {b, c}, {a, b, c}},
- $|P(A)| = 8 = 2^3 = 2^{|A|}$

2.	**Example(2)** Find the Cardinality for:

1. Φ = null = 0
2. {a, b} = 2
3. {1,2,3,4,5,6} = 6
4. {Φ} = 1
5. {{}} = 1
6. {a, {b, c}, d} = 3
7. { {a, b, c, d, e, f} } = 1

| 3.	Automaton is an abstract computing device.
	
	    a. True
	    b. False
		A

4.	……. is a set of symbols.
	
	…… is a finite, non-empty set of symbols.
	
	  a. Alphabet
	  b. String
	  c. Language
	  d. Grammar
		A

5.	……. is a sequence of symbols.
	
	…….. is a finite sequence of symbols chosen from ∑
	
	  a. Alphabet
	  b. String
	  c. Language
	  d. Grammar
		B

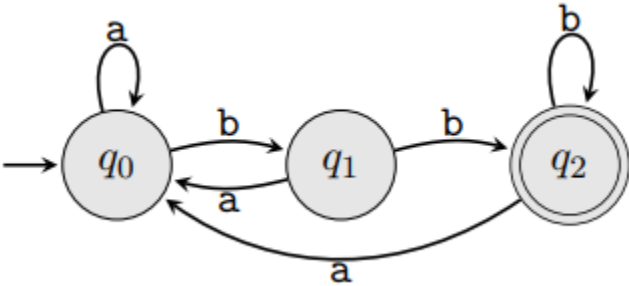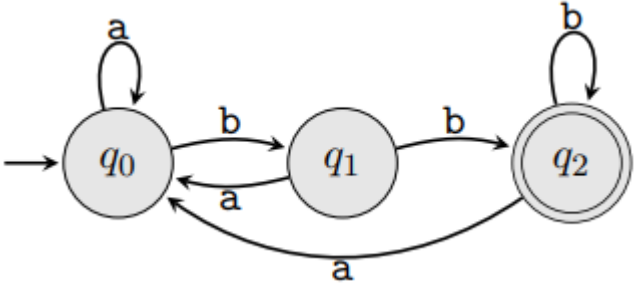|		

6.	.........is a collection of sentences of finite length all constructed from a finite alphabet of symbols
	
	    a. Alphabet
	    b. String
	    c. Language
	    d. Grammar
		C

7.	.... is a finite list of rules defining a language.
	
	    a. Alphabet
	    b. String
	    c. Language
	    d. Grammar
		D

8.	$\Sigma^* =$ ....
	
	    a. $\Sigma^0 \cup \Sigma^1 \cup \Sigma^2 \cup \ldots$
	    b. $\Sigma^1 \cup \Sigma^2 \cup \Sigma^3 \cup \ldots$
	    c. Φ
	    d. λ
		A

9.	$\Sigma^+ =$ ....
	
	    a. $\Sigma^0 \cup \Sigma^1 \cup \Sigma^2 \cup \ldots$
	    b. $\Sigma^1 \cup \Sigma^2 \cup \Sigma^3 \cup \ldots$
	    c. Φ
	    d. λ
		B

10.	Proving techniques includes ....
	
	    a. By contradiction
	    b. By induction
	    c. By contrapositive statement
	    d. All of the above
		D

11.	Let the set A is {1, 2, 3} and B is {2, 3, 4}. Then the number of elements in A ∪ B is? a) 4 b) 5 c) 6 d) 7	A
12.	Let the set A is {1, 2, 3} and B is {2, 3, 4}. Then number of elements in A ∩ B is? a) 1 b) 2 c) 3 d) 4	B
13.	The intersection of the sets {1, 2, 5} and {1, 2, 6} is the set _____ a) {1, 2} b) {5, 6} c) {2, 5} d) {1, 6}	A

| 14.	Two sets are called disjoint if there _____ is the empty set. a) Union b) Difference c) Intersection d) Complement	C
15.	Which of the following two sets are disjoint? a) {1, 3, 5} and {1, 3, 6} b) {1, 2, 3} and {1, 2, 3} c) {1, 3, 5} and {2, 3, 4} d) {1, 3, 5} and {2, 4, 6}	D
16.	The difference of {1, 2, 3} and {1, 2, 5} is the set _____ a) {1} b) {5} c) {3} d) {2}	C
17.	The complement of the set A is _____ a) A – B b) U – A c) A – U d) B – A	B
18.	What is the Cardinality of the Power set of the set {0, 1, 2}? a) 8 b) 6 c) 7 d) 9	A
19.	7. If A is {{Φ}, {Φ, {Φ}}}, then the power set of A has how many element? a) 2 b) 4 c) 6 d) 8	B

