Q.1 **Assume the R is a relation on a set A, aRb is partially ordered such that a and b are**

A. reflexive

B. transitive

C. symmetric

D. **reflexive and transitive**

Explanation **A partially ordered relation refers to one which is Reflexive, Transitive and Ant symmetric.**

Q.2 **The non- Kleene Star operation accepts the following string of finite length over set A = {0,1} | where string s contains even number of 0 and 1**

A. 01,0011,010101

B. **0011,11001100**

C. ε,0011,11001100

D. ε,0011,11001100

Explanation **The Kleene star of A, denoted by A*, is the set of all strings obtained by concatenating zero or more strings from A.**

Q.3 **A regular language over an alphabet ∑ is one that cannot be obtained from the basic languages using the operation**

A. Union

B. Concatenation

C. Kleene*

D. **All of the mentioned**

Explanation **Union, Intersection, Concatenation, Kleene*, Reverse are all the closure properties of Regular Language.**

Q.4 **Statement 1: A Finite automata can be represented graphically;**
Statement 2: The nodes can be its states; Statement 3: The edges or arcs can be used for transitions
Hint: Nodes and Edges are for trees and forests too.
Which of the following make the correct combination?

A. Statement 1 is false but Statement 2 and 3 are correct

B. Statement 1 and 2 are correct while 3 is wrong

C. None of the mentioned statements are correct

D. **All of the mentioned**

Explanation **It is possible to represent a finite automaton graphically, with nodes for states, and arcs for transitions.**

Q.5 **The minimum number of states required to recognize an octal number divisible by 3 are/is**
A. 1
B. **3**
C. 5
D. 7
Explanation **According to the question, minimum of 3 states are required to recognize an octal number divisible by 3.**

Q.6 **Which of the following is a not a part of 5-tuple finite automata?**
A. Input alphabet
B. Transition function
C. Initial State
D. **Output Alphabet**
Explanation **A FA can be represented as FA= (Q, ∑, δ, q0, F) where Q=Finite Set of States, ∑=Finite Input Alphabet, δ=Transition Function, q0=Initial State, F=Final/Acceptance State).**

Q.7 **If an Infinite language is passed to Machine M, the subsidiary which gives a finite solution to the infinite input tape is**
A. **Compiler**
B. Interpreter
C. Loader and Linkers
D. None of the mentioned
Explanation **A Compiler is used to give a finite solution to an infinite phenomenon. Example of an infinite phenomenon is Language C, etc.**

Q.8 **The number of elements in the set for the Language L={xϵ(∑r) *|length if x is at most 2} and ∑={0,1} is**
A. **7**
B. 6
C. 8
D. 5
Explanation **∑r= {1,0} and a Kleene* operation would lead to the following set=COUNT{ε,0,1,00,11,01,10} =7.**

Q.9 **For the following change of state in FA, which of the following codes is an incorrect option?**
A. δ (m, 1) =n
B. **δ (0, n) =m**
C. δ (m,0) =ε

D. s: accept = false; cin >> char;

Explanation **δ(QX∑) = Q1 is the correct representation of change of state. Here, δ is called the Transition function.**

Q.10 **δ(QX∑) = Q1 is the correct representation of change of state. Here, δ is called the Transition function.**

A. {aa, ab, ba, bb}

B. **{aaaa, abab, ε, abaa, aabb}**

C. {aaa, aab, aba, bbb}

D. All of the mentioned

Explanation **∑* represents any combination of the given set while ∑x represents the set of combinations with length x where x ϵ I.**

Q.11 **Moore Machine is an application of:**

A. Finite automata without input

B. **Finite automata with output**

C. Non- Finite automata with output

D. None of the mentioned

Explanation **Finite automaton with an output is categorize din two parts: Moore M/C and Mealy M/C.**

Q.12 **In Moore machine, output is produced over the change of:**

A. transitions

B. **states**

C. Both

D. None of the mentioned

Explanation **Moore machine produces an output over the change of transition states while mealy machine does it so for transitions itself**.

Q.13 **For a give Moore Machine, Given Input=’101010’, thus the output would be of length:**

A. **|Input|+1**

B. |Input|

C. |Input-1|

D. Cannot be predicted

Explanation **Initial state, from which the operations begin is also initialized with a value.**

Q.14 **Statement 1: Null string is accepted in Moore Machine.**
Statement 2: There are more than 5-Tuples in the definition of Moore Machine.

A. **Statement 1 is true and Statement 2 is true**
B. Statement 1 is true while Statement 2 is false
C. Statement 1 is false while Statement 2 is true
D. Statement 1 and Statement 2, both are false

Explanation **Even ε, when passed as an input to Moore machine produces an output.**

Q.15 **What is the output for the given language?**
Language: A set of strings over $\sum = \{a, b\}$ is taken as input and it prints 1 as an output "for every occurrence of a, b as its substring. (INPUT: abaaab)

A. **0010001**
B. 0101010
C. 0111010
D. 0010000

Explanation **The outputs are as per the input, produced.**

Q.16 **The output alphabet can be represented as:**

A. δ
B. Δ
C. $\sum$
D. None of the mentioned

Explanation **Source-The tuple definition of Moore and mealy machine comprises one new member i.e. output alphabet as these are finite machines with output.**

Q.17 **The O/P of Moore machine can be represented in the following format:**

A. **$Op(t)=\delta(Op(t))$**
B. $Op(t)=\delta(Op(t)i(t))$
C. $Op(t): \sum$
D. None of the mentioned

Explanation **$Op(t)=\delta(Op(t))$ is the defined definition of how the output is received on giving a specific input to Moore machine.**

Q.18 **Which of the following is a correct statement?**

A. **Moore machine has no accepting states**
B. Mealy machine has accepting states
C. We can convert Mealy to Moore but not vice versa
D. All of the mentioned

Explanation **Statement a and b is correct while c is false. Finite machines with output have no accepting states and can be converted within each other.**

Q.19 **In mealy machine, the O/P depends upon?**
A. State
B. Previous State
C. **State and Input**
D. Only Input
Explanation **Definition of Mealy Machine.**

Q.20 **Which of the given are correct?**
A. Moore machine has 6-tuples
B. Mealy machine has 6-tuples
C. **Both Mealy and Moore has 6-tuples**
D. None of the mentioned
Explanation **Finite Automaton with Output has a common definition for both the categories.**

Q.21 **The O/P of Mealy machine can be represented in the following format:**
A. Op(t)= δ(Op(t))
B. **Op(t)= δ(Op(t)i(t))**
C. Op(t): ∑
D. None of the mentioned

Q.22 **The ratio of number of input to the number of output in a mealy machine can be given as:**
A. **1**
B. n: n+1
C. n+1: n
D. None of the mentioned
Explanation **The number of output here follows the transitions in place of states as in Moore machine.**

Q.23 **Mealy and Moore machine can be categorized as:**
A. Inducers
B. **Transducers**
C. Turing Machines
D. Linearly Bounder Automata
Explanation **They are collectively known as Transducers.**

Q.24 **The major difference between Mealy and Moore machine is about:**
A. **Output Variations**
B. Input Variations
C. Both
D. None of the mentioned
Explanation **Mealy and Moore machine vary over how the outputs depends on prior one (transitions) and on the latter one(states).**

Q.25 **Statement 1: Mealy machine reacts faster to inputs.**
Statement 2: Moore machine has more circuit delays.
Choose the correct option:

A. **Statement 1 is true and Statement 2 is true**
B. Statement 1 is true but Statement 2 is false
C. Statement 1 is false and Statement 2 is true
D. None of the mentioned is true

Explanation **Being an input dependent and output capable FSM, Mealy machine reacts faster to inputs.**

Q.26 **Which one among the following is true?**
A mealy machine

A. produces a language
B. produces a grammar
C. can be converted to NFA
D. **has less circuit delays**

Explanation **It does not produce a language or a grammar or can be converted to a NFA.**

Q.27 **Which of the following does not belong to input alphabet if S={a, b}* for any language?**

A. a
B. b
C. **e**
D. none of the mentioned

Explanation **The automaton may be allowed to change its state without reading the input symbol using epsilon but this does not mean that epsilon has become an input symbol. On the contrary, one assumes that the symbol epsilon does not belong to any alphabet.**

Q.28 **An e-NFA is____________in representation.**

A. Quadruple
B. **Quintuple**
C. Triple
D. None of the mentioned

Explanation **An e-NFA consist of 5 tuples: A=(Q, S, d, q0. F)**
Note: e is never a member of S.

Q.29 **State true or false:**
Statement: Both NFA and e-NFA recognize exactly the same languages.

A. **true**
B. false

Explanation **e-NFA do come up with a convenient feature but nothing new.They do not extend the class of languages that can be represented.**

Q.30 **Design a NFA for the language:**
L: {an| n is even or divisible by 3}
Which of the following methods can be used to simulate the same.

A. e-NFA
B. Power Construction Method
C. **Both (a) and (b)**
D. None of the mentioned

Explanation **It is more convenient to simulate a machine using e-NFA else the method of Power Construction is used from the union-closure of DFA's.**

Q.31 **Which of the following not an example Bounded Information?**

A. fan switch outputs {on, off}
B. **electricity meter reading**
C. colour of the traffic light at the moment
D. none of the mentioned

Explanation **Bounded information refers to one whose output is limited and it cannot be said what were the recorded outputs previously until memorized.**

Q.32 **A Language for which no DFA exist is a________**

A. Regular Language
B. **Non-Regular Language**
C. May be Regular
D. Cannot be said

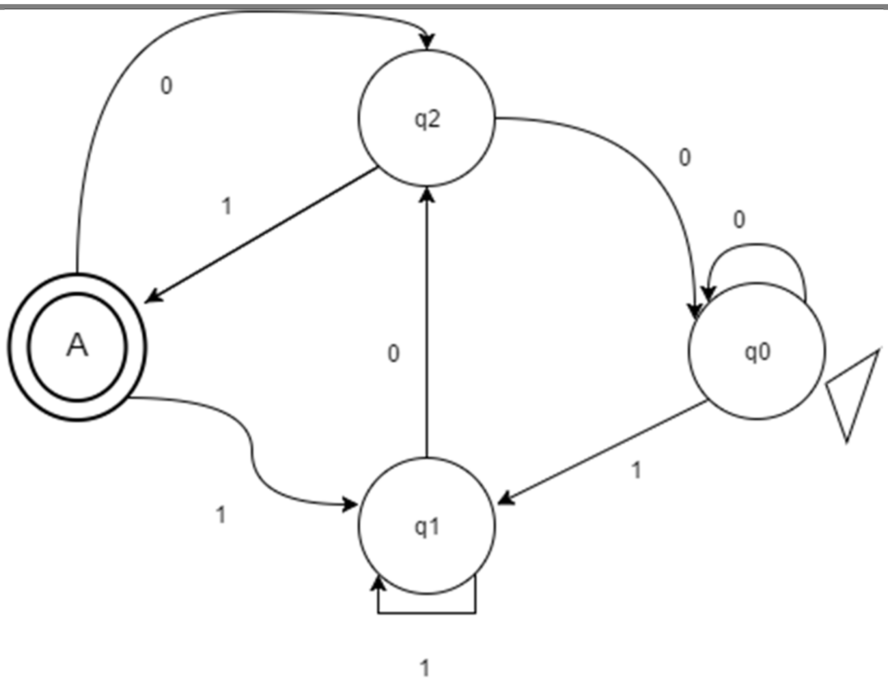
Explanation **A language for which there is no existence of a deterministic finite automata is always Non Regular and methods like Pumping Lemma can be used to prove the same.**

Q.33 **A DFA cannot be represented in the following format**

A. Transition graph
B. Transition Table
C. C code
D. **None of the mentioned**

Explanation **A DFA can be represented in the following formats: Transition Graph, Transition Table, Transition tree/forest/Any programming Language.**

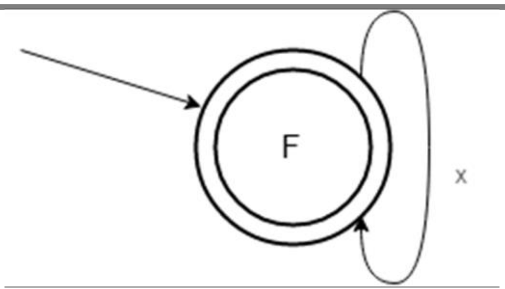
Q.34 **What the following DFA accepts?**



A.	**x is a string such that it ends with '101'**
B.	x is a string such that it ends with '01'
C.	x is a string such that it has odd 1's and even 0's
D.	x is a strings such that it has starting and ending character as 1
Explanation	**Strings such as {1101,101,10101} are being accepted while {1001,11001} are not. Thus, this conclusion leads to option a.**

Q.35	**When are 2 finite states equivalent?**
A.	Same number of transitions
B.	Same number of states
C.	**Same number of states as well as transitions**
D.	Both are final states
Explanation	**Two states are said to be equivalent if and only if they have same number of states as well as transitions.**

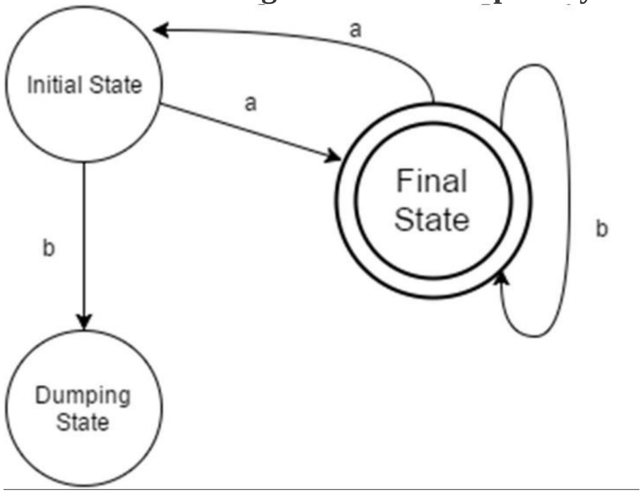
Q.36 **What does the following figure most correctly represents?**



A. Final state with loop x
B. Transitional state with loop x
C. **Initial state as well as final state with loop x**
D. Insufficient Data

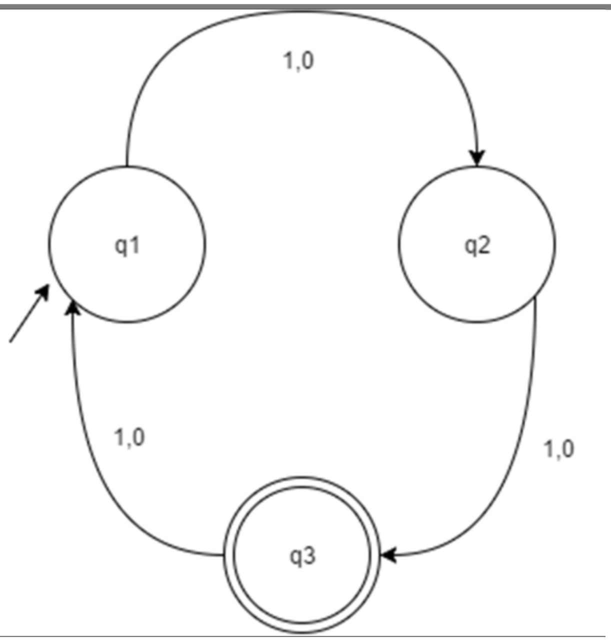
Explanation **The figure represents the initial as well as the final state with an iteration of x.**

Q.37 **hich of the following will not be accepted by the following DFA?**



A. **ababaabaa**
B. abbbaa
C. abbbaabb
D. abbaabbaa

Q.38 **Which of the following will the given DFA won't accept?**



A. ε
B. 11010
C. 10001010
D. String of letter count 11

Explanation **As the initial state is not made an acceptance state, thus ε will not be accepted by the given DFA. For the automata to accept ε as an entity, one should make the initial state as also the final state.**

Q.39 **Can a DFA recognize a palindrome number?**
A. Yes
B. **No**
C. Yes, with input alphabet as ∑*
D. Can't be determined

Explanation **Language to accept a palindrome number or string will be non-regular and thus, its DFA cannot be obtained. Though, PDA is possible.**

Q.40 **Which of the following is not an example of finite state machine system?**
A. Control Mechanism of an elevator
B. Combinational Locks
C. Traffic Lights

D. **Digital Watches**

Explanation **Proper and sequential combination of events leads the machines to work in hand which includes The elevator, Combinational Locks, Traffic Lights, vending machine, etc. Other applications of Finite machine state system are Communication Protocol Design, Artificial Intelligence Research, A Turnstile, etc.**

Q.41 **The password to the admins account=”administrator”. The total number of states required to make a password-pass system using DFA would be ___________**