20.	Let L={a, b, c} , w=abb and u=bcaa, Find wu
	  a. abbbcaa
	  b. bcaaabb
	  c. abb+bcaa
	  d. bcaa+abb
		A

21.	Let L={a,b,c} , w=abb and u=bcaa, Find |wu|
	               a. 7
	               b. 3
	               c. 4
		A

22.	Let L={a,b,c} , w=abb and u=bcaa, Find $(wu)^r$
	               a. abbbcaa
	               b. bcaaabb
	               c. aacbbba
	               d. bcaa+abb
		C

23.	If A = {a, ba}, which of the following strings is NOT in A*: a. bb b. λ c. aa d. baa	A
24.	If L={ab, bb} which is the following strings is NOT L* a. bbb b. abbb c. abababbb d. abab	A
25.	If Σ = {ab, c}, u = abcc and v = cab, then , $\lvert u^2 v \rvert$ equals a. 11 b. 8 c. 7 d. 5	A

26.	Suppose there are 75 people in a room. Then, at least how many people must have their birthday in the same month?
	
	   a. 75 / 12 c. 6
	   b. 7 d. 5
		B

Automata – Revision (1) – 2021 - DFA and NFA

27.	What is the language defined by the following DFA: a. {babab} b. {b^n a b^n a b^n, n ≥0} c. {b^n a b^m a , m, n ≥0} d. {b^n a b^m a b^k, m ,n ,k ≥0}	D

28.	Select the language defined by the following finite automaton:
	
	Select one:
	  ○ a. $\{b^n ab^m a: m, n \geq 0\}$
	  ⦿ b. $\{b^n ab^m: m, n \geq 0\}$ ✔
	  ○ c. $\{b^n ab^m ab^p: m, n, p \geq 0\}$
	  ○ d. $\{aa\}$
		B