A. **14 states**

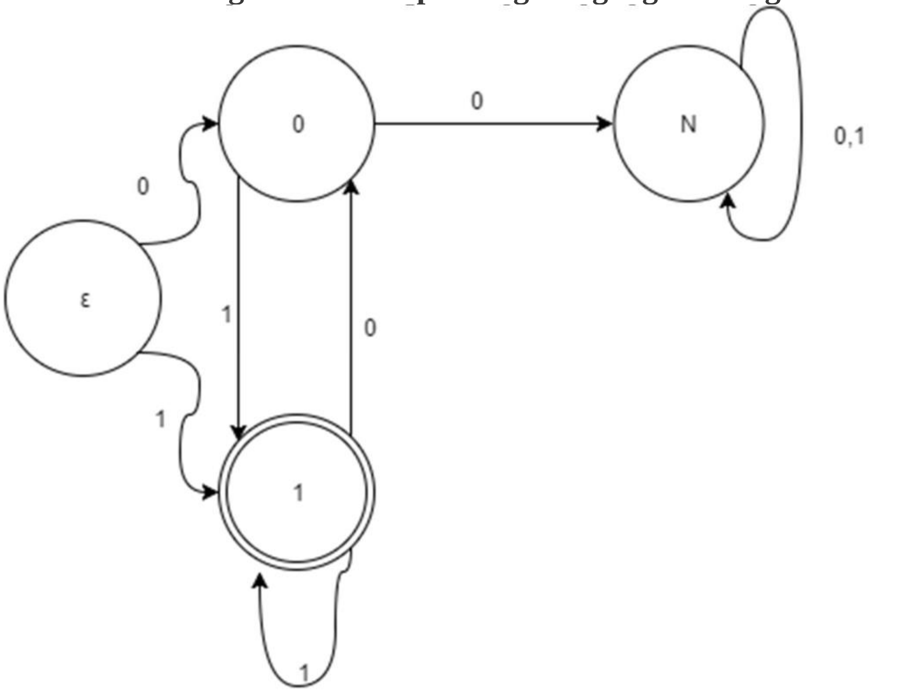
B. 13 states

C. 12 states

D. A password pass system cannot be created using DFA

Explanation **For a string of n characters with no repetitive substrings, the number of states required to pass the string is n+1.**

Q.42 **Which of the following is the corresponding Language to the given DFA?**



A. L= {x ϵ {0, 1} * | x ends in 1 and does not contain substring 01}

B. **L= {x ϵ {0,1} * |x ends in 1 and does not contain substring 00}**

C. L= {x ϵ {0,1} |x ends in 1 and does not contain substring 00}

D. L= {x ϵ {0,1} * |x ends in 1 and does not contain substring 11}

Explanation **The Language can be anonymously checked and thus the answer can be predicted. The language needs to be accepted by the automata (acceptance state) in order to prove its regularity.**

Q.43 **Let ∑= {a, b, …. z} and A = {Hello, World}, B= {Input, Output}, then (A*∩B) U (B*∩A) can be represented as:**

A. {Hello, World, Input, Output, ε}

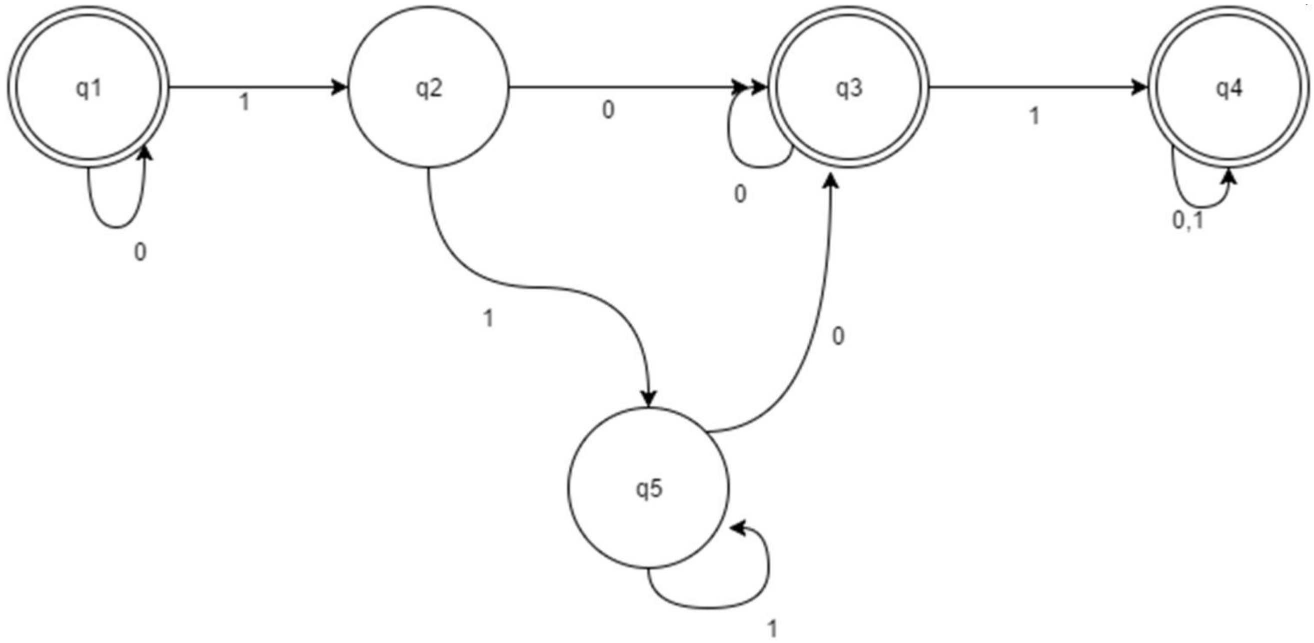
B. {Hello, World, ε}

C. {Input, Output, ε}

D. **{}**

Explanation **Union operation creates the universal set by combining all the elements of first and second set while intersection operation creates a set of common elements of the first and the second state.**

Q.44 **Let the given DFA consist of x states. Find x-y such that y is the number of states on minimization of DFA?**



A. 5

B. **2**

C. 1

D. 4

Q.45 **u='1101', v='0001', then uv=11010001 and vu= 00011101.Using the given information what is the identity element for the string?**

A. u^{-1}

B. v^{-1}

C. u^{-1}v^{-1}

D. **ε**

Explanation **Identity relation: εw = wε = w, thus the one satisfying the given relation will be the identity element.**

Q.46 **Which of the following substring will the following notation result?**

δ	0	1
Q0	Q1	Q4
Q1	Q4	Q2
Q2	Q3	Q3
Q3	Q2	Q2
Q4	Q4	Q4

A. 0101011

B. 0101010

C. **010100**

D. 100001

Explanation **The given DFA notation accepts the string of even length and prefix '01'.**

Q.47 **Predict the following step in the given bunch of steps which accepts a strings which is of even length and has a prefix='01'**
δ (q0, ε) =q0 < δ(q0,0) =δ (δ (q0, ε),0) =δ(q0,0) =q1 < ________________

A. δ (q0, 011) =δ (δ (q0,1), 1) =δ (q2, 1) =q3

B. **δ (q0, 01) =δ (δ (q0, 0), 1) = δ (q1, 1) =q2**

C. δ (q0, 011) =δ (δ (q01, 1), 1) =δ (q2, 0) =q3

D. δ (q0, 0111) =δ (δ (q0, 011), 0) = δ (q3, 1) =q2

Explanation **Here, δ refers to transition function and results into new state or function when an transition is performed over its state.**

Q.48 **Fill the missing blank in the given Transition Table:**
Language L= {xϵ∑= {0,1} |x accepts all the binary strings not divisible by 3}

	0	1
Q0	Q0	Q1
Q1	Q2	Q0
Q2	________	Q2

A. Q0

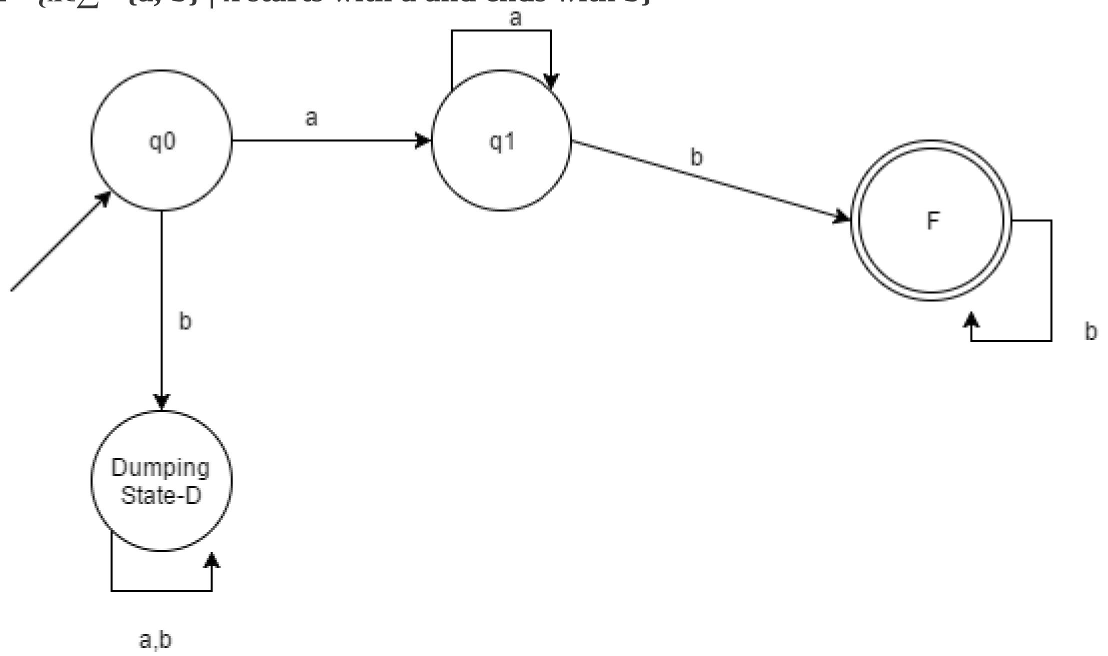
B. **Q1**

C. Q2

D. No Transition

Explanation **The tabular representation of DFA is quite readable and can be used to some ore complex problems. Here, we need to form the transition graph and fill up the given blank.**

Q.49 **Which among the following is the missing transition in the given DFA?**
L= {xϵ∑= {a, b} | x starts with a and ends with b}



A. δ (q0, a) =q0

B. **δ (F, a) =q1**

C. δ (F, a) =D

D. δ (q1, a) =D

Explanation **For the given Language, the transition missing is δ (F, a) =q1.**

Q.50 **The complement of a language will only be defined when and only when the__________over the language is defined.**

A. String

B. Word

C. **Alphabet**

D. Grammar

Explanation **It is not possible to define the complement of a language without defining the input alphabets. Example: A language which does not consist of substring 'ab' while the complement would be the language which does contain a substring 'ab'.**

Q.51 **Which among the following is not notated as infinite language?**

A. Palindrome

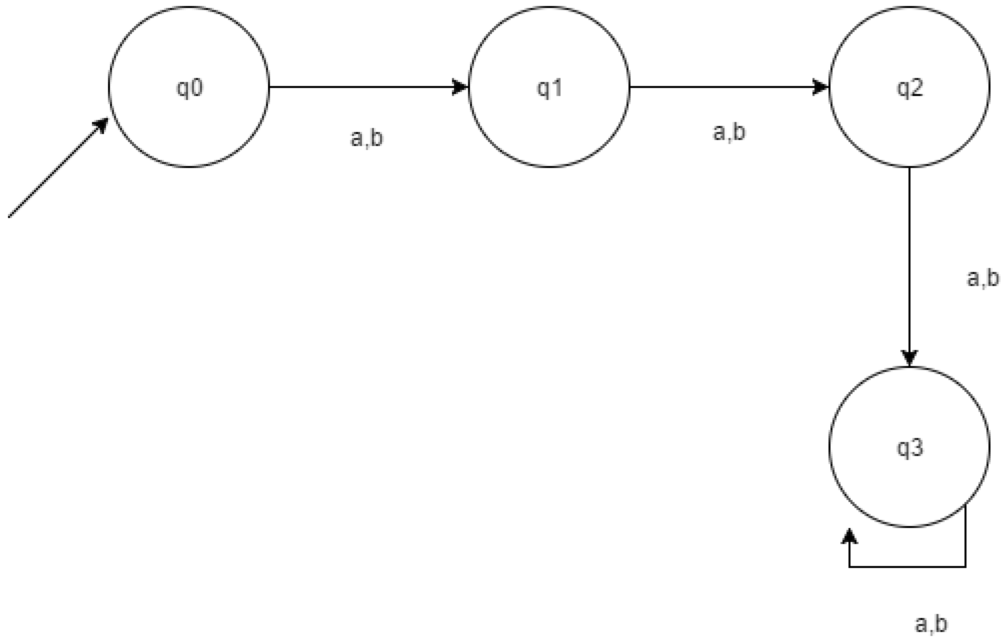
B. Reverse

C. **Factorial**

D. L={ab}*

Explanation **Factorial, here is the most appropriate non-infinite domain. Otherwise, palindrome and reverse have infinite domains.**

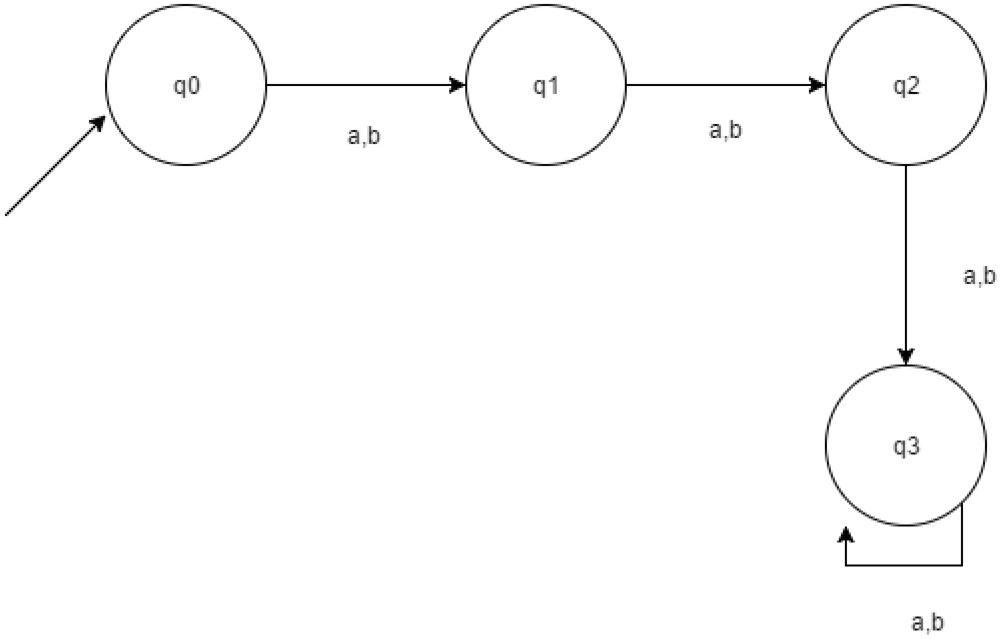
Q.52 **Which among the following states would be notated as the final state/acceptance state?**
L= {xϵ∑= {a, b} | length of x is 2}



A. q1

B. **q2**
C. q1, q2
D. q3
Explanation **According to the given language, q2 Is to become the final/acceptance state in order to satisfy.**

Q.53 **Which of the following are the final states in the given DFA according to the Language given.?**
L= {xϵ∑= {a, b} |length of x is at most 2}



A. q0, q1
B. q0, q2
C. q1, q2
D. **q0, q1, q2**
Explanation **According to the given language, the length is at most 2, thus the answer is found accordingly.**

Q.54 **There are_________tuples in finite state machine.**
A. 4
B. **5**
C. 6
D. unlimited
Explanation **States, input symbols,initial state,accepting state and transition function.**

Q.55 **Transition function maps.**
A. Σ * Q -> Σ
B. Q * Q -> Σ
C. Σ * Σ -> Q
D. **Q * Σ -> Q**
Explanation **Inputs are state and input string output is states.**

Q.56 **Number of states require to accept string ends with 10.**
A. **3**
B. 2
C. 1
D. can’t be represented.
Explanation **This is minimal finite automata.**

Q.57 **Extended transition function is .**
A. **Q * Σ* -> Q**
B. Q * Σ -> Q
C. Q* * Σ* -> Σ
D. Q * Σ -> Σ
Explanation **This takes single state and string of input to produce a state.**

Q.58 **δ*(q,ya) is equivalent to .**
A. δ((q,y),a)
B. **δ(δ*(q,y),a)**
C. δ(q,ya)
D. independent from δ notation
Explanation **First it parse y string after that it parse a.**

Q.59 **String X is accepted by finite automata if .**
A. δ*(q,x) E A
B. δ(q,x) E A
C. **δ*(Q0,x) E A**
D. δ(Q0,x) E A
Explanation **If automata starts with starting state and after finite moves if reaches to final step then it called accepted.**

Q.60 **Languages of a automata is**

A. **If it is accepted by automata**
B. If it halts
C. If automata touch final state in its life time
D. All language are language of automata
Explanation **If a string accepted by automata it is called language of automata.**

Q.61 **Language of finite automata is.**
A. Type 0
B. Type 1
C. Type 2
D. **Type 3**
Explanation **According to Chomsky classification.**

Q.62 **Finite automata requires minimum________number of stacks.**
A. 1
B. **0**
C. 2
D. None of the mentioned
Explanation **Finite automata doesn’t require any stack operation .**

Q.63 **Number of final state require to accept Φ in minimal finite automata.**
A. **1**
B. **2**
C. **3**
D. **None of the mentioned**
Explanation **No final state requires.**

Q.64 **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
Explanation **Starts with ab then any number of a or b and ends with bba.**

Q.65 **How many DFA’s exits with two states over input alphabet {0,1} ?**
A. 16
B. **26**

C. 32
D. 64
Explanation **Number of DFA's = $2^n * n^{(2*n)}$.**

Q.66 **The basic limitation of finite automata is that**
A. **It can't remember arbitrary large amount of information.**
B. It sometimes recognize grammar that are not regular.
C. It sometimes fails to recognize regular grammar.
D. All of the mentioned
Explanation **Because there is no memory associated with automata.**

Q.67 **Number of states require to simulate a computer with memory capable of storing '3' words each of length '8'.**
A. $3 * 2^8$
B. **$2^{(3*8)}$**
C. $2^{(3+8)}$
D. None of the mentioned
Explanation **$2^{(m*n)}$ states requires .**

Q.68 **FSM with output capability can be used to add two given integer in binary representation. This is**
A. **True**
B. False
C. May be true
D. None of the mentioned
Explanation **Use them as a flip flop output .**

Q.69 **Which of the following options is correct?**
Statement 1: Initial State of NFA is Initial State of DFA.
Statement 2: The final state of DFA will be every combination of final state of NFA.
A. **Statement 1 is true and Statement 2 is true**
B. Statement 1 is true and Statement 2 is false
C. Statement 1 can be true and Statement 2 is true
D. Statement 1 is false and Statement 2 is also false
Explanation **Statement 1 and 2 always true for a given Language.**

Q.70 **Given Language: L= {ab U aba}***

If X is the minimum number of states for a DFA and Y is the number of states to construct the NFA,
|X-Y|=?