29.	Which of the following is not a part of 5-tuple of DFA a. Initial state b. Transition function c. Input alphabet d. Output alphabet	D

30.	The practical implementations of DFA are limited but emerging (e.g., Micron automata)
	    a. True
	    b. False
		B

31.	The states of a DFA are represented as a circle ◯
	
	    a. True
	    b. False
		A

32.	The initial state is represented with an arrow and is frequently named q_0 → q_0
	
	    a. True
	    b. False
		A

33.	Accepting states are drawn with two circles ◎
	
	    a. True
	    b. False
		A

34.	For the following DFA, what is the alphabets
	    a. $\{q_0, q_1, q_2\}$
	    b. $\{a, b\}$
	    c. $\{q0\}$
	    d. $\{q2\}$
		B

35.	For the following DFA, what is the states
	    a. $\{q_0, q_1, q_2\}$
	    b. $\{a, b\}$
	    c. $\{q0\}$
	    d. $\{q2\}$
		A
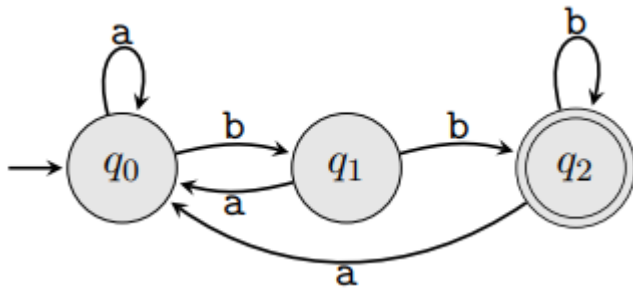
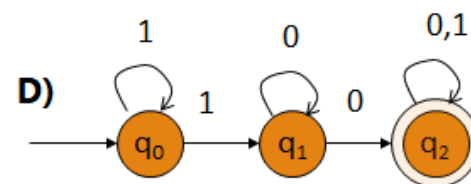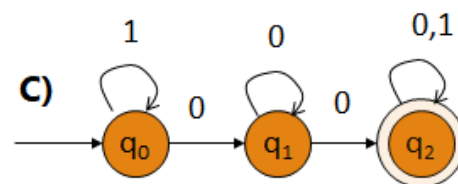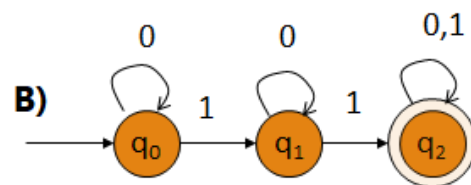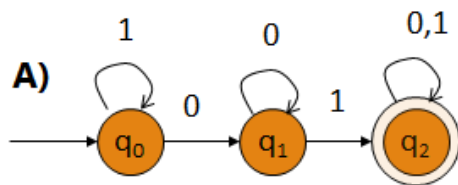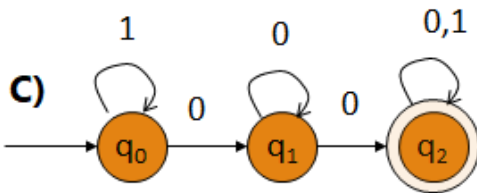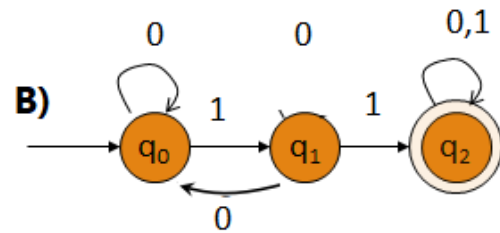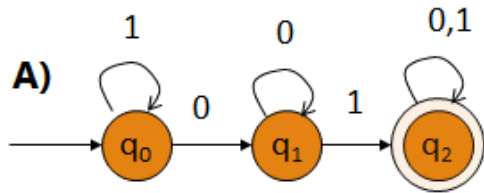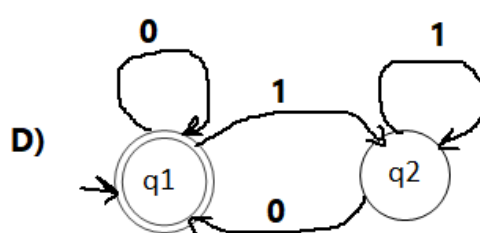| 36.	For the following DFA, the transition table is a. True b. False	$\begin{array}{c\|cc} \delta & a & b \\ \hline q_0 & q_0 & q_1 \\ q_1 & q_0 & q_2 \\ q_2 & q_0 & q_2 \end{array}$	A