A. **2**
B. 3
C. 4
D. 1

Explanation **Construct the DFA and NFA individually, and the attain the difference of states.**

Q.71 **An automaton that presents output based on previous state or current input:**

A. Acceptor
B. Classifier
C. **Transducer**
D. None of the mentioned.

Explanation **A transducer is an automaton that produces an output on the basis of what input has been given currently or previous state.**

Q.72 **If NFA of 6 states excluding the initial state is converted into DFA, maximum possible number of states for the DFA is ?**

A. 64
B. 32
C. **128**
D. 127

Explanation **The maximum number of sets for DFA converted from NFA would be not greater than 2n.**

Q.73 **NFA, in its name has 'non-deterministic' because of :**

A. The result is undetermined
B. **The choice of path is non-deterministic**
C. The state to be transited next is non-deterministic
D. All of the mentioned

Explanation **Non deterministic or deterministic depends upon the definite path defined for the transition from one state to another or undefined(multiple paths).**

Q.74 **Which of the following is correct proposition?**
Statement 1: Non determinism is a generalization of Determinism.
Statement 2: Every DFA is automatically an NFA

A. Statement 1 is correct because Statement 2 is correct
B. **Statement 2 is correct because Statement 2 is correct**

C. Statement 2 is false and Statement 1 is false

D. Statement 1 is false because Statement 2 is false

Explanation **DFA is a specific case of NFA.**

Q.75 **Given Language L= {xϵ {a, b}*|x contains aba as its substring}**
Find the difference of transitions made in constructing a DFA and an equivalent NFA?

A. **2**

B. 3

C. 4

D. Cannot be determined.

Explanation **The individual Transition graphs can be made and the difference of transitions can be determined.**

Q.76 **The construction time for DFA from an equivalent NFA (m number of node)is:**

A. $O(m^2)$

B. **$O(2^m)$**

C. O(m)

D. O(log m)

Explanation **From the coded NFA-DFA conversion.**

Q.77 **If n is the length of Input string and m is the number of nodes, the running time of DFA is x that of NFA.Find x?**

A. **$1/m^2$**

B. 2^m

C. 1/m

D. log m

Explanation **Running time of DFA: O(n) and Running time of NFA =$O(m^2n)$.**

Q.78 **Which of the following option is correct?**

A. NFA is slower to process and its representation uses more memory than DFA

B. DFA is faster to process and its representation uses less memory than NFA

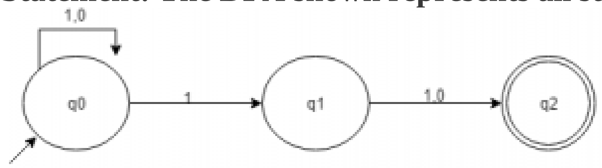
C. **NFA is slower to process and its representation uses less memory than DFA**

D. DFA is slower to process and its representation uses less memory than NFA

Explanation **NFA, while computing strings, take parallel paths, make different copies of input and goes along different paths in order to search for the result. This creates the difference in processing speed of DFA and NFA.**

Q.79 **The number of tuples in an extended Non Deterministic Finite Automaton:**
A. **5**
B. 6
C. 7
D. 4
Explanation **For NFA or extended transition function on NFA, the tuple elements remains same i.e. 5.**

Q.80 **Choose the correct option for the given statement:**
Statement: The DFA shown represents all strings which has 1 at second last position.



A. Correct
B. Incorrect, Incomplete DFA
C. **Wrong proposition**
D. May be correct
Explanation **The given figure is an NFA. The statement contradicts itself.**

Q.81 **What is wrong in the given definition?**
Def: ({q0, q1, q2}, {0,1}, δ, q3, {q3})
A. The definition does not satisfy 5 Tuple definition of NFA
B. There are no transition definition
C. **Initial and Final states do not belong to the Graph**
D. Initial and final states can’t be same
Explanation **q3 does not belong to Q where Q= set of finite states.**

Q.82 **If δ is the transition function for a given NFA, then we define the δ’ for the DFA accepting the same language would be:**
Note: S is a subset of Q and a is a symbol.
A. **$\delta'(S, a) = U_{p\epsilon s}\ \delta(p, a)$**
B. $\delta'(S, a) = U_{p\neq s}\ \delta(p, a)$
C. $\delta'(S, a) = U_{p\epsilon s}\ \delta(p)$
D. $\delta'(S) = U_{p\neq s}\ \delta(p)$
Explanation **According to subset construction, equation 1 holds true.**

Q.83 **What is the relation between DFA and NFA on the basis of computational power?**

A. DFA > NFA
B. NFA > DFA
C. **Equal**
D. Can’t be said

Explanation **DFA is said to be a specific case of NFA and for every NFA that exists for a given language, an equivalent DFA also exists.**

Q.84 **If a string S is accepted by a finite state automaton, $S=s_1s_2s_3......s_n$ where $s_i \epsilon \sum$ and there exists a sequence of states r0, r1, r2…… rn such that $\delta(r(i), s_{i+1}) = r_{i+1}$ for each 0, 1, …n-1, then r(n) is:**

A. initial state
B. transition symbol
C. **accepting state**
D. intermediate state

Explanation **r(n) is the final state and accepts the string S after the string being traversed through r(i) other states where I ϵ 01,2…(n-2).**

Q.85 **According to the given table, compute the number of transitions with 1 as its symbol but not 0:**

Q	Δ(q,0)	δ(q,1)
q0	{q0}	{q0, q1}
q1	{q2}	{q2}
q2	{q3}	{q3}
q3	Φ	Φ

A. 4
B. 3
C. 2
D. **1**

Explanation **The transition graph is made and thus the answer can be found.**

Q.86 **From the given table, δ*(q0, 011) =?**

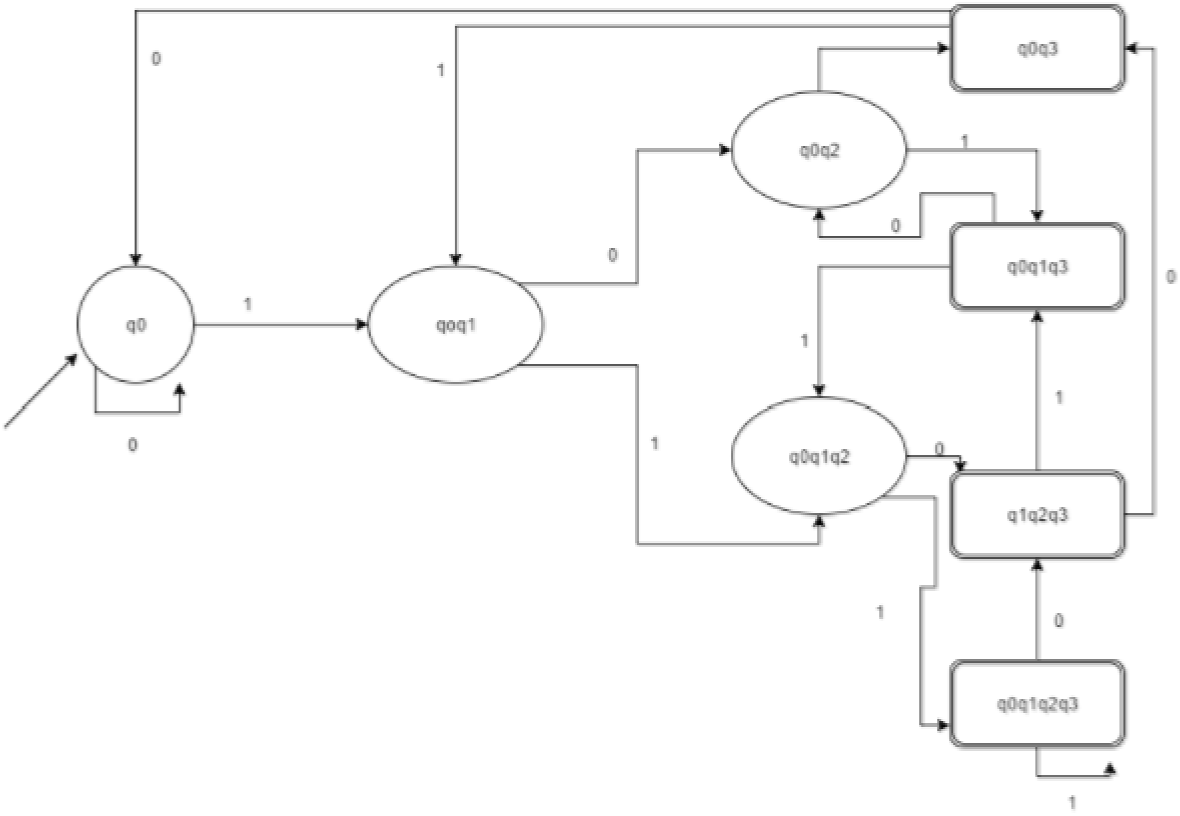
Q	Δ(q,0)	δ(q,1)
q0	{q0}	{q0, q1}
q1	{q2}	{q2}
q2	{q3}	{q3}
q3	Φ	Φ

A. {q0}
B. **{q1} U {q0, q1, q2}**

C. {q2, q1}
D. {q3, q1, q2, q0}

Explanation **δ*(q0,011) = U$_{r\epsilon}$δ*(q0,01) δ (r, 1) = {q0, q1, q2}.**

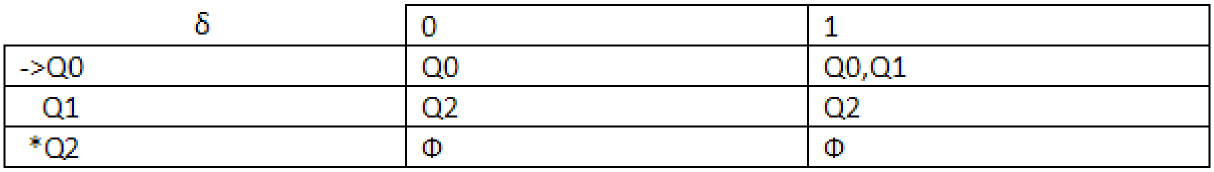
Q.87 **Number of times the state q3 or q2 is being a part of extended 6 transition state is**



A. **6**
B. 5
C. 4
D. 7

Explanation **According to the question, presence of q2 or q1 would count so it does and the answer according to the diagram is 6.**

Q.88 **Predict the missing procedure:**



δ	0	1
->Q0	Q0	Q0,Q1
Q1	Q2	Q2
*Q2	Φ	Φ

1.$\Delta(Q0, \varepsilon) = \{Q0\}$,

2.$\Delta(Q0, 01) = \{Q0, Q1\}$

3.$\delta(Q0, 010) = ?$

A. {Q0, Q1, Q2}

B. {Q0, Q1}

C. **{Q0, Q2}**

D. {Q1, Q2}

Explanation **According to given table and extended transition state implementation, we can find the state at which it rests.**

Q.89 **Subset Construction method refers to:**

A. **Conversion of NFA to DFA**

B. DFA minimization

C. Eliminating Null references

D. ε-NFA to NFA

Explanation **The conversion of a non-deterministic automata into a deterministic one is a process we call subset construction or power set construction.**

Q.90 **Given Language:**

$L_n = \{x \epsilon \{0,1\}^* \mid |x| \geq n$, nth symbol from the right in x is 1$\}$

How many state are required to execute L_3 using NFA?

A. 16

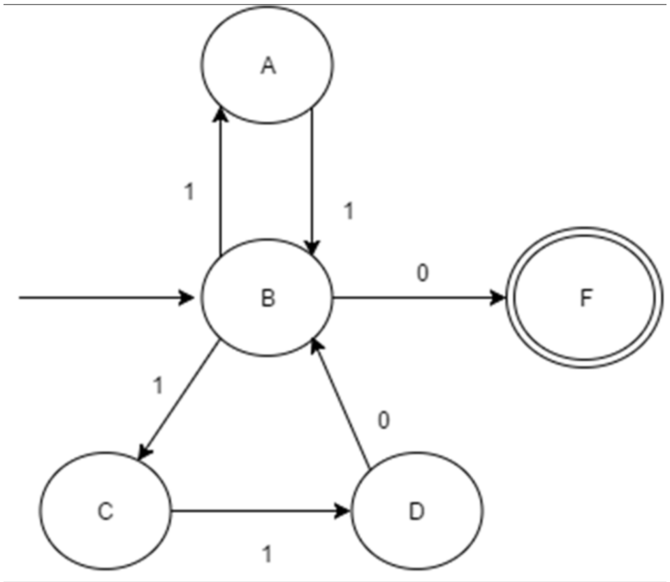
B. **15**

C. 8

D. 7

Explanation **The finite automaton for the given language is made and thus, the answer can be obtained.**

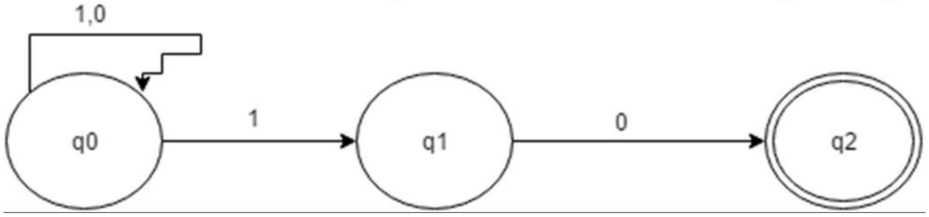
Q.91 **Which of the following does the given NFA represent?**



A. {11, 101} * {01}
B. {110, 01} * {11}
C. **{11, 110} * {0}**
D. {00, 110} * {1}

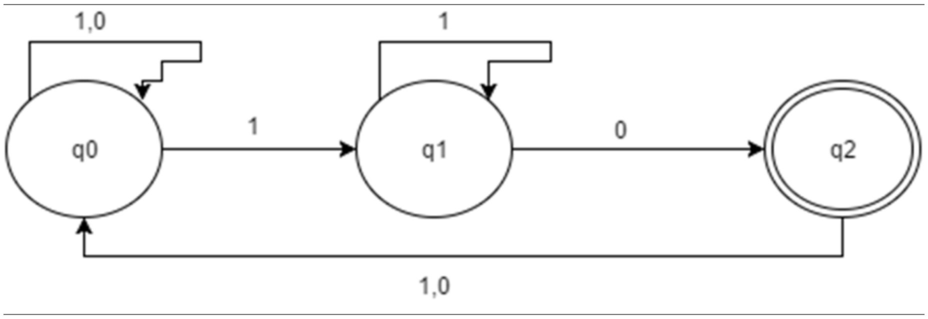
Explanation **The given diagram can be analysed and thus the option can be seeked.**

Q.92 **The number of transitions required to convert the following into equivalents DFA:**



A. **2**
B. 3
C. 1
D. 0

Explanation



Q.93 **If L is a regular language, L^c and L^r both will be:**
A. **Accepted by NFA**
B. Rejected by NFA
C. One of them will be accepted
D. Cannot be said
Explanation **If L is a regular Language, L^c and L^r both are regular even.**

Q.94 **In NFA, this very state is like dead-end non final state:**
A. ACCEPT
B. **REJECT**
C. DISTINCT
D. START
Explanation **REJECT state will be like a halting state which rejects a particular invalid input.**

Q.95 **We can represent one language in more one FSMs, true or false?**
A. **TRUE**
B. FALSE
C. May be true
D. Cannot be said
Explanation **We can represent one language in more one FSMs, example for a same language we have a DFA and an equivalent NFA.**

Q.96 **The production of form non-terminal -> ε is called:**
A. Sigma Production
B. **Null Production**
C. Epsilon Production
D. All of the mentioned
Explanation **The production of form non-terminal ->ε is call null production.**

Q.97 **Which of the following is a regular language?**

A. String whose length is a sequence of prime numbers

B. String with substring ww^r in between

C. Palindrome string

D. **String with even number of Zero's**

Explanation **DFSM's for the first three option is not possible; hence they aren't regular.**

Q.98 **Which of the following recognizes the same formal language as of DFA and NFA?**

A. Power set Construction

B. Subset Construction

C. Robin-Scott Construction

D. **All of the mentioned**

Explanation **All the three option refers to same technique if distinguishing similar constructions for different type of automata.**

Q.99 **Under which of the following operation, NFA is not closed?**

A. Negation

B. Kleene

C. Concatenation

D. **None of the mentioned**

Explanation **NFA is said to be closed under the following operations:**
a) Union
b) Intersection
c) Concatenation
d) Kleene
e) Negation

Q.100 **It is less complex to prove the closure properties over regular languages using**

A. **NFA**

B. DFA

C. PDA

D. Can't be said

Explanation **We use the construction method to prove the validity of closure properties of regular languages. Thus, it can be observe, how tedious and complex is the construction of a DFA as compared to an NFA with respect to space.**

Q.101 **Which of the following is an application of Finite Automaton?**

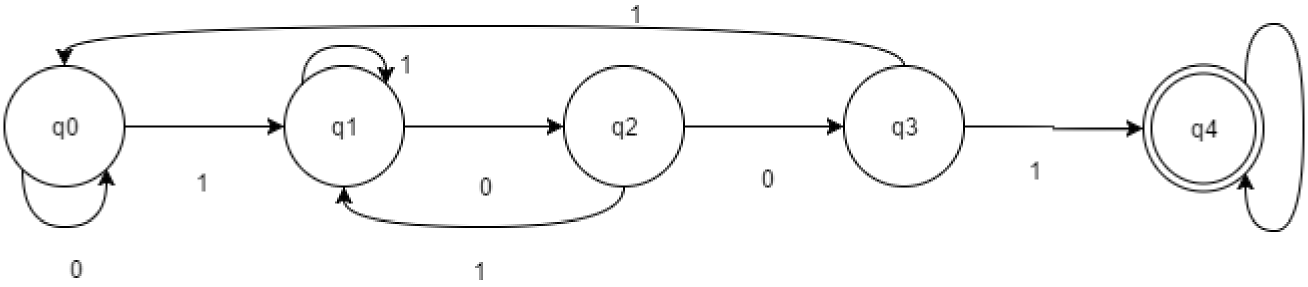
A. Compiler Design
B. Grammar Parsers
C. Text Search
D. **All of the mentioned**

Explanation **There are many applications of finite automata, mainly in the field of Compiler Design and Parsers and Search Engines.**

Q.102 **John is asked to make an automaton which accepts a given string for all the occurrence of '1001' in it. How many number of transitions would John use such that, the string processing application works?**

A. **9**
B. 11
C. 12
D. 15

Explanation



Q.103 **Which of the following do we use to form an NFA from a regular expression?**

A. Subset Construction Method
B. Power Set Construction Method
C. **Thompson Construction Method**
D. Scott Construction Method

Explanation **Thompson Construction method is used to turn a regular expression in an NFA by fragmenting the given regular expression through the operations performed on the input alphabets.**

Q.104 **Which among the following can be an example of application of finite state machine(FSM)?**

A. **Communication Link**
B. Adder
C. Stack
D. None of the mentioned

Explanation **Idle is the state when data in form of packets is send and returns if NAK is received else waits**

for the NAK to be received.

Q.105 **Which among the following is not an application of FSM?**

A. Lexical Analyser

B. BOT

C. State charts

D. **None of the mentioned**

Explanation **Finite state automation is used in Lexical Analyser, Computer BOT (used in games), State charts, etc.**

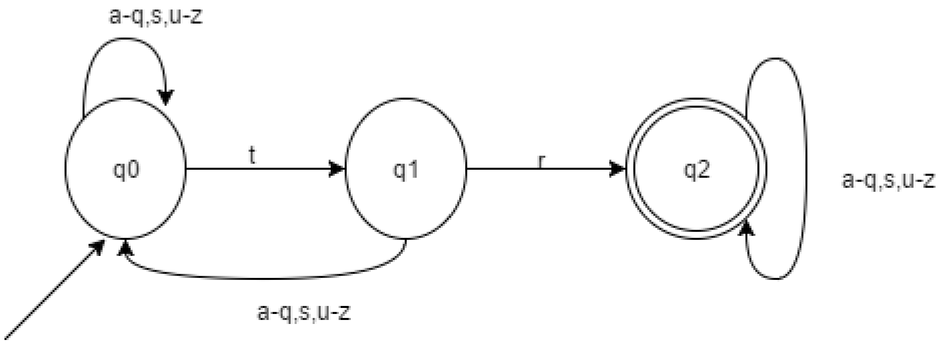
Q.106 **L1= {w | w does not contain the string tr }**
L2= {w | w does contain the string tr}
Given ∑= {t, r}, The difference of the minimum number of states required to form L1 and L2?

A. **0**

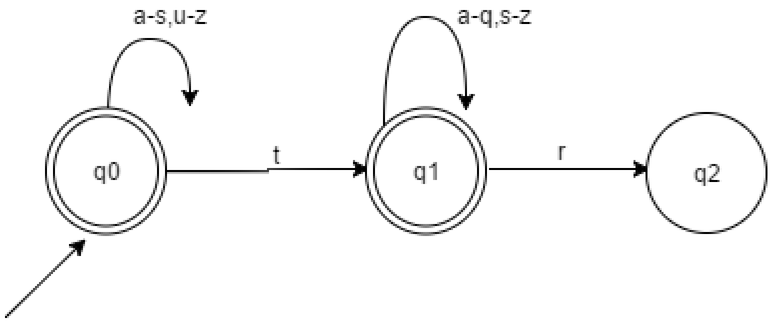
B. 1

C. 2

D. Cannot be said



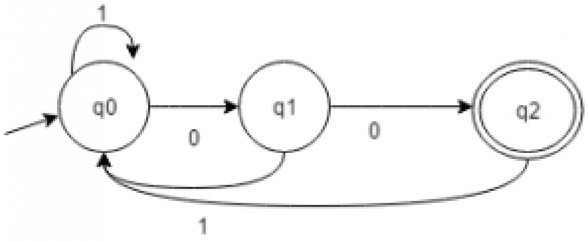
Explanation



Q.107 **Predict the number of transitions required to automate the following language using only 3 states:**
L= {w | w ends with 00}

A. **3**
B. 2
C. 4
D. Cannot be said

Explanation



Q.108 **The total number of states to build the given language using DFA:**
L= {w | w has exactly 2 a's and at least 2 b's}

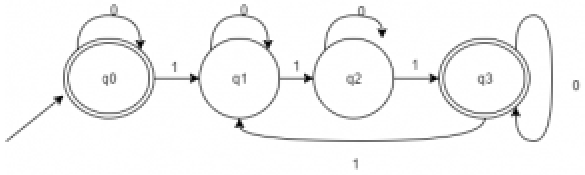
A. **10**
B. 11
C. 12
D. 13

Explanation **We need to make the number of a as fixed i.e. 2 and b can be 2 or more. Thus, using this condition a finite automata can be created using 1 states.**

Q.109 **Given Language: {x | it is divisible by 3}**
The total number of final states to be assumed in order to pass the number constituting {0, 1} is

A. 0
B. 1
C. **2**
D. 3

Explanation **The DFA for the given language can be constructed as follows:**



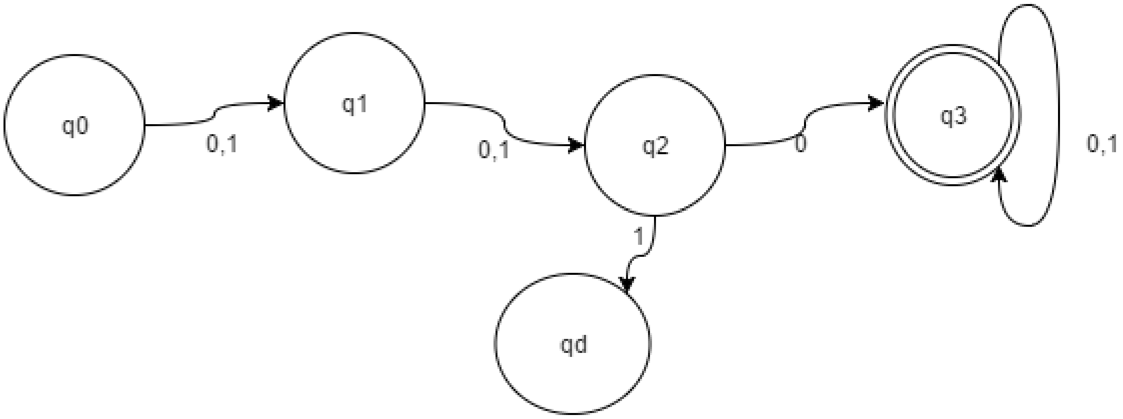
Q.110 **A binary string is divisible by 4 if and only if it ends with:**
A. **100**
B. 1000
C. 1100
D. 0011
Explanation **If the string is divisible by four, it surely ends with the substring ‘100’ while a binary string divisible by 2 would surely end with the substring ‘10’.**

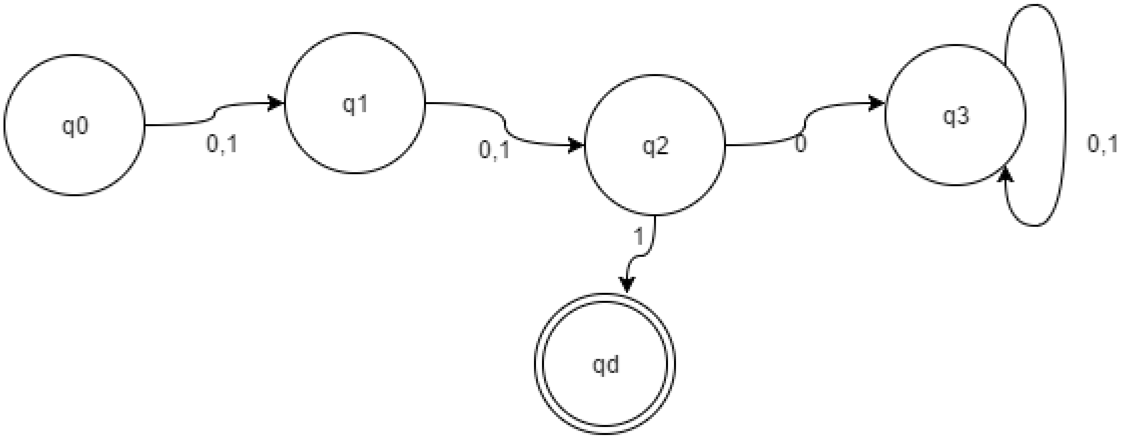
Q.111 **Let L be a language whose FA consist of 5 acceptance states and 11 non final states. It further consists of a dumping state. Predict the number of acceptance states in L^c**
A. **16**
B. 11
C. 5
D. 6
Explanation **If L leads to FA1, then for L^c, the FA can be obtained by exchanging the final and non-final states.**

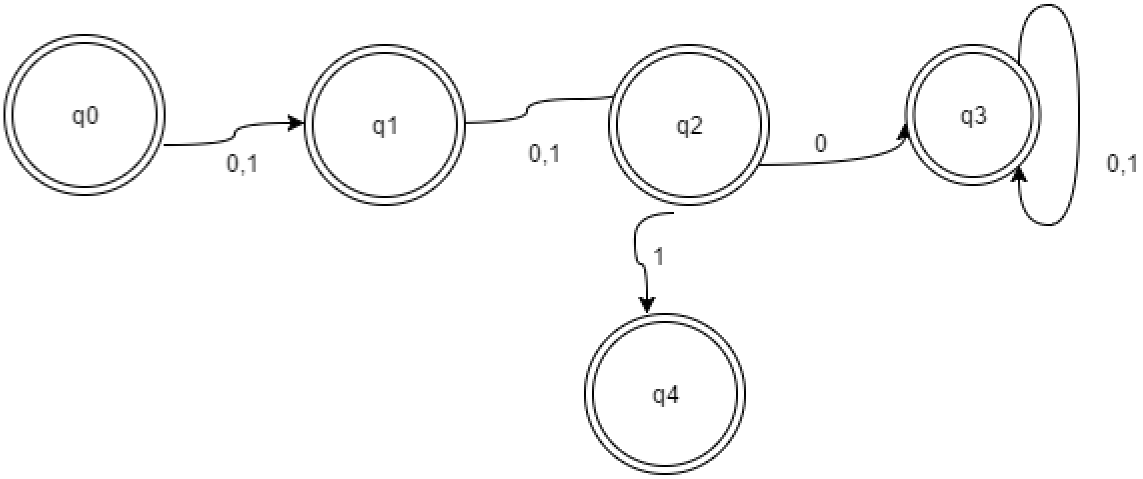
Q.112 **If L1 and L2 are regular languages, which among the following is an exception?**
A. L1 U L2
B. L1 – L2
C. L1 ∩ L2
D. **All of the mentioned**
Explanation **It the closure property of Regular language which lays down the following statement:**
If L1, L2 are 2- regular languages, then L1 U L2, L1 ∩ L2, $L1^C$, L1 – L2 are regular language.

Q.113 **Predict the analogous operation for the given language:**
A: {[p, q] | p ϵ A1, q does not belong to A2}
A. **A1-A2**
B. A2-A1
C. A1.A2
D. A1+A2
Explanation **When set operation ‘-‘ is performed between two sets, it points to those values of prior set which belongs to it but not to the latter set analogous to basic subtraction operation.**

Q.114 **Which among the following NFA’s is correct corresponding to the given Language?**
L= {xϵ {0, 1} | 3rd bit from right is 0}

A. 

B. 

C. 

D. None of the mentioned

Explanation **The NFA accepts all binary strings such that the third bit from right end is 1 and if not, is**

send to Dumping state. Note: It is assumed that the input is given from the right end bit by bit.

Q.115 **Statement 1: NFA computes the string along parallel paths.**
Statement 2: An input can be accepted at more than one place in an NFA.
Which among the following options are most appropriate?

A. Statement 1 is true while 2 is not
B. Statement 1 is false while is not
C. **Statement 1 and 2, both are true**
D. Statement 1 and 2, both are false

Explanation **While the machine runs on some input string, if it has the choice to split, it goes in all possible way and each one is different copy of the machine. The machine takes subsequent choice to split further giving rise to more copies of the machine getting each copy run parallel. If any one copy of the machine accepts the strings, then NFA accepts, otherwise it rejects.**

Q.116 **Which of the following options is correct for the given statement?**
Statement: If K is the number of states in NFA, the DFA simulating the same language would have states less than 2^k.

A. **True**
B. False

Explanation **If K is the number of states in NFA, the DFA simulating the same language would have states equal to or less than 2_k.**

Q.117 **Let N (Q, ∑, δ, q0, A) be the NFA recognizing a language L. Then for a DFA (Q', ∑, δ', q0', A'), which among the following is true?**

A. $Q' = P(Q)$
B. $\Delta' = \delta' (R, a) = \{q \in Q \mid q \in \delta (r, a), \text{ for some } r \in R\}$
C. $Q'=\{q0\}$
D. **All of the mentioned**

Explanation **All the optioned mentioned are the instruction formats of how to convert a NFA to a DFA.**

Q.118 **There exists an initial state, 17 transition states, 7 final states and one dumping state, Predict the maximum number of states in its equivalent DFA?**

A. **226**
B. 225
C. 224
D. 223

Explanation **The maximum number of states an equivalent DFA can comprise for its respective NFA with k states will be 2^k.**

Q.119 **ccording to the given transitions, which among the following are the epsilon closures of q1 for the given NFA?**
Δ (q1, ε) = {q2, q3, q4}
Δ (q4, 1) =q1
Δ (q1, ε) =q1

A. q4
B. q2
C. q1
D. **q1, q2, q3, q4**

Explanation **The set of states which can be reached from q using ε-transitions, is called the ε-closure over state q.**

Q.120 **State true or false?**
Statement: An NFA can be modified to allow transition without input alphabets, along with one or more transitions on input symbols.

A. **True**
B. False

Explanation **It is possible to construct an NFA with ε-transitions, presence of no input symbols, and that is called NFA with ε-moves.**

Q.121 State true or false?
Statement: ε (Input) does not appears on Input tape.

A. **True**
B. False

Explanation **ε does not appears on Input tape, ε transition means a transition without scanning a symbol i.e. without moving the read head.**

Q.122 **Statement 1: ε- transition can be called as hidden non-determinism.**
Statement 2: δ (q, ε) = p means from q it can jump to p with a shift in read head.
Which among the following options is correct?