37.	For the following DFA, the string
	"ababb" is
	  a. Accepted
	  b. Rejected
	  c. None
			A
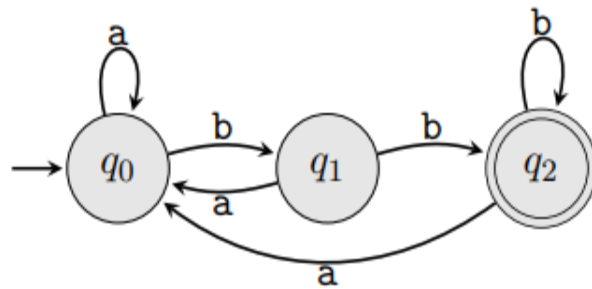
38.	A language L is accepted by a DFA if it is accepted by an NFA
	  a. True
	  b. False
			A

39.	The application of the Finite Automata
	  a. Text indexing
	  b. Find pattern P in text T
	  c. Both a and b
	  d. None
			C

40.	The DFA that accepts the language L = {w | w is a binary string that contains 01 as a substring} 		A

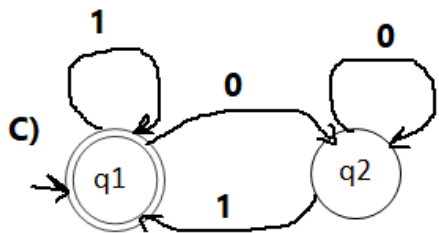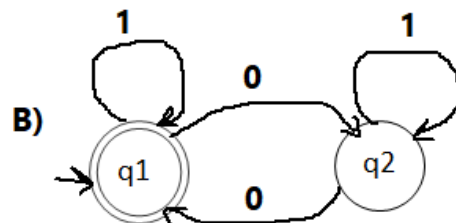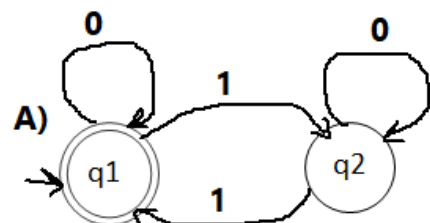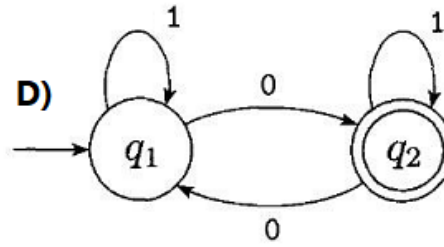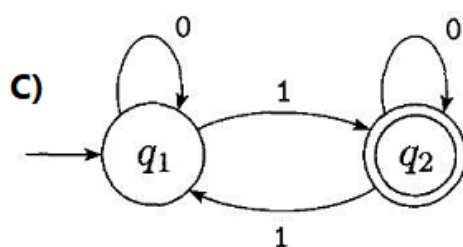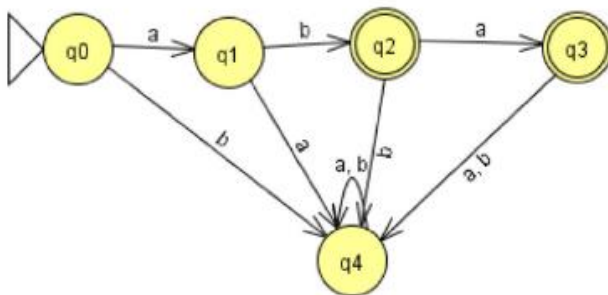|		
41.	The DFA that accepts the language L = {w | w is a binary string that contains 11 as a substring} **A)** (states q_0, q_1, q_2 with transitions: 1 self-loop on q_0, 0 from q_0 to q_1, 0 self-loop on q_1, 1 from q_1 to q_2, 0,1 self-loop on q_2) **B)** (states q_0, q_1, q_2 with transitions: 0 self-loop on q_0, 1 from q_0 to q_1, 0 from q_1 to q_0, 1 from q_1 to q_2, 0,1 self-loop on q_2) **C)** (states q_0, q_1, q_2 with transitions: 1 self-loop on q_0, 0 from q_0 to q_1, 0 self-loop on q_1, 0 from q_1 to q_2, 0,1 self-loop on q_2) **D)** (states q_0, q_1, q_2 with transitions: 1 self-loop on q_0, 1 from q_0 to q_1, 0 self-loop on q_1, 0 from q_1 to q_2, 0,1 self-loop on q_2)	B
42.	The DFA that accepts the language L = { w | w is a binary string that has even number of 1s} **A)** (states q1 accepting, q2; 0 self-loop on q1, 1 from q1 to q2, 0 self-loop on q2, 1 from q2 to q1) **B)** (states q1 accepting, q2; 1 self-loop on q1, 0 from q1 to q2, 1 self-loop on q2, 0 from q2 to q1) **C)** (states q1 accepting, q2; 1 self-loop on q1, 0 from q1 to q2, 0 self-loop on q2, 1 from q2 to q1) **D)** (states q1 accepting, q2; 0 self-loop on q1, 1 from q1 to q2, 1 self-loop on q2, 0 from q2 to q1)	A
43.	The DFA that accepts the language of all stings ending with 1. **A)** (states q_1, q_2 accepting; 0 self-loop on q_1, 1 from q_1 to q_2, 1 self-loop on q_2, 0 from q_2 to q_1) **B)** (states q_1, q_2 accepting; 1 self-loop on q_1, 0 from q_1 to q_2, 0 self-loop on q_2, 1 from q_2 to q_1) **C)** (states q_1, q_2 accepting; 0 self-loop on q_1, 1 from q_1 to q_2, 0 self-loop on q_2, 1 from q_2 to q_1) **D)** (states q_1, q_2 accepting; 1 self-loop on q_1, 0 from q_1 to q_2, 1 self-loop on q_2, 0 from q_2 to q_1)	A

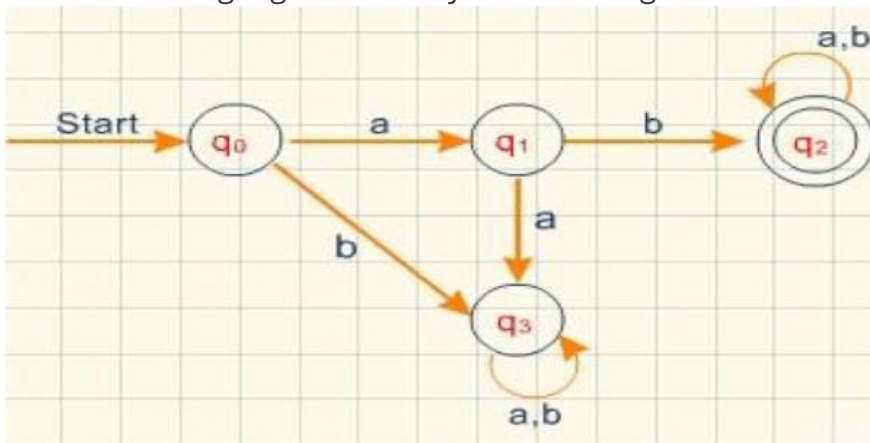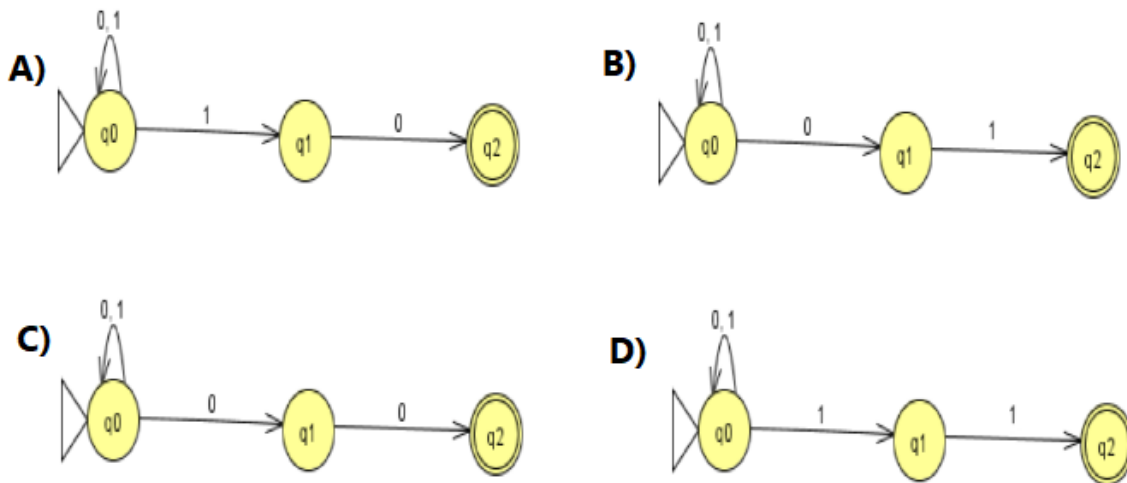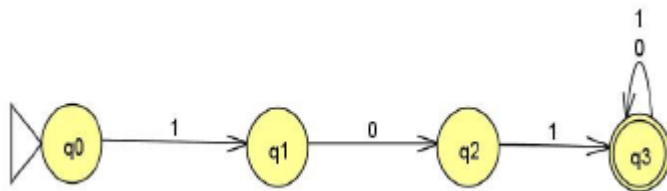|		

44.	What is the language defined by the following DFA
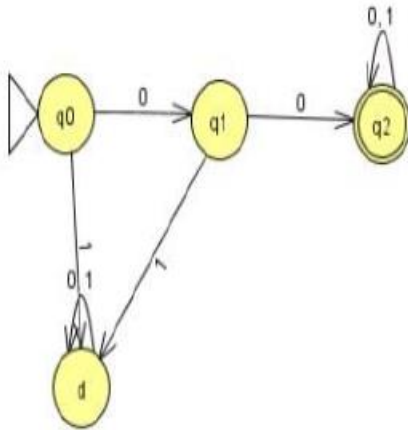	
	  a. The set of the strings that start with 00
	  b. The set of the strings that start with 11
	  c. The set of the end that end with 00
	  d. The set of the end that end with 11
		A

45.	What is the language defined by the following DFA
	
	  a. The strings {ab, aba}
	  b. The strings {ba, aba}
	  c. The strings {ab, abb}
		A

46.	What is the language defined by the following DFA
	
	  a. The set of the strings that start with ab
	  b. The set of the strings that start with ba
	  c. The set of the end that end with ab
	  d. The set of the end that end with ba
		A