A. Statement 1 and 2, both are correct
B. Statement 1 and 2, both are wrong
C. **Statement 1 is correct while Statement 2 is wrong**
D. Statement 1 is wrong while Statement 2 is correct

Explanation **The transition with ε leads to a jump but without any shift in read head. Further, the method can be called one to introduce hidden non-determinism.**

Q.123 **ε- closure of q1 in the given transition graph:**

A. {q1}

B. {q0, q2}

C. **{q1, q2}**

D. {q0, q1, q2}

Explanation **ε-closure is defined as the set of states being reached through ε-transitions from a starting state.**

Q.124 **Predict the total number of final states after removing the ε-moves from the given NFA?**

A. 1

B. 2

C. **3**

D. 0

Explanation **The NFA which would result after eliminating ε-moves can be shown diagramatically.**

Q.125 **For NFA with ε-moves, which among the following is correct?**

A. **Δ: Q X (∑ U {ε}) -> P(Q)**

B. Δ: Q X (∑) -> P(Q)

C. Δ: Q X (∑*) -> P(Q)

D. All of the mentioned

Explanation **Due to the presence of ε symbol, or rather an epsilon-move, the input alphabets unites with it to form a set including ε.**

Q.126 **Which among the following is false?**
ε-closure of a subset S of Q is:

A. Every element of S ϵ Q

B. For any q ϵ ε(S), every element of δ (q, ε) is in ε(S)

C. No other element is in ε(S)

D. **None of the mentioned**

Explanation **All the mentioned are the closure properties of ε and encircles all the elements if it satisfies the following options:**
a) Every element of S ϵ Q
b) For any q ϵ ε(S), every element of δ (q, ε) is in ε(S)
c) No other element is in ε(S)

Q.127 **The automaton which allows transformation to a new state without consuming any input symbols:**

A. NFA

B. DFA

C. **NFA-l**

D. All of the mentioned

Explanation **NFA-l or e-NFA is an extension of Non deterministic Finite Automata which are usually called NFA with epsilon moves or lambda transitions.**

Q.128 **e-transitions are**

A. conditional

B. **unconditional**

C. input dependent

D. none of the mentioned

Explanation **An epsilon move is a transition from one state to another that doesnt require any specific condition.**

Q.129 **The___________of a set of states, P, of an NFA is defined as the set of states reachable from any state in P following e-transitions.**

A. **e-closure**

B. e-pack

C. Q in the tuple

D. None of the mentioned

Explanation **The e-closure of a set of states, P, of an NFAis defined as the set of states reachable from any state in P following e-transitions.**

Q.130 **Is the language preserved in all the steps while eliminating epsilon transitions from a NFA?**

A. **yes**

B. no

Explanation **Yes, the language is preserved during the dteps of construction: L(N)=L(N1)=L(N2)=L(3).**

Q.131 **Which of the following does not belong to input alphabet if S={a, b}* for any language?**

A. a

B. b

C. **e**

D. none of the mentioned

Explanation **The automaton may be allowed to change its state without reading the input symbol using epsilon but this does not mean that epsilon has become an input symbol. On the contrary, one assumes that the symbol epsilon does not belong to any alphabet.**

Q.132 **Regular sets are closed under union,concatenation and kleene closure.**

A. **True**
B. False
C. Depends on regular set
D. Can’t say

Explanation **Regular sets are closed under these three operation.**

Q.133 **Complement of a DFA can be obtained by**

A. making starting state as final state.
B. no trival method.
C. **making final states non-final and non-final to final.**
D. make final as a starting state.

Explanation **String accepted in previous DFA will not be accepted and non accepting string will be accepted .**

Q.134 **Complement of regular sets are __________**

A. **Regular**
B. CFG
C. CSG
D. RE

Explanation **Regular sets are closed under complement operation.**

Q.135 **If L1 and L2 are regular sets then intersection of these two will be**

A. **Regular**
B. Non Regular
C. Recursive
D. Non Recursive

Explanation **Regular expression are also colsed under intersection.**

Q.136 **If L1 is regular L2 is unknown but L1-L2 is regular ,then L2 must be**

A. Empty set
B. CFG
C. Decidable
D. **Regular**

Explanation **Regular is closed under difference.**

Q.137 **Reverse of a DFA can be formed by**
A. using PDA
B. making final state as non-final
C. **making final as starting state and starting state as final state**
D. None of the mentioned
Explanation **By making final state as starting state string starting from end will be accepted.**

Q.138 **Reverse of (0+1)* will be**
A. Phi
B. Null
C. **(0+1)***
D. (0+1)
Explanation **There is only one state which is start and final state of DFA so interchanging starting start and final state doesn't change DFA.**

Q.139 **A____________is a substitution such that h(a) contains a string for each a.**
A. Closure
B. Interchange
C. **Homomorphism**
D. Inverse Homomorphism
Explanation **This operation replace using a function.**

Q.140 **Homomorphism of a regular set is ________**
A. Universal set
B. Null set
C. **Regular set**
D. Non regular set
Explanation **Regular set are closed under homomorphism.**

Q.141 **(a ^ 5b ^ 5)* is example of ________**
A. Type 0 language
B. Type 1 language
C. Type 2 language
D. **Type 3 language**
Explanation **It is a regular expression.**

Q.142 **Which of the following is type 3 language ?**
A. Strings of 0's whose length is perfect square
B. Palindromes string

C. Strings of 0’s having length prime number

D. **String of odd number of 0’s**

Explanation **Only d is regular language.**

Q.143 **a ^ nb ^ n where (n+m) is even .**

A. Type 0

B. Type 1

C. Type 2

D. **Type 3**

Explanation **It is a regular expression.**

Q.144 Complement of a ^ nb ^ m where n >= 4 and m <= 3 is example of

A. Type 0

B. Type 1

C. Type 2

D. **Type 3**

Explanation It is a regular expression.

Q.145 **L is a regular Language if and only If the set of___________classes of IL is finite.**

A. **Equivalence**

B. Reflexive

C. Myhill

D. Nerode

Explanation **According to Myhill Nerode theorem, the corollary proves the given statement correct for equivalence classes.**

Q.146 **A language can be generated from simple primitive language in a simple way if and only if**

A. It is recognized by a device of infinite states

B. **It takes no auxiliary memory**

C. Both are correct

D. Both are wrong

Explanation **A language is regular if and only if it can be accepted by a finite automaton. Secondly, It supports no concept of auxiliary memory as it loses the data as soon as the device is shut down.**

Q.147 **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}**

Explanation **The given option represents {0, 01} in different forms using set operations and Regular Expressions. The operator like ^, v, etc. are logical operation and they form invalid regular expressions when used.**

Q.148 **According to the given language, which among the following expressions does it corresponds to?**
Language L={xϵ{0,1}|x is of length 4 or less}

A. $(0+1+0+1+0+1+0+1)^4$
B. $(0+1)^4$
C. $(01)^4$
D. **$(0+1+\varepsilon)^4$**

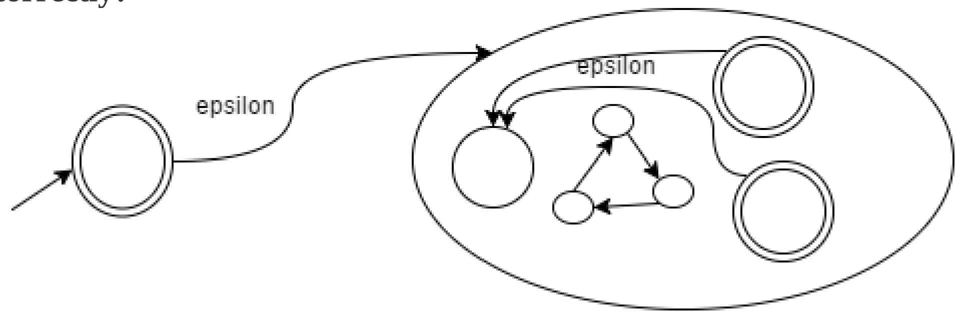
Explanation **The extended notation would be $(0+1)^4$ but however, we may allow some or all the factors to be ε. Thus ε needs to be included in the given regular expression.**

Q.149 **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}

Explanation **The given regular expression corresponds to a language of binary strings which is of even length including a length of 0.**

Q.150 **If R represents a regular language, which of the following represents the Venn-diagram most correctly?**



A. An Irregular Set

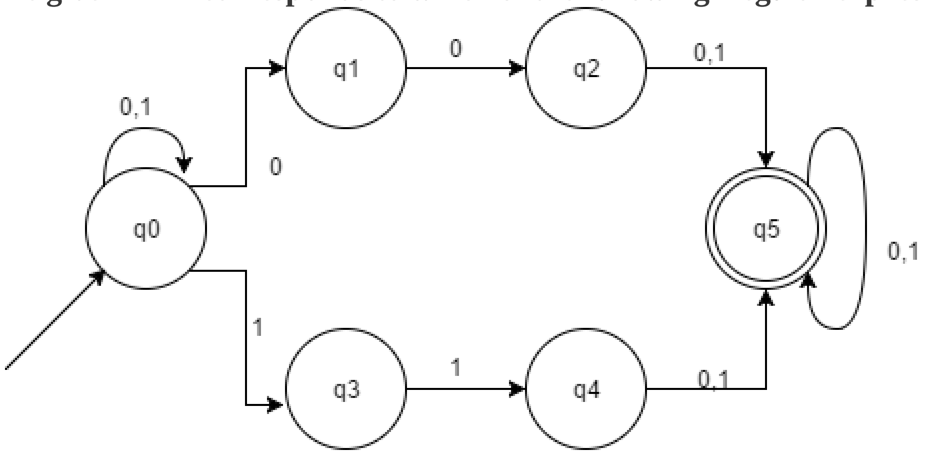
B. **R***

C. R complement

D. R reverse

Explanation **The given diagram represents the Kleene operation over the Regular Language R in which the final states become the initial and the initial state becomes final.**

Q.151 **The given NFA corresponds to which of the following Regular expressions?**



A. **(0+1) *(00+11) (0+1) ***

B. (0+1) *(00+11) *(0+1) *

C. (0+1) *(00+11) (0+1)

D. (0+1) (00+11) (0+1) *

Explanation **The transition states shown are the result of breaking down the given regular expression in fragments. For dot operation, we change a state, for union (plus) operation, we diverge into two transitions and for Kleene Operation, we apply a loop.**

Q.152 **Concatenation Operation refers to which of the following set operations:**

A. Union

B. **Dot**

C. Kleene

D. Two of the options are correct

Explanation **Two operands are said to be performing Concatenation operation AB = A•B = {xy: x ∈A & y ∈B}.**

Q.153 **Concatenation of R with Φ outputs:**

A. R

B. **Φ**

C. R, Φ
D. None of the mentioned

Explanation **By distributive property (Regular expression identities), we can prove the given identity to be Φ.**

Q.154 **RR* can be expressed in which of the forms:**

A. **R+**
B. R-
C. R+ U R-
D. R

Explanation **RR*=R+ as R+ means the occurrence to be at least once.**

Q.155 **A finite automaton accepts which type of language:**

A. Type0
B. Type1
C. Type2
D. **Type3**

Explanation **Type 3 refers to Regular Languages which is accepted by a finite automaton.**

Q.156 **Which among the following are incorrect regular identities?**

A. εR=R
B. ε*=ε
C. Φ*=ε
D. **RΦ=R**

Explanation **There are few identities over Regular Expressions which include: RΦ=ΦR=Φ≠R**

Q.157 **implify the following regular expression:**
ε+1*(011) *(1*(011) *) *

A. **(1+011) ***
B. (1*(011) *)
C. (1+(011) *) *
D. (1011) *

Explanation **ε+1*(011) *(1*(011) *) ***
ε + RR*= ε + R*R= ε + R+= R*

Q.158 **P, O, R be regular expression over ∑, P is not ε, then**
R=Q + RP has a unique solution:

A. Q*P
B. **QP***
C. Q*P*
D. (P*O*) *

Explanation
**The given statement is the Arden's Theorem and it tends to have a unique solution as QP*.
Let P and Q be regular expressions,
R=Q+RP
R=Q+(Q+RP) P
R=Q+((Q+RP) +RP) +P=Q+QP+RPP+RPP=Q+QP+(Q+RP) PP+(Q+RP)
PP=Q+QP+QPP+RPPP+QPP+RPPP,
If we do this recursively, we get:
R= QP***

Q.159 Arden's theorem is true for:
A. More than one initial states
B. Null transitions
C. **Non-null transitions**
D. None of the mentioned

Explanation
**Arden's theorem strictly assumes the following;
a) No null transitions in the transition diagrams
b) True for only single initial state**

Q.160 The difference between number of states with regular expression (a + b) and (a + b) * is:
A. **1**
B. 2
C. 3
D. 0

Explanation

Q.161 In order to represent a regular expression, the first step to create the transition diagram is:
A. **Create the NFA using Null moves**
B. Null moves are not acceptable, thus should not be used
C. Predict the number of states to be used in order to construct the Regular expression
D. None of the mentioned

Explanation
**Two steps are to be followed while converting a regular expression into a transition diagram:
a) Construct the NFA using null moves.
b) Remove the null transitions and convert it into its equivalent DFA.**

Q.162 **(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}

Explanation **The regular expression is fragmented and the set of the strings eligible is formed. '+' represents union while '.' Represents concatenation.**

Q.163 **The minimum number of states required to automate the following Regular Expression: (1) *(01+10) (1) ***

A. **4**
B. 3
C. 2
D. 5

Explanation

Q.164 **Regular Expression denote precisely the_________of Regular Language.**

A. **Class**
B. Power Set
C. Super Set
D. None of the mentioned

Explanation **Regular Expression denote precisely the class of regular language. Given any regular expression, L(R) is a regular language. Given any regular language L, there is a regular expression R, such that L(R)=L.**

Q.165 **Which of the following is correct?**
Statement 1: ε represents a single string in the set.
Statement 2: Φ represents the language that consist of no string.

A. **Statement 1 and 2 both are correct**
B. Statement 1 is false but 2 is correct
C. Statement 1 and 2 both are false
D. There is no difference between both the statements, ε and Φ are different notation for same reason

Explanation **ε represents a single string in the set namely, the empty string while Statement 2 is also correct.**

Q.166 **The appropriate precedence order of operations over a Regular Language is**

A. Kleene, Union, Concatenate
B. Kleene, Star, Union

C. **Kleene, Dot, Union**
D. Star, Union, Dot

Explanation **If a regular language expression is given, the appropriate order of precedence if the parenthesis is ignored is: Star or Kleene, Dot or Concatenation, Union or Plus.**

Q.167 **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

Explanation **When we wish to distinguish between a regular expression R and the language it represents; we write L(R) to be the language of R.**

Q.168 **Let for ∑= {0,1} R= (∑∑∑) *, 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

Explanation **This regular expression can be used to eliminate the answers and get the result. The length can be even and as well more than 3 when R= (∑∑∑) (∑∑∑) (particular case).**

Q.169 **If ∑= {0,1}, then Φ* will result to:**
A. **ε**
B. ∑
C. Φ
D. None of the mentioned

Explanation **The star operation brings together any number of strings from the language to get a string in the result. If the language is empty, the star operation can put together 0 strings, resulting only the empty string.**

Q.170 **The given NFA represents which of the following NFA**
A. **(ab U a) ***
B. (a*b* U a*)
C. (ab U a*)
D. (ab)* U a*

Explanation **The Regular expression (ab U a) * is converted to NFA in a sequence of stages as it can be clearly seen in the diagram. This NFA consist of 8 stated while its minimized form only contains 2 states.**

Q.171 **Which of the following represents a language which has no pair of consecutive 1’s if ∑= {0,1}?**

A. **(0+10)*(1+ε)**

B. (0+10)*(1+ε)*

C. (0+101)*(0+ε)

D. (1+010)*(1+ε)

Explanation **All the options except ‘a’ accept those strings which comprises minimum one pair of 1’s together.**

Q.172 **The finite automata accept the following languages:**

A. Context Free Languages

B. Context Sensitive Languages

C. **Regular Languages**

D. All the mentioned

Explanation **A finite automaton accepts the languages which are regular and for which a DFA can be constructed.**

Q.173 **(a + b*c) most correctly represents:**

A. (a +b) *c

B. (a)+((b)*.c)

C. (a + (b*)).c

D. **a+ ((b*).c)**

Explanation **Following the rules of precedence, Kleene or star operation would be done first, then concatenation and finally union or plus operation.**

Q.174 **Which of the following regular expressions represents the set of strings which do not contain a substring ‘rt’ if ∑= {r, t}**