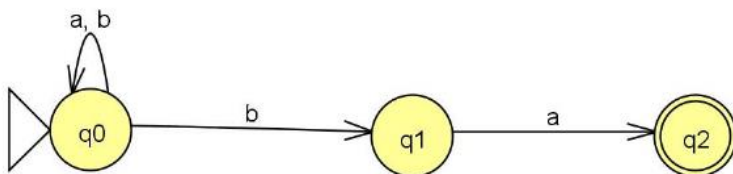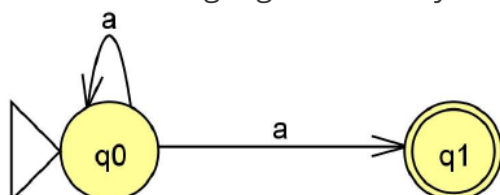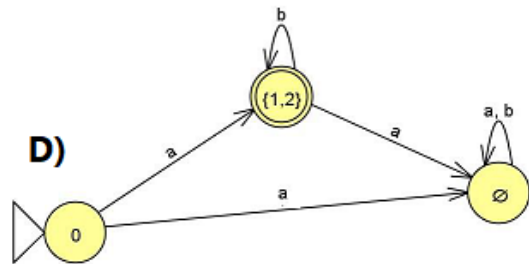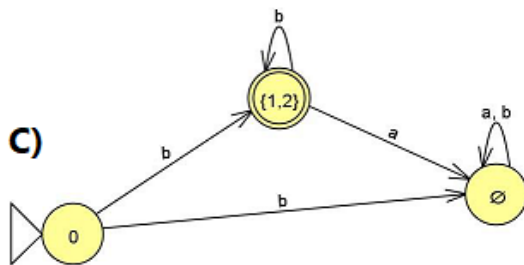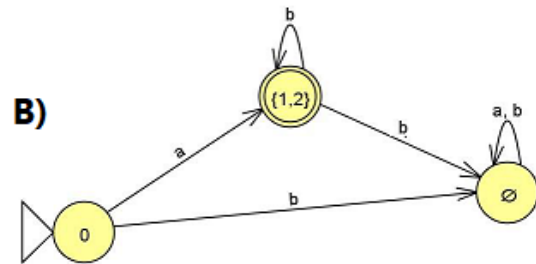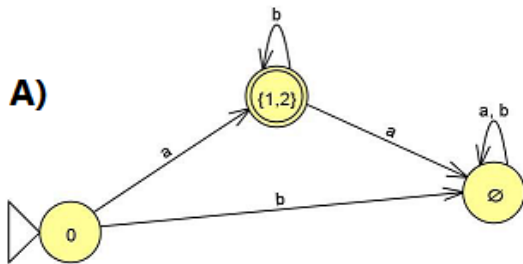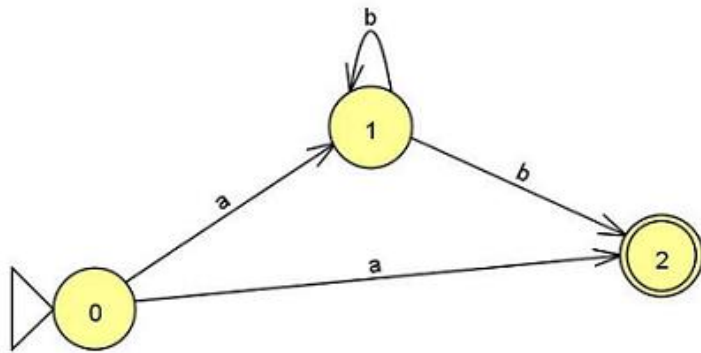| 47.	NFA that defines the language of all strings ending with 01	
	A) **B)** **C)** **D)**	B

48.	What is the language defined by the following automaton?
	
	    a. The set of the strings that start with 101
	    b. The set of the strings that start with 100
	    c. The set of the end that end with 101
	    d. The set of the end that end with 100
		A

49.	What is the language defined by this NFA?
	
	    a. The set of the strings that start with ba
	    b. The set of the strings that start with ab
	    c. The set of the end that end with ba
	    d. The set of the end that end with ab
		C

50.	What is the language defined by this NFA?
	
	    a. The set of strings that contain only a's
	    b. The set of strings that contain only b's
	    c. The set of strings that contain only one a
	    d. None
		A

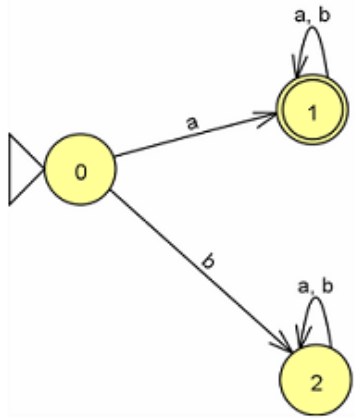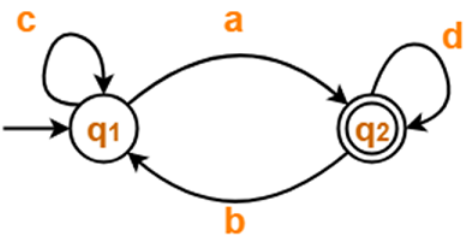|		
51.	Convert the following NFA to DFA: 	A
	Automata – Revision (1) – 2021 - Regular Expression (RE)	

52.	[a + b]+ is not a regular expression
	   a. True
	   b. False
	   c.
		A

53.	Find a regular expression to denote a language of **all strings with exactly one a** over the alphabet ∑= {a, b}
	   a. b * a b*
	   b. a b*
	   c. b* a
	   d. a
		A

54.	Find a regular expression to denote a language of **all strings with exactly one a** over the alphabet ∑= {a, b, c}
	   a. a
	   b. a (b +c)*
	   c. (b + c)* a
	   d. (b + c)* a (b +c)*
		D

55.	Find a regular expression to denote a language of **all strings with at least one a** over the alphabet $\sum$ = {a, b, c}
	    a. a
	    b. (b+ c)* a (b + c)*
	    c. a (a + b + c)*
	    d. (a + b+ c)* a (a + b + c)*
		D