A. (rt)*

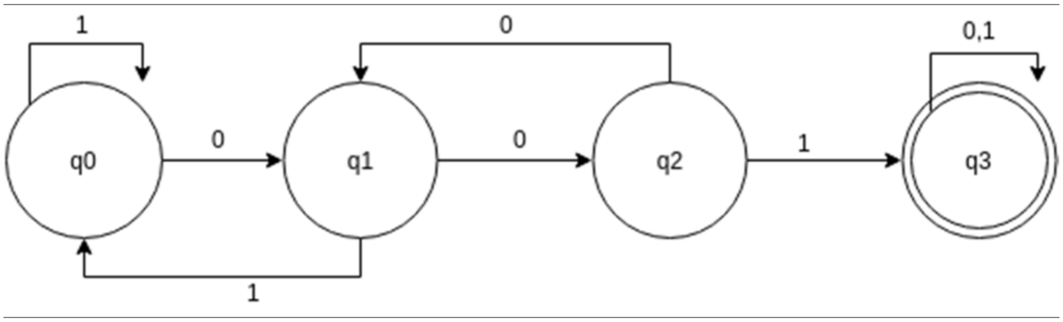
B. (tr)*

C. (r*t*)

D. **(t*r*)**

Explanation **As Kleene operation is not on the whole of the substring, it will not repeat and maintain the order of t, r.**

Q.175 **Which of the following is same as the given DFA?**



A. **(0+1)*001(0+1)***
B. 1*001(0+1)*
C. (01)*(0+0+1)(01)*
D. None of the mentioned

Explanation **There needs to be 001 together in the string as an essential substring. Thus, the other components can be anything, 0 or 1 or e.**

Q.176 **Which of the following statements is not true?**
A. Every language defined by any of the automata is also defined by a regular expression
B. **Every language defined by a regular expression can be represented using a DFA**
C. Every language defined by a regular expression can be represented using NFA with e moves
D. Regular expression is just another representation for any automata definition

Explanation **Using NFA with e moves, we can represent all the regular expressions as an automata. As regular expressions include e, we need to use e moves.**

Q.177 **The total number of states required to automate the given regular expression (00)*(11)***
A. 3
B. 4
C. **5**
D. 6

B. (11+110)*1
C. **(110+11)*0**
D. (1+110)*1

Explanation **There is no state change for union operation, but has two different paths while for concatenation or dot operation, we have a state change for every element of the string.**

Q.178 **Generate a regular expression for the following problem statement:
Password Validation: String should be 8-15 characters long. String must contain a number, an Uppercase letter and a Lower case letter.**

A. **^(?=.*[a-z])(?=.*[A-Z])(?=.*\d).{8,15}$**

B. ^(?=.*[a-z])(?=.*[A-Z])(?=.*\d).{9,16}$

C. ^(?=.[a-z])(?=.[A-Z])(?=.\d).{8,15}$

D. None of the mentioned

Explanation **Passwords like abc123, 123XYZ, should not be accepted . If one also wants to include special characters as one of the constraint, one can use the following regular expression:
^(?=.*[a-z])(?=.*[A-Z])(?=.*\d)(?=.*[^\da-za-Z]).{8,15}$**

Q.179 **Generate a regular expression for the following problem statement:
P(x): String of length 6 or less for å={0,1}***

A. **(1+0+e)6**

B. (10)6

C. (1+0)(1+0)(1+0)(1+0)(1+0)(1+0)

D. More than one of the mentioned is correct

Explanation **As the input variables are under Kleene Operation, we need to include e,thus option c is not correct,thereby option (a) is the right answer.**

Q.180 **The minimum number of states required in a DFA (along with a dumping state) to check whether the 3rd bit is 1 or not for |n|>=3**

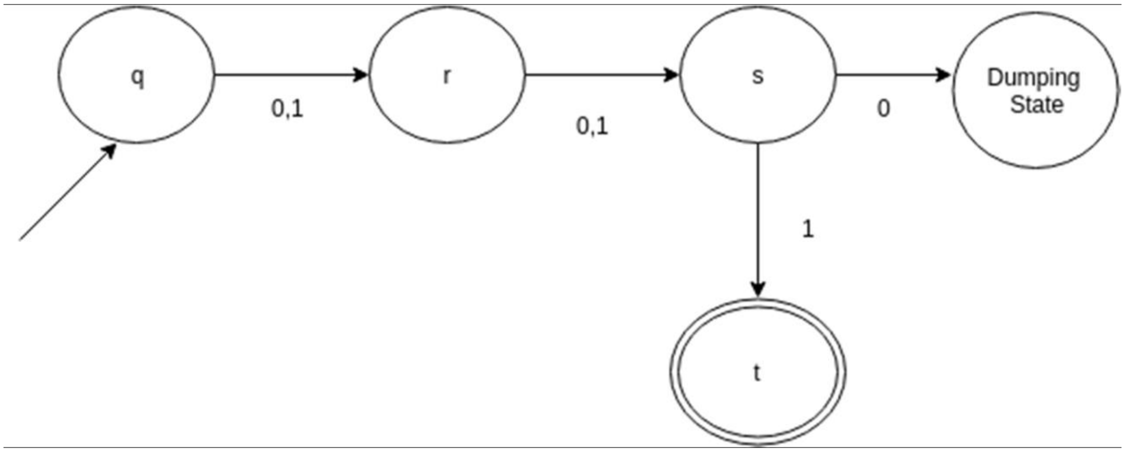
A. 3

B. 4

C. **5**

D. 1

Explanation



Q.181 **Which of the regular expressions corresponds to the given problem statement:**
P(x): Express the identifiers in C Programming language
l=letters
d=digits

A. (l+_)(d+_)*
B. (l+d+_)*
C. **(l+_)(l+d+_)***
D. (_+d)(l+d+_)*

Explanation **Identifiers in C Programming Language follows the following identifiers rule:**

a) The name of the identifier should not begin with a digit.
b) It can only begin with a letter or a underscore.
c) It can be of length 1 or more.

Q.182 **Generate a regular expression for the given language:l**
L(x): {xÎ{0,1}*| x ends with 1 nd does not contain a substring 01}

A. (0+01)*
B. (0+01)*1
C. **(0+01)*(1+01)**
D. All of the mentioned

Explanation **(a) and (b) are the general cases where we restrict the acceptance of a string witrh substring 00 but we ignore the case where the string needs to end with 1 which therby, does not allows the acceptance of e.**

Q.183 **Which of the following is an utility of state elimination phenomenon?**

A. DFA to NFA
B. NFA to DFA
C. **DFA to Regular Expression**
D. All of the mentioned

Explanation **We use this algorithm to simplify a finite automaton to regular expression or vice versa. We eliminate states while converting a given finite automata to its corresponding regular expression.**

Q.184 **If we have more than one accepting states or an accepting state with an outdegree, which of the following actions will be taken?**

A. addition of new state
B. removal of a state
C. make the newly added state as final
D. **more than one option is correct**

Explanation **If there is more than one accepting state or if the single accepting state as an out degree , add a new accepting state, make all other states non accepting, and hold an e-transitions from each former accepting state to the new accepting state.**

Q.185 **Which of the following is not a step in elimination of states procedure?**

A. Unifying all the final states into one using e-transitions

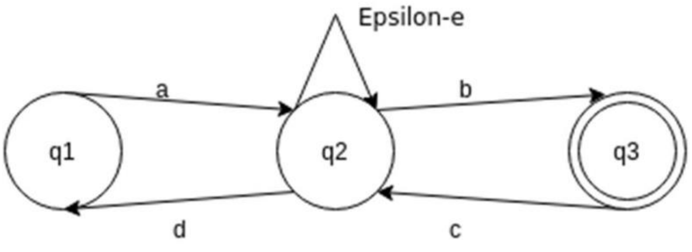
B. **Unify single transitions to multi transitions that contains union of input**

C. Remove states until there is only starting and accepting states

D. Get the resulting regular expression by direct calculation

Explanation **While eliminating the states, we unify multiple transitions to one transition that contains union of input and not the vice versa.**

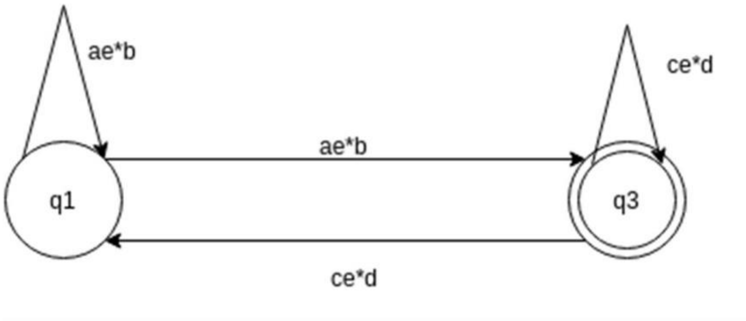
Q.186 **Can the given state diagram be reduced?**



A. **Yes**

B. No

Explanation **The state q2 can be eliminated with ease and the reduced state diagram can be represented as:**



Q.187 **Which of the following methods is suitable for conversion of DFA to RE?**

A. **Brzozowski method**

B. Arden’s method

C. Walter’s method

D. All of the mentioned

Explanation **Brzozowski method takes a unique approach to generating regular expressions. We create a system of regular expressions with one regular expression unknown for each state in M, and then we solve the system for Rλ where Rλ is the regular expression associated with starting**

state qλ.

Q.188 **State true or false:**
Statement: The state removal approach identifies patterns within the graph and removes state, building up regular expressions along each transition.

A. **true**
B. false

Explanation **This method has the advantage over the transitive closure technique as it can easily be visualized.**

Q.189 **The behaviour of NFA can be simulated using DFA.**

A. **always**
B. never
C. sometimes
D. none of the mentioned

Explanation **For every NFA, there exists an equivalent DFA and vice versa.**

Q.190 **It is suitable to use_____________method/methods to convert a DFA to regular expression.**

A. Transitive Closure properties
B. Brzozowski method
C. State elimination method
D. **All of the mentioned**

Explanation **For converting RE to DFA , first we convert RE to NFA (Thompson Construction), and then NFA is converted into DFA(Subset Construction).**

Q.191 **State true or false:**
Statement: For every removed state, there is a regular expression produced.

A. **true**
B. false

Explanation **For every state which is eliminated, a new regular expression is produced. The newly generated regular expression act as an input for a state which is next to removed state.**

Q.192 **Is it possible to obtain more than one regular expression from a given DFA using the state elimination method?**

A. **Yes**
B. No

Explanation **Using different sequence of removal of state, we can have different possible solution of regular expressions. For n-state deterministic finite automata excluding starting and final states, n!**

Removal sequences are there. It is very tough to try all the possible removal sequences for smaller expressions.

Q.193 **A regular language over an alphabet a is one that can be obtained from**

A. union

B. concatenation

C. kleene

D. **All of the mentioned**

Explanation **None.**

Q.194 **Regular expression {0,1} is equivalent to**

A. 0 U 1

B. 0 / 1

C. 0 + 1

D. **All of the mentioned**

Explanation **All are equivalent to union operation.**

Q.195 **Precedence of regular expression in decreasing order is**

A. * , . , +

B. . , * , +

C. . , + , *

D. + , a , *

Explanation **None.**

Q.196 **Regular expression Φ* is equivalent to**

A. **ϵ**

B. Φ

C. 0

D. 1

Explanation **None.**

Q.197 **a? is equivalent to**

A. a

B. a+Φ

C. **a+ϵ**

D. wrong expression

Explanation **Zero or one time repetition of previous character**

Q.198 **ϵL is equivalent to**
A. ϵ
B. Φ
C. **L**
D. **Lϵ**
Explanation **None.**

Q.199 **(a+b)* is equivalent to**
A. b*a*
B. **(a*b*)***
C. a*b*
D. none of the mentioned
Explanation **None.**

Q.200 **ΦL is equivalent to**
A. **LΦ**
B. **Φ**
C. L
D. ϵ
Explanation **None.**

Q.201 **Which of the following pair of regular expression are not equivalent?**
A. 1(01)* and (10)*1
B. x(xx)* and (xx)*x
C. **(ab)* and a*b***
D. x+ and x*x+
Explanation **(ab)*=(a*b*)*.**

Q.202 **Consider following regular expression**
i) (a/b)* ii) (a*/b*)* iii) ((ϵ/a)b*)*
Which of the following statements is correct
A. i,ii are equal and ii,iii are not
B. i,ii are equal and i,iii are not
C. ii,iii are equal and i,ii are not
D. **all are equal**
Explanation **All are equivalent to (a+b)*.**

Q.203 **How many strings of length less than 4 contains the language described by the regular expression (x+y)*y(a+ab)*?**

A. 7
B. 10
C. **12**
D. 11

Explanation
string of length 0 = Not possible (because y is always present).
string of length 1 = 1 (y)
string of length 2 = 3 (xy,yy,ya)
string of length 3 = 8 (xxy,xyy,yxy,yyy,yaa,yab,xya,yya)

Q.204 **Which of the following is true?**

A. (01)*0 = 0(10)*
B. (0+1)*0(0+1)*1(0+1) = (0+1)*01(0+1)*
C. (0+1)*01(0+1)*+1*0* = (0+1)*
D. **All of the mentioned**

Explanation **None**

Q.205 **A language is regular if and only if**

A. **accepted by DFA**
B. accepted by PDA
C. accepted by LBA
D. accepted by Turing machine

Explanation **All of above machine can accept regular language but all string accepted by machine is regular only for DFA.**

Q.206 **Regular grammar is**

A. **context free grammar**
B. non context free grammar
C. english grammar
D. none of the mentioned

Explanation **Regular grammar is subset of context free grammar.**

Q.207 **Let the class of language accepted by finite state machine be L1 and the class of languages represented by regular expressions be L2 then**

A. L1<L2
B. L1>=L2

C. L1 U L2 = .*
D. **L1=L2**
Explanation **Finite state machine and regular expression have same power to express a language.**

Q.208 **Which of the following is not a regular expression?**
A. [(a+b)*-(aa+bb)]*
B. **[(0+1)-(0b+a1)*(a+b)]***
C. (01+11+10)*
D. (1+2+0)*(1+2)*
Explanation **Except b all are regular expression*.**

Q.209 **Regular expression are**
A. **Type 0 language**
B. Type 1 language
C. Type 2 language
D. Type 3 language
Explanation **According to Chomsky hierarchy .**

Q.210 **Which of the following is true?**
A. Every subset of a regular set is regular
B. **Every finite subset of non-regular set is regular**
C. The union of two non regular set is not regular
D. Infinite union of finite set is regular
Explanation **None**

Q.211 **L and ~L are recursive enumerable then L is**
A. Regular
B. Context free
C. Context sensitive
D. **Recursive**
Explanation **If L is recursive enumerable and its complement too if and only if L is recursive.**

Q.212 **Regular expressions are closed under**
A. Union
B. Intersection
C. Kleen star
D. **All of the mentioned**

Explanation **According to definition of regular expression.**

Q.213 **What kind of expressions do we used for pattern matching?**
A. Regular Expression
B. Rational Expression
C. **Regular & Rational Expression**
D. None of the mentioned

Explanation **In automata theory, Regular Expression(sometimes also called the Rational Expression) is a sequence or set of characters that define a search pattern, mainly for the use in pattern matching with strings or string matching.**

Q.214 **Which of the following do Regexps do not find their use in?**
A. search engines
B. word processors
C. sed
D. **none of the mentioned**

Explanation **Regexp processors are found in several search engines, seach and replace mechanisms, and text processing utilities**

Q.215 **Which of the following languages have built in regexps support?**
A. **Perl**
B. Java
C. Python
D. C++

Explanation **Many languages come with built in support of regexps like Perl, Javascript, Ruby etc. While some provide support using standard libraries like .NET, Java, Python, C++, C and POSIX.**

Q.216 **The following is/are an approach to process a regexp:**
A. Contruction of NFA and subsequently, a DFA
B. Thompson’s Contruction Algorithm
C. **Both (a) and (b)**
D. None of the mentioned

Explanation **A regexp processor translates the syntax into internal representation which can be executed and matched with a string and that internal representation can have several approaches like the ones mentioned.**

Q.217 **Are the given two patterns equivalent?**
A. **gray|grey**

B. gr(a|e)y
C. yes
D. no

Explanation **Paranthesis can be used to define the scope and precedence of operators. Thus, both the expression represents the same pattern.**

Q.218 **Which of the following are not quantifiers?**
A. Kleene plus +
B. Kleene star *
C. Question mark ?
D. **None of the mentioned**

Explanation **A quantifier after a token specifies how often the preceding element is allowed to occur. ?, *, +, {n}, {min, }, {min, max} are few quantifiers we use in regexps implementations.**

Q.219 **Which of the following cannot be used to decide whether and how a given regexp matches a string:**
A. NFA to DFA
B. Lazy DFA algorithm
C. Backtracking
D. **None of the mentioned**

Explanation **There are at least three algorithms which decides for us, whether and how a regexp matches a string which included the transformation of Non deterministic automaton to deterministic finite automaton, The lazy DFA algorithm where one simulates the NFA directly, building each DFA on demand and then discarding it at the next step and the process of backtracking whose running time is exponential.**

Q.220 **What does the following segment of code output?**

```
$string1 = "Hello World\n";
if ($string1 =~ m/(H..).(l..)/) {
  print "We matched '$1' and '$2'.\n";
}
```

A. We matched ‘Hel’ and ‘ld’
B. We matched ‘Hel’ and ‘lld’
C. **We matched ‘Hel’ and ‘lo ‘**
D. None of the mentioned

Explanation **() groups a series of pattern element to a single element.**

Q.221 **When we use pattern in parenthesis, we can use any of '$1', '$2' later to refer to the previously matched pattern.**

Given segment of code:

```
$string1 = "Hello\nWorld\n";
if ($string1 =~ m/d\n\z/) {
print "$string1 is a string ";
  print "that ends with 'd\\n'.\n";
}
```

What does the symbol /z does?