56.	Find a regular expression to denote the language $\{a^m b^n$: m, n $\geq$ 0 }
	    a. a* b*
	    b. (ab)*
	    c. $a^+ b^+$
	    d. $(ab)^+$
		A

57.	Find a regular expression to denote the language $\{a^m b^n$: m, n $\geq$ 1 }
	    a. a* b*
	    b. (ab)*
	    c. $a^+ b^+$ = aa*bb*
	    d. $(ab)^+$
		C

58.	Find a regular expression to denote the language $\{awa$: w ϵ $\{a, b\}$*}
	    a. aa
	    b. a (a + b)* a
	    c. (a + b)* a
	    d. a (a + b)*
		B

59.	Find a regular expression to denote the language $\{abw$: w ϵ $\{a, b\}$*}
	    a. ab
	    b. ab (a + b)* ab
	    c. (a + b)* ab
	    d. ab (a + b)*
		D

60.	Find a regular expression to denote the language $\{w$ ab : w ϵ $\{a, b\}$*}
	    a. ab
	    b. ab (a + b)* ab
	    c. (a + b)* ab
	    d. ab (a + b)*
		C

61.	Find a regular expression to denote the language of all strings of a's and b's with b as a 3rd letter:
	    a. (a + b) (a + b) b (a + b)*
	    b. (a + b)* (a + b) b (a + b)*
	    c. (a + b) b (a + b)*
	    d. (a + b) (a + b) b
		A

62.	Which of the following does not represents the given language? Language: {0,01} a) 0+01 b) {0} U {01} c) {0} U {0}{1} d) {0} ^ {01}	D

63.	Which among the following looks similar to the given expression? ((0+1). (0+1)) * a) {xε {0,1} *|x is all binary number with even length} b) {xε {0,1} |x is all binary number with even length} c) {xε {0,1} *|x is all binary number with odd length} d) {xε {0,1} |x is all binary number with odd length}	A
64.	Concatenation Operation refers to which of the following set operations: a) Union b) Dot c) Kleene d) Two of the options are correct	B
65.	Concatenation of R with Φ outputs: a) R b) Φ c) R.Φ d) None of the mentioned	B
66.	RR* can be expressed in which of the forms: a) R^+ b) R^- c) $R^+ \cup R^-$ d) R	A
67.	Which among the following are incorrect regular identities? a) $\varepsilon R = R$ b) $\varepsilon^* = \varepsilon$ c) $\Phi^* = \varepsilon$ d) $R\Phi = R$	D
68.	(0+ε) (1+ε) represents a) {0, 1, 01, ε} b) {0, 1, ε} c) {0, 1, 01 ,11, 00, 10, ε} d) {0, 1}	A
69.	Regular Expression R and the language it describes can be represented as: a) R, R(L) b) L(R), R(L) c) R, L(R) d) All of the mentioned	C
70.	Let for Σ= {0,1} R= $(\Sigma\Sigma\Sigma)$ *, the language of R would be a) {w | w is a string of odd length} b) {w | w is a string of length multiple of 3} c) {w | w is a string of length 3} d) All of the mentioned	B
71.	If Σ= {0,1}, then Φ* will result to: a) ε b) Φ c) Σ d) None of the mentioned	A

72.	The finite automata accept the following languages: a) Context Free Languages b) Context Sensitive Languages c) Regular Languages d) All the mentioned	C
73.	Which of the following regular expressions represents the set of strings which do not contain a substring 'rt' if $\sum$= {r, t} a) (rt)* b) (tr)* c) (r*t*) d) (t*r*)	D
74.	Regular expression for all strings starts with ab and ends with bba is……. a) aba*b*bba b) ab(ab)*bba c) ab(a + b)*bba d) All of the mentioned	C
75.	Find RE for the following DFA a. a (a + b)* b. (a + b)* a c. a (a b)* d. a (a + b)	A
76.	Find RE for the following DFA a. c* a (d + b c* a)* b. c a (d + b c* a)* c. c a* (d + b c* a)* d. c* a* (d + b c* a)*	A

77.
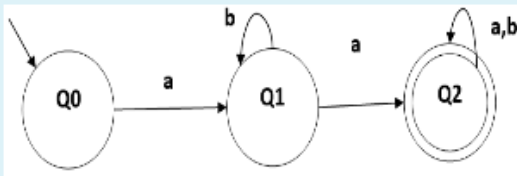
The regular expression for the above DFA is :

Select one:

- a. $ab^*a(a+b)^*$ ✔
- b. $ab(a+b)$
- c. $aba(a+b)$
- d. aba^*

A

78.