A. changes line

B. matches the beginning of a string

C. **matches the end of a string**

D. none of the mentioned

Explanation **It matches the end of a string and not an internal line.The given segment of code outputs:
Hello
World
is a string that ends with 'd\n'**

Q.222 **Conversion of a regular expression into its corresponding NFA :**

A. **Thompson's Construction Algorithm**

B. Powerset Construction

C. Kleene's algorithm

D. None of the mentioned

Explanation **Thompson construction algorithm is an algorithm in automata theory used to convert a given regular expression into NFA. Similarly, Kleene algorithm is used to convert a finite automaton to a regular expression.**

Q.223 **Which among the following is not a UNIX command for regular expressions?**

A. ed

B. sed

C. vi

D. **none of the mentioned**

Explanation **Regular expressions are used by different commands in Unix like ed, sed, grep, awk, vi, etc. Sed stands for stream editor which is exclusively used for executing scripts.**

Q.224 **What is the significance of $ used in regular expression in UNIX?**

A. Matches the beginning of the line

B. **Matches the end of lines**
C. Matches any single character
D. None of the mentioned

Explanation **Regular expression provides more flexibility while matching string patterns. Special characters like ^, $, *, . are very useful.**

Q.225 **Generate the regular expression to match blank lines**
A. / */
B. /bl
C. /^?/
D. **/^$/**

Explanation **There are few expressions which provide the utility of matching metacharacters including /^$/ for blank lines, / */ for matching one or more spaces, /^.*$/ for matching an entire line whatever it is.**

Q.226 **For the given syntax of sed, which among the following is not a correct option? General syntax of sed: /pattern/action**
A. / are used as delimiters
B. pattern refers to a regular expression
C. **pattern refers to the string to be matched**
D. action refers to the command

Explanation **In the general syntax of sed, pattern is the regular expression and action refers to the command given (p: prints the line, d: deletes the line, etc).**

Q.227 **What does grep do in UNIX?**
A. It is an editor in UNIX
B. **It searches for text patterns**
C. Both (a) and (b)
D. None of the mentioned

Explanation **The grep is a standard UNIX utility program that searches through a set of files in search of a text pattern,specified through a regular expression.**

Q.228 **State true or false:**
Statement: A regular expression is a sequence of characters that represent a pattern.
A. **true**
B. false

Explanation **Such a generated pattern could be a fixed word or describe something like more general.**

Q.229 **Which of the following options support the given statement?**
Statement: A regular expression could be a fixed word or describe something like more general.

A. **This flexibility makes Regular expression invaluable.**
B. This flexibility makes the Regular expression unvaluable.
C. Both (a) and (b)
D. None of the mentioned

Explanation **Regular expressions are very much invaluable tools; they can be used to find a particular segment of line in a file and instruct to take certain actions.**

Q.230 **What does the following segment of code does?**
grep -i man heroes.txt

A. manually opens a file called heroes.txt
B. manages heroes.txt
C. **search for “man” in the file “heroes.txt”**
D. none of the mentioned

Explanation **grep is a command which finds the pattern in a particular text segment.Here, it scans each line in heroes.txt and looks for an m followed by a and then followed by n.**

Q.231 **What does “X?” do regular expression operator?**

A. Matches zero or more capital X’s.
B. **Matches no or one occurence of the capital letter X.**
C. Matches one or more capital X’s.
D. All of the mentioned

Explanation **There are many other common regular expression operators like $, ^, etc. Which have their own respective purposes.**

Q.232 **Which of the following does not support regular expressions?**

A. sed
B. awk
C. emacs
D. **none of the mentioned**

Explanation **There are many UNIX tools including vi, Emacs, sed, awk and modern programming languages which support regular expressions.**

Q.233 **Lexemes can be referred to as:**

A. elements of lexicography
B. **sequence of alphanumeric characters in a token**

C. lexical errors

D. none of the mentioned

Explanation **A lexeme is a string of characters that form a syntactic unit. It is reasonable to say that is the sequence of alphanumeric characters in a token.**

Q.234 **If the lexical analyser finds a lexeme with the same name as that of a reserved word,it**

A. overwrites the word

B. overwrites the functionality

C. **generates an error**

D. something else

Explanation **Reserved words are known as keywords and they are specific and reserved with its functionality to a language. Thus, getting an input with the same name by the analyzer will generate an error.**

Q.235 **The methodology to show an error when the analyzer faces a keyword over an user's input is based on:**

A. **rule priority**

B. longest match rule

C. keyword-out rule

D. none of mentioned

Explanation **The lexical analyzer follows the rule priority where its prioritizes keywords over an input it gets with the same name as that of the keyword and thus generates an error.**

Q.236 **State true or false:**
Statement: A lexical analyzer reads the source code line by line.

A. True

B. **False**

Explanation **A lexical analyzer reads the source code letter by letter and when it encounters a space or an operator or any special character, it decides that the word is completed.**

Q.237 **Which among the following statement is correct?**
Statement 1: When the analyzer scans 'int' and 'intvalue', it is not able to decide whether the int leads to a keyword or an identifier.
Statement 2: Longest Match Rule

A. Statement 1 is assertion, Statement 2 is the reason

B. **Statement 1 is assertion, Statement 2 is the solution**

C. There is no such Statement 2

D. This is not a function of Lexical Analyzer

Explanation **The Longest Match rule states that the lexeme scanned should be determined on the basis of longest match among all the token available.**

Q.238 **The output of the lexical and syntax analyzer can stated as:**

A. parse stream, parse tree
B. token tree, parse tree
C. **token stream, parse tree**
D. all of the mentioned

Explanation **The lexical analyzer outputs the stream of token which is taken up by syntax analyzer one by one against the production rule and parse tree is generated.**

Q.239 **Which among the following is not a tool to construct lexical analyzer from a regular expression?**

A. lex
B. flex
C. jflex
D. **none of the mentioned**

Explanation **Lexical analysis is done using few tools such as lex, flex and jflex. Jflex is a computer program that generates lexical analyzers (also known as lexers or scanners) and works apparently like lex and flex. Lex is commonly used with yacc parser generator.**

Q.240 **A program that performs lexical analysis is termed as:**

A. scanner
B. lexer
C. tokenizer
D. **all of the mentioned**

Explanation **A program which performs lexical analysis is called lexer, scanner or lexer. Nowadays, lexer is combined with a parser which allows syntactic analysis.**

Q.241 **Lexers and parsers are not found in which of the following?**

A. compiler front end processing
B. prettyprinters
C. linters
D. **none of the mentioned**

Explanation **Lexers and parsers are most commonly used in compilers, but it has more application elsewhere like in prettyprinters or linters(application of stylistic formatting conventions to textfiles, source code, etc.).**

Q.242 **Which phase of compiler includes Lexical Analysis?**

A. **1**

B. 2

C. 3

D. Its primary function, not in any phase

Explanation **The first phase of compilation process is called lexical analysis. It fragments the source code into token which is the smallest programming unit of a program.**

Q.243 **The minimum length of a string {0,1}* not in the language corresponding to the given regular expression:**
(0*+1*)(0*+1*)(0*+1*)

A. 3

B. **4**

C. 5

D. 6

Explanation **0101 or 1010 the strings with minimum length on {0,1}* which does not belong to the language of the given regular expression.Other strings like 111, 000, 1101, etc are accepted by the language .**

Q.244 **Which of the following regular expression is equivalent to R(1,0)?**
R(1,0)={111*}*

A. **(11+111)***

B. (111+1111)*

C. (111+11*)*

D. All of the mentioned

Explanation **What we observe from the question is that, it includes e and 11 and any number of 1's then. Therefore, its simplifies when we write the same reg. Expression as (11+111)*.**

Q.245 **The minimum number of 1's to be used in a regular expression of the given language:**
R(x): The language of all strings containing exactly 2 zeroes.

A. 2

B. **3**

C. 0

D. 1

Explanation **It is not required to automate the question if asked theoretically.The number of zeroes fixed is 2. Therefore, we can represent the regular expression as 1*01*01*.**

Q.246 **The given regular language corresponds to which of the given regular language e+1+(1+0)*0+(0+1)*11**

A. The language of all strings that end with 11 or 00

B. The language of all strings that end with 0 or 1

C. **The language of all strings which does not end with 01**

D. None of the mentioned

Explanation **According to the given regular expression, e is accepted by its language and it does not end with 00 or 11 or 0 or 1. Thus option a and b are eliminated. Further, the regular expression is valid for the third option.**

Q.247 **Statement: If we take the union of two identical expression, we can replace them by one copy of the expression.**
Which of the following is a correct option for the given statement?

A. Absorption Law

B. **Idempotent Law**

C. Closure Law

D. Commutative Law

Explanation **Idempotent Law states that if we take the union of two like expression, we can use a copy of the expression instead i.e. L+L=L. The common arithmetic operators are not idempotent.**

Q.248 **Which among the following can be an annihilator for multiplication operation?**

A. **0**

B. 1

C. 100

D. 22/7

Explanation **An annihilator for an operator is a value such that when the operator is applied to the annihilator and some other value, the result is the annihilator.**

Q.249 **Statement: A digit, when used in the CFG notation, will always be used as a terminal.**
State true or false?

A. **True**

B. False

Explanation **Lowercase letters near the beginning of an alphabet, a, b and so on are terminal symbols. We shall also assume that digits and other characters such as + or parenthesis are terminals.**

Q.250 **Choose the incorrect process to check whether the string belongs to the language of certain variable or not?**

A. recursive inference

B. derivations
C. head to body method
D. **All of the mentioned**

Explanation **There are two approaches to infer that certain string are in the language of a certain variable. The most conventional way is to use the rules from body to head, recursive inference. The second approach is expanding the starting variable using one of its productions whose head is tart symbol and derive a string consisting entirely of terminals(head to body or derivations).**

Q.251 **Statement: Left most derivations are lengthy as compared to Right most derivations. Choose the correct option:**

A. correct statement
B. incorrect statement
C. **may or may not be correct**
D. depends on the language of the grammar

Explanation **It completely depends on the person who develops the grammar of any language, how to make use of the tools i.e. leftmost and rightmost derivations.**

Q.252 **All the regular languages can have one or more of the following descriptions:**
i) DFA ii) NFA iii) e-NFA iv) Regular Expressions
Which of the following are correct?

A. i, ii, iv
B. i, ii, iii
C. i, iv
D. **i, ii, iii, iv**

Explanation **The class of languages known as the regular language has atleast four different descriptions: i) DFA ii) NFA iii) e-NFA iv) Regular Expressions**

Q.253 **Which of the technique can be used to prove that a language is non regular?**

A. Ardens theorem
B. **Pumping Lemma**
C. Ogden’s Lemma
D. None of the mentioned

Explanation **We use the powerful technique called Pumping Lemma, for showing certain languages not to be regular. We use Ardens theorem to find out a regular expression out of a finite automaton.**

Q.254 **Which of the following language regular?**

A. $\{a^ib^i|i>=0\}$
B. **$\{a^ib^i|0<i<5\}$**
C. $\{a^ib^i|i>=1\}$

D. None of the mentioned

Explanation **Here, i has limits i.e. the language is finite, contains few elements and can be graphed using a deterministic finite automata. Thus, it is regular. Others can be proved non regular using Pumping lemma.**

Q.255 **Which of the following are non regular?**

A. The set of strings in {a,b}* with an even number of b's

B. The set of strings in {a, b, c}* where there is no c anywhere to the left of a

C. The set of strings in {0, 1}* that encode, in binary, an integer w that is a multiple of 3. Interpret the empty strings e as the number 0.

D. **None of the mentioned**

Explanation **All of the given languages are regular and finite and thus, can be represented using respective deterministic finite automata. We can also use mealy or moore machine to represent remainders for option c.**

Q.256 **If L is DFA-regular, L' is**

A. Non regular

B. **DFA-regular**

C. Non-finite

D. None of the mentioned

Explanation **This is a simple example of a closure property: a property saying that the set of DFA-regular languages is closed under certain operations.**

Q.257 **Which of the following options is incorrect?**

A. A language L is regular if and only if ~L has finite number of equivalent classes.

B. **Let L be a regular language. If ~L has k equivalent classes, then any DFA that recognizes L must have atmost k states.**

C. A language L is NFA-regular if and only if it is DFA-regular.

D. None of the mentioned

Explanation **Let L be a regular language. If ~L has k equivalent classes, then any DFA that recognizes L must have atleast k states.**

Q.258 **Myphill Nerode does the following:**

A. Minimization of DFA

B. Tells us exactly when a language is regular

C. **Both (a) and (b)**

D. None of the mentioned

Explanation **In automata theory, the Myphill Nerode theorem provides a necessary and sufficient condition for a language to be regular. The Myphill Nerode theorem can be used to show a language L is**

regular by proving that the number of equivalence classes of R_L(relation) is finite.

Q.259 **Which of the following are related to tree automaton?**

A. Myphill Nerode Theorem

B. State machine

C. Courcelle's Theorem

D. **All of the mentioned**

Explanation **The myphill nerode theorem can be generalized to trees and an application of tree automata prove an algorithmic meta theorem about graphs.**

Q.260 **Given languages:**
i) $\{a^nb^n|n>=0\}$
ii) <div>^{n}</div>^{n}
iii) $\{w\in\{a,b\}*\ |\ \#a(w)=\#b(w)\}$, # represents occurrences
Which of the following is/are non regular?:

A. i, iii

B. i

C. iii

D. **i, ii, iii**

Explanation **There is no regular expression that can parse HTML documents. Other options are also non-regular as they cannot be drawn into finite automaton.**

Q.261 **Finite state machine are not able to recognize Palindromes because:**

A. Finite automata cannot deterministically find the midpoint

B. Finite automata cannot remember arbitarily large amount of data

C. Even if the mid point is known, it cannot find whether the second half matches the first

D. **All of the mentioned**

Explanation **It is the disadvantage or lack of property of a DFA that it cannot remember an arbitrarily such large amount of data which makes it incapable of accepting such languages like palindrome, reversal, etc.**

Q.262 **Relate the following statement:**
Statement: All sufficiently long words in a regular language can have a middle section of words repeated a number of times to produce a new word which also lies within the same language.

A. Turing Machine

B. **Pumping Lemma**

C. Arden's theorem

D. None of the mentioned

Explanation **Pumping lemma defines an essential property for every regular language in automata theory. It has certain rules which decide whether a language is regular or not.**

Q.263 **While applying Pumping lemma over a language, we consider a string w that belong to L and fragment it into__________parts.**

A. 2
B. 5
C. **3**
D. 6

Explanation **We select a string w such that w=xyz and |y|>0 and other conditions. However, there exists an integer n such that |w|>=n for any wÎL.**

Q.264 **If we select a string w such that w∈L, and w=xyz. Which of the following portions cannot be an empty string?**

A. x
B. **y**
C. z
D. all of the mentioned

Explanation **The lemma says, the portion y in xyz cannot be zero or empty i.e. |y|>0, this condition needs to be fulfilled to check the conclusion condition.**

Q.265 **Let w= xyz and y refers to the middle portion and |y|>0.What do we call the process of repeating y 0 or more times before checking that they still belong to the language L or not?**

A. Generating
B. **Pumping**
C. Producing
D. None of the mentioned

Explanation **The process of repeatation is called pumping and so, pumping is the process we perform before we check whether the pumped string belongs to L or not.**

Q.266 **There exists a language L. We define a string w such that w∈L and w=xyz and |w| >=n for some constant integer n.What can be the maximum length of the substring xy i.e. |xy|<=?**

A. **n**
B. **|y|**
C. **|x|**
D. none of the mentioned

Explanation **It is the first conditional statement of the lemma that states that |xy|<=n, i.e. the maximum**

length of the substring xy in w can be n only.

Q.267 **Fill in the blank in terms of p, where p is the maximum string length in L.**
Statement: Finite languages trivially satisfy the pumping lemma by having n = _______

A. p*1

B. **P+1**

C. p-1

D. None of the mentioned

Explanation **Finite languages trivially satisfy the pumping lemma by having n equal to the maximum string length in l plus 1.**

Q.268 **Answer in accordance to the third and last statement in pumping lemma:**
For all________$xy^iz \in L$

A. i>0

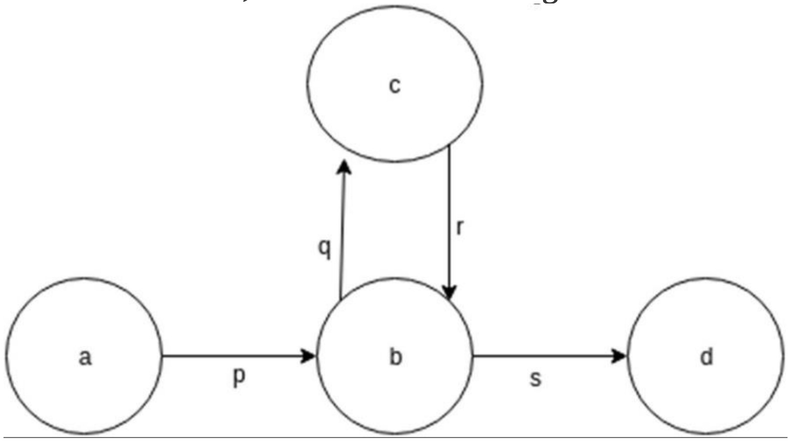
B. I<0

C. I<=0

D. **i>=0**

Explanation **Suppose L is a regular language . Then there is an integer n so that for any x∈L and |x|>=n, there are strings u,v,w so that**
x= uvw
|uv|<=n
|v|>0
for any m>=0, $uv^mw \in L$.

Q.269 **If d is a final state, which of the following is correct according to the given diagram?**



A. **x=p, y=qr, z=s**

B. x=p, z=qrs
C. x=pr, y=r, z=s
D. All of the mentioned

Explanation **The FSA accepts the string pqrs. In terms of pumping lemma, the string pqrs is broken into an x portion an a, a y portion qr and a z portion s.**

Q.270 **Let w be a string and fragmented by three variable x, y, and z as per pumping lemma. What does these variables represent?**

A. **string count**
B. string
C. both (a) and (b)
D. none of the mentioned

Explanation **Given: w =xyz. Here, xyz individually represents strings or rather substrings which we compute over conditions to check the regularity of the language.**

Q.271 **Which of the following one can relate to the given statement:**
Statement: If n items are put into m containers, with n>m, then atleast one container must contain more than one item.

A. Pumping lemma
B. **Pigeon Hole principle**
C. Count principle
D. None of the mentioned

Explanation **Pigeon hole principle states the following example: If there exists n=10 pigeons in m=9 holes, then since 10>9, the pigeonhole principle says that at least one hole has more than one pigeon.**

Q.272 **Which kind of proof is used to prove the regularity of a language?**

A. **Proof by contradiction**
B. Direct proof
C. Proof by induction
D. None of the mentioned

Explanation **We use the method of proof by contradiction in pumping lemma to prove that a language is regular or not.**

Q.273 **The language of balanced paranthesis is**

A. regular
B. **non regular**
C. may be regular
D. none of the mentioned

Explanation **Given n, there is a string of balanced parentheses that begins with more than p left parentheses, so that y will contain entirely of left parentheses. By repeating y, we can produce a string that does not contain the same number of left and right parentheses, and so they cannot be balanced.**

Q.274 **State true or false:**
Statement: Pumping lemma gives a necessary but not sufficient condition for a language to be regular.

A. **true**

B. false

Explanation **The converse of the lemma is not true. There may exists some language which satisfy all the conditions of the lemma and still be non-regular.**

Q.275 **Which of the following is/are an example of pigeon hole principle?**

A. Softball team

B. Sock picking

C. Hair counting

D. **All of the mentioned**

Explanation **There are several applications of pigeonhole principle:**
Example: The softball team: Suppose 7 people who want to play softball(n=7 items), with a limitation of only 4 softball teams to choose from. The pigeonhole principle tells us that they cannot all play for different teams; there must be atleast one team featuring atleast two of the seven players.

Q.276 **Pigeonhole principle can be applied in the following computer science algorithms:**

A. hashing algorithm

B. lossless compression algorithm

C. **both (a) and (b)**

D. none of the mentioned

Explanation **Collisions are inevitable in a hash table because the number of possible keys exceeds the number of indices in the array.**

Q.277 **If n objects are distributed over m places, and n < m, then some of the places receive:**

A. at least 2 objects

B. **at most 2 objects**

C. no object

D. none of the mentioned

Explanation **This is one of the alternative formulations of the pigeon hole principle. As n < m, there will**

exist some place which will not receive any of the object.

Q.278 **Which of the following fields may have pigeonhole principle violated?**

A. Discrete mathematics

B. Computer Science

C. **Quantum Mechanics**

D. None of the mentioned

Explanation **Y Aharonov proved mathematically the violation of pigeon hole principle in Quantum mechanics and proposed inferometric experiments to test it.**

Q.279 **Which of the following is not an application of Pumping Lemma?**

A. $\{0^i1^i|i>=0\}$

B. $\{0^ix|i>=0, x\in\{0, 1\}^*$ and $|x|<=i\}$

C. $\{0^n|$ n is prime$\}$

D. **None of the mentioned**

Explanation **None of the mentioned are regular language and are an application to the technique Pumping Lemma. Each one of the mentioned can be proved non regular using the steps in Pumping lemma.**

Q.280 **Which of the following can refer a language to be non regular?**

A. Pumping Lemma

B. Myphill Nerode

C. **Both (a) and (b)**

D. None of the mentioned

Explanation **On the contrary, the typical way to prove that a language is to construct either a finite state machine or a regular expression for the language.**

Q.281 **Which of the following is not an example of counting argument?**

A. Pigeonhole principle

B. Dirichlet’s drawer principle

C. Dirichlet’s box principle

D. **None of the mentioned**

Explanation **Pigeon hole principle or Dirichlet’s drawer principle or Dirichlet’s box principle is an example of counting argument whose field is called Combinatorics.**

Q.282 **If L1, L2 are regular and op(L1, L2) is also regular, then L1 and L2 are said to be ____________under an operation op.**

A. open

B. **closed**
C. decidable
D. none of the mentioned

Explanation **If two regular languages are closed under an operation op, then the resultant of the languages over an operation op will also be regular.**

Q.283 **Suppose a regular language L is closed under the operation halving, then the result would be:**
A. 1/4 L will be regular
B. 1/2 L will be regular
C. 1/8 L will be regular
D. **Al of the mentioned**

Explanation **At first stage 1/2 L will be regular and subsequently, all the options will be regular.**

Q.303 **If L1′ and L2′ are regular languages, then L1.L2 will be**
A. **regular**
B. non regular
C. may be regular
D. none of the mentioned

Explanation **Regular language is closed under complement operation. Thus, if L1′ and L2′ are regular so are L1 and L2. And if L1 and L2 are regular so is L1.L2.**

Q.284 **If L1 and L2′ are regular languages, L1 ∩ (L2′ U L1′)’ will be**
A. **regular**
B. non regular
C. may be regular
D. none of the mentioned

Explanation **If L1 is regular, so is L1′ and if L1′ and L2′ are regular so is L1′ U L2′. Further, regular languages are also closed under intersection operation.**

Q.285 **If A and B are regular languages, !(A’ U B’) is:**
A. **regular**
B. non regular
C. may be regular
D. none of the mentioned

Explanation **If A and B are regular languages, then A Ç B is a regular language and A ∩ B is equivalent to !(A’ U B’).**

Q.286 **Which among the following are the boolean operations that under which regular languages are closed?**

A. Union

B. Intersection

C. Complement

D. **All of the mentioned**

Explanation **Regular languages are closed under the following operations:**
a) Regular expression operations
b) Boolean operations
c) Homomorphism
d) Inverse Homomorphism

Q.287 **Suppose a language L1 has 2 states and L2 has 2 states. After using the cross product construction method, we have a machine M that accepts L1 ∩ L2. The total number of states in M:**

A. 6

B. **4**

C. 2

D. 8

Explanation **M is defined as: (Q, S, d, q0, F)**
where Q=Q1*Q2 and F=F1*F2

Q.288 **If L is a regular language, then (L')' U L will be :**

A. **L**

B. L'

C. f

D. none of the mentioned

Explanation **(L')' is equivalent to L and L U L is subsequently equivalent to L.**

Q.289 **If L is a regular language, then (((L')r')')* is:**

A. **regular**

B. non regular

C. may be regular

D. none of the mentioned

Explanation **If L is regular so is its complement, if L' is regular so is its reverse, if (L')^r is regular so is its Kleene.**

Q.290 **Which among the following is the closure property of a regular language?**

A. Emptiness
B. Universality
C. Membership
D. **None of the mentioned**

Explanation **All the following mentioned are decidability properties of a regular language. The closure properties of a regular language include union, concatenation, intersection, Kleene, complement , reverse and many more operations.**

Q.291 **If L is a language, the reversal of the language can be represented as:**
A. L’
B. L^c
C. **L^r**
D. more than one option is correct

Explanation **L^r is defined as the reversal of a language. L^r is a set of strings whose reversal is in L.**
Example: L={0, 01, 100}
Lr={0, 10, 001}

Q.292 **If L is a regular language,_____is also regular.**
A. L^r
B. L’
C. L*
D. **All of the mentioned**

Explanation **L^r, L’, L* i.e. reversal, complementation and kleene all are the closure properties of regular language.**

Q.293 **If E=F+G;**
E^r=?
A. **F^r+G^r**
B. $(F+G)^r$
C. Both (a) and (b)
D. None of the mentioned

Explanation **If E is a symbol a, e, or f, then Er=E. Other inductive properties include union of reversals, concatenation and Kleene.**

Q.294 **If E= FG, E^r=?**
A. F^rG^r
B. **G^rF^r**
C. Both (a) and (b)

D. None of the mentioned

Explanation **If E= FG, $E^r=G^rF^r$. Example: (01*)R=(1*)R(0)R**

Q.295 **Simplify the following identity:**
E=01*+10*
E^R=?

A. **(1*0+0*1)**

B. $(01*10*)^R$

C. (0*1+10*)

D. All of the mentioned

Explanation **01*+10***
ER=$(01*)^R+(10*)^R$=>$(1*)^R0^R+(0*)^R1^R$=>1*0+0*1

Q.296 **Which of the following obey the closure properties of Regular language?**

A. Homomorphism

B. Inverse Homomorphism

C. Reversal

D. **All of the mentioned**

Explanation **Homomorphism on an aphabet is a function that gives a string for each symbol in that alphabet. Example: h(0)=ab, etc.**

Q.297 **Let h(L) be a language of regular expression abe*+e(ab)*. Simplify the h(L)**

A. (ab)*+eab*

B. abe*+ea*b*

C. (ab)*

D. None of the mentioned

Explanation **abe*+e(ab)*(Using the identities e=e*, eE=Ee=E)**
=ab+(ab)*=> ab will contain inside (ab)*, thus =>(ab)*.

Q.298 **Let h(0)=ab; h(1)=e**
Let L={abab,baba}
h-1(L)=________

A. the language of two one’s and any number of zeroes

B. **the language of two zeroes and any number of one’s**

C. the language of two zeroes and two one’s

D. none of the mentioned

Explanation **h-1(L) is the language with two 0’s and any number of 1’s=>(1*01*01*).**

Q.299 **While proving Inverse Homomorphism, which of the following steps are needed?**
A. Start with a DFA Ain L
B. Construct a DFA B for h-1(L)
C. The set of states, initial and final states should be same.
D. **All of the mentioned**

Explanation **While constructing DFA B, we need to take care of the following:**
a) The same set of states
b) The same start state
c) The same final state
d) Input alphabet = the symbols to which homomorphism h applies.

Q.300 **8. Let h(0)=ab; h(1)=e**
Let L={abab,baba}
h-1(L)= the language of two zeroes and any number of one's.
The given example belongs to which of the following?
A. Homomorphism
B. **Inverse Homomorphism**
C. Both (a) and (b)
D. None of the mentioned

Explanation **Let h be a homomorphism and L a language whose alphabet is the output language of h.**
h-1(L) = {w | h(w) is in L}.

Q.301 **Which of the following conversion is not feasible?**
A. Regular expression to automaton conversion
B. Automaton to Regular Expression Conversion
C. NFA to DFA
D. **None of the mentioned**

Explanation **Each of the four formats of representation of the regular language be it, DFA, NFA, Regular Expression or e-NFA can be converted to the rest three forms.**

Q.302 **The computation of e-closure of n-states takes_______time.**
A. $O(n^2)$
B. **$O(n^3)$**
C. $O(2^n)$
D. None of the mentioned

Explanation **We must search from each of the n states along all arcs labelled e. If there are n states, there can be no more than n^2 states.**

Q.303 **For a__________state DFA, the time taken for DFA-NFA conversion is O(n).**

A. **n**

B. $n^{1/2}$

C. n^2

D. 2^n

Explanation **The conversion DFA to NFA is simple, and takes O(n) time on an n-state DFA.**

Q.304 **With reference to Automaton to Regular Expression Conversion, for each of the n rounds, where n is the number of states of DFA, we can__________the size of the regular expression constructed.**

A. double

B. triple

C. **quadruple**

D. none of the mentioned

Explanation **We can quadruple the size of the regular expression per round. Thus, we can simply write n^3 expressions can take time $O(n^3 4^n)$, where n =number of states of the DFA.**

Q.305 **Conversion of regular expression to e-NFA takes____________time.**

A. **linear**

B. exponential

C. logarithmic

D. none of the mentioned

Explanation **It is possible to parse the expression efficiently, using a technique that takes only O(n) time on a expression of length n^3**

Q.306 **The conversion of NFA to DFA can be done in:**

A. **exponential time**

B. linear time

C. logarithmic time

D. all of the mentioned

Explanation **We can eliminate e-transitions from an n state epsilon-NFA to build an ordinary NFA in $O(n^3)$ time, without changing the number of states.Next, producing to DFA can take exponential time.**

Q.307 **Which of the following cannot be converted in an ordinary NFA?**

A. DFA

B. Regular Expression

C. e-NFA

D. **None of the mentioned**

Explanation **Each of the following can expressed in terms of ordinary NFA with different time complexities.**

Q.308 **NFA to DFA conversion is done via**

A. **Subset Construction method**

B. Warshalls Algorithm

C. Ardens theorem

D. None of the mentioned

Explanation **Powerset or subset construction method is a standard method for converting a non deterministic finite automata into DFA which recognizes the same formal language.**

Q.309 **State true or false:**
Statement: Regular expression can directly be converted to DFA without intermediate steps.

A. true

B. **false**

Explanation **There exists subsequent steps like formation of epsilon-NFA and NFA before the formation of corresponding DFA.**

Q.310 **Is the following statement correct?**
Statement: Thompson construction is used to convert Regular expression to finite automata.

A. **Yes**

B. No

Explanation **Thompson's Construction is used to find out a Finite Automaton from a Regular Expression. We will reduce the regular expression into smallest regular expressions and convert them to NFA and finally to DFA.**

Q.311 **Language classes have the following property:**

A. Closure property

B. Decision property

C. **Closure & Decision property**

D. None of the mentioned

Explanation **A decision property of a language class is an algorithm that takes a formal description of a language(e.g., a DFA) and tells whether or not some property holds.**

Q.312 **Which of the following are decision properties?**

A. Emptiness

B. Infiniteness

C. Membership

D. **All of the mentioned**

Explanation **Emptiness, Infiniteness and Membership are the decision properties of any language class. Example: Is the language L empty? Or Is w, a string belongs to the regular language L?**

Q.313 **Pick the odd one out of the given properties of a regular language:**

A. Kleene

B. Reversal

C. Homomorphism

D. **Membership**

Explanation **Membership is a decision property of language class while others mentioned like Kleene, Reversal and Homomorphism are Closure properties of language class.**

Q.314 **For an automata, which of the following are equivalent variants? DFA,NFA and NFA with epsilon transitions**

A. DFA and NFA

B. NFA and epsilon NFA

C. DFA and epsilon NFA

D. **All of the mentioned**

Explanation **For a given automata, all the formats of representation be it deterministic finite automata or non deterministic finite automata or non deterministic finite automata with epsilon transitions, all are equivalent variants.**

Q.315 **Which of the following are not meant to specify a regular language?**

A. Regular Expression

B. DFA

C. NDFA and epsilon-NFA

D. **All of the mentioned**

Explanation **It is possible to convert from one specification to another. We can express a regular language in all the given four variants.**

Q.316 **Which of the following problems do not belong to decision properties?**

A. Given two languages, are there strings that are in both

B. Is the language a subset of another regular language

C. Is the language same as another regular language

D. **None of the mentioned**

Explanation **To give a solution to the mentioned problems, we require decision properties and for some, we need additional tools like minimized automaton and Pumping lemma.**

Q.317 **Which of the following is a function of Closure properties?**

A. Helps construct representations

B. Helps show informally described languages not to be in class

C. **Both (a) and (b)**

D. None of the mentioned

Explanation **Using closure properties we can give a=solution to many problems like :**
Is the regular languages L1 and L2 closed on concatenation operation?, etc.

Q.318 **Suppose there is a string w=abbab, and there exists a DFA which accepts w. How many stepts will be required to test its membership?**

A. 2

B. 1

C. 4

D. None of the mentioned

Explanation **If a string belongs to a language, the number of steps required to test that member ship is equal to the length of string i.e. 5.**

Q.319 **If a DFA has n states and the language contains any string of length n or more, the language is termed as:**

A. Infinite

B. Empty

C. Non regular

D. None of the mentioned

Explanation **The language is surely finite if it is limited to string of length n or less. This is because there are atleast n+1 states along the path while traversing w(string).**

Q.320 **State true or false:**
Statement: If an n-state DFA accepts a string w of length n or more, then there must be a state that appears twice on the path labeled w from the start state to the final state.

A. **true**

B. false

Explanation **This occurs because there are atleast n+1 states along the path while traversing the string w.**