Regular Expression $(a^* + b)$ denotes the language

Select one:

- a. $\{\lambda, a, b, aa, aaa, \ldots\}$ ✔
- b. $\{a, b, aa, ab, ba, bb, \ldots\}$
- c. $\{\lambda, a, b, aa, ab, ba, bb, \ldots\}$
- d. $\{\lambda, a, b\}$

A

79.

The RE for the language
$\{w \in \{a, b\}^* : w\ conatins\ at\ least\ one\ a\ is\ a(a+b)^*$

Select one:

- ○ True
- ◉ False ✔

B

80.

Choose the correct regular expression to describe the language: $\{\lambda, a, b, ab, abb, abbb, abbbbb \ldots\}$

Select one:

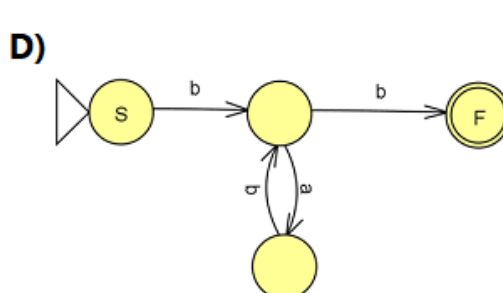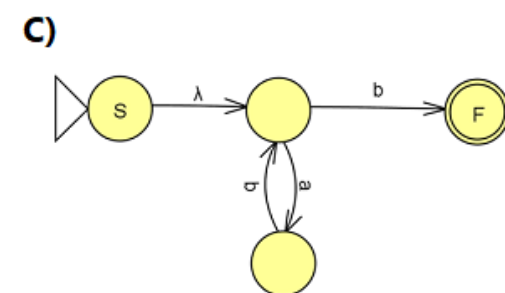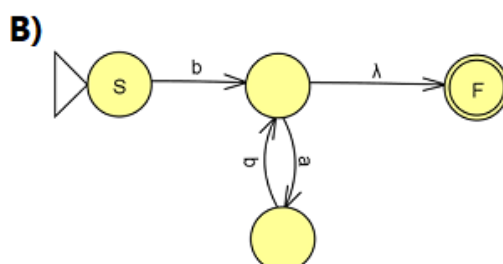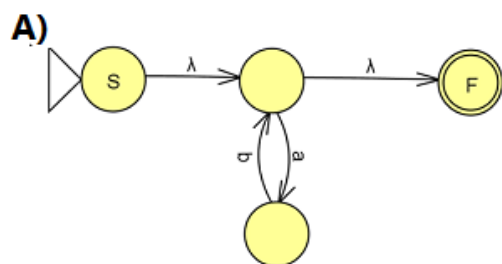- a. $\lambda + b + ab^*$ ✔
- b. $(ab)^*$
- c. ab^*
- d. a^*b^*

81. Construct an NFA for $a* + ab$

A)

B)

C)

D)
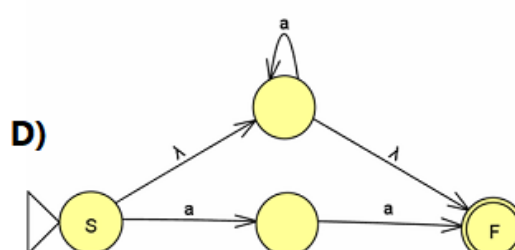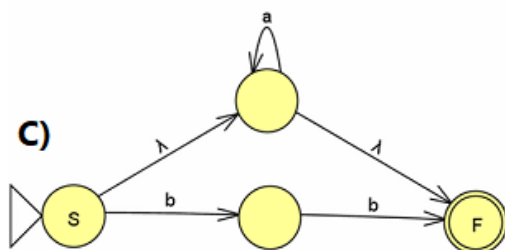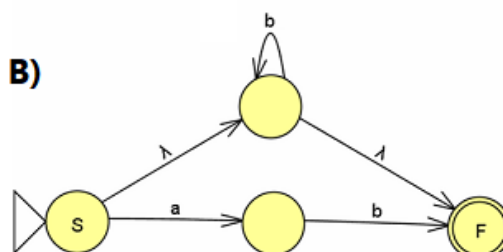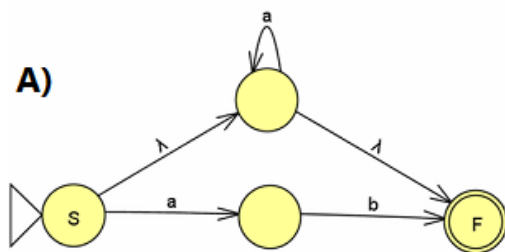
A

82. Construct NFA for $(ab)*$

A)

B)

C)

D)

A

Best Wishes