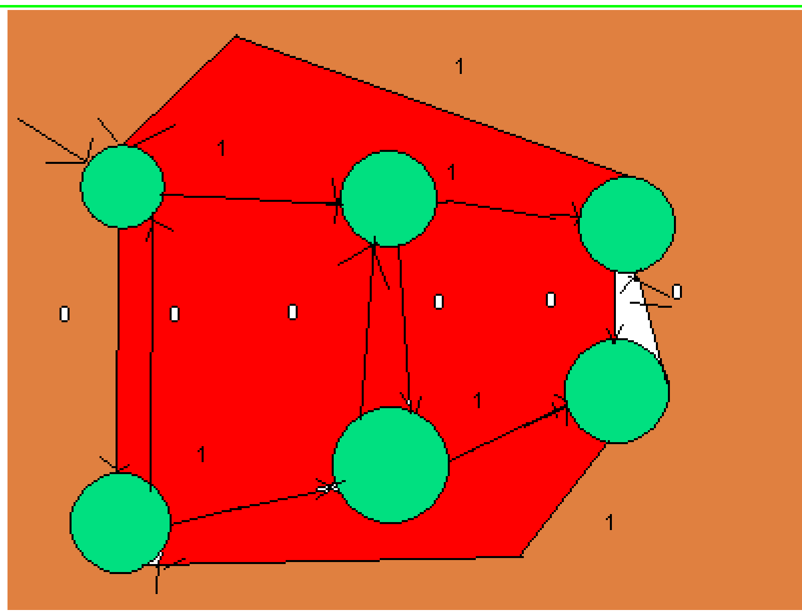


LINKED QUESTIONS

Q1. Consider the finite automata of four states M=({Q0,Q1,Q2,Q3){0,1},δ,F) with δ given by

	0	*1*
Q0	*Q1*	*Q1*

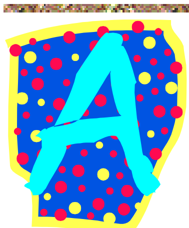
Q1	***Q1***	***Q1***
Q2	***Q2***	***Q2***
Q3	***Q3***	***Q3***

Q1(a) A final state to be in F for the empty string to be accepted is

A) Q0 B)Q1 C)Q2 D)Q3

Q1(b) Another final state to be in F for (0+1)* to be accepted is

A) Q0 B)Q1 C)Q2 D)Q3



Answer Q1(a) A Q1(b) B

Q2. Consider the finite automata of four states M=({Q0,Q1,Q2,Q3){0,1},δ,F) with δ given by

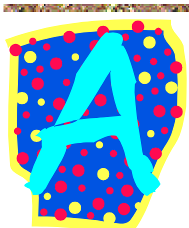
	0	***1***
Q0	***Q1***	***Q1***
Q1	***Q0***	***Q0***
Q2	***Q2***	***Q2***
Q3	***Q3***	***Q3***

Q2(a) A final state to be in F for the empty string to be accepted is

A) Q0 B)Q1 C)Q2 D)Q3

Q2(b) Another final state to be in F for ((0+1)(0+1))* to be accepted is

A) Q0 B)Q1 C)Q2 D)Q3



Answer Q2(a) A Q2(b) A

Q3. Consider the finite automata of four states M=({Q0,Q1,Q2,Q3){0,1},δ,F) with δ given by

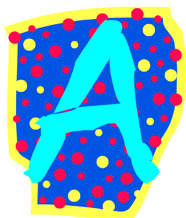
	0	1
Q0	Q1	Q1
Q1	Q0	Q0
Q2	Q2	Q2
Q3	Q3	Q3

Q3(a) A final state to be in F for the empty string to be accepted is

A) Q0 B)Q1 C)Q2 D)Q3

Q3(b) Another final state to be in F for ((0+1)) to be accepted is*

A) Q0 B)Q1 C)Q2 D)Q3



Answer Q3(a) A Q3(b) B

Q4. Consider the finite automata of four states M=({Q0,Q1,Q2,Q3}{0,1},δ,F) with δ given by

	0	1
Q0	Q1	Q1
Q1	Q1	Q1
Q2	Q2	Q2
Q3	Q3	Q3

Q4(a) A final state to be in F for the empty string to be accepted is

A) Q0 B)Q1 C)Q2 D)Q3

Q4(b) Another final state to be in F for only the empty string to be accepted is

A) Q0 B)Q1 C)Q2 or Q1 D)Q3 or Q2

Answer Q4(a) A Q4(b) D

Q5. Consider the grammar

$S \rightarrow aSa|bSb|b|c$

Q5(a) The rules to be added for palidromes to be accepted are

$S \rightarrow a$ and $S \rightarrow \varepsilon$ B.$S \rightarrow aS$ and $S \rightarrow \varepsilon$ C. no rules D.$S \rightarrow \varepsilon$

Q5(b) The rules to be added further for all palidromes over {a,b,c} to be accepted is

A.$S \rightarrow cSc$ B.$S \rightarrow acS$ C. $S \rightarrow aSc$ D. no rules required

Answer: Q5(a) A Q5(b) A

Q6. Consider the finite automata given below over the alphabet {0,1}

	0	*1*
Q0	*Q1*	*Reject*
Q1	*Q0*	*Reject*
Q2	*Reject*	*Reject*
Q4	*Reject*	*Reject*

Let Q0 be the start state

Q6(a) A state to be made final for the empty set to be accepted is

A)Q0 B)Q1 C)Q2 D)Q3

Q6(b) A state to be made final for the empty string to be in the set accepted is

A)Q0 B)Q1 C)Q2 D)Q3

Q6(c) A state to be made further final for the set of all even number of 0's to be accepted is

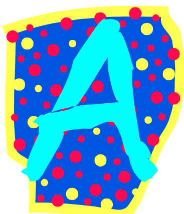
A) Q0 B)Q1 C)Q2 D)Q3

Q6(d) A state to be made further final for all the odd number of 0's to be accepted is

A)Q0 B)Q1 C)Q2 D)Q3

Q6(e) A state further to be made final for all the 0's to be accepted is

a)Q0 B)Q2 C)Q3 D) No other state



Answer:Q6(a) (A);Q6(b)(A);Q6(c)A;Q6(d)B;Q6(e)D

Q7. Consider the grammar

A→aAb|ab
B→bCc|bc
A1→a|a A1
B1→b|b B1
C1→c|c C1
S→A1|B1|C1

Q7(A) Consider augmenting the grammar with the rules
S→AB1|A1 B|A B1 C1| A1 B C1
The grammar now generates

a.all strings in L={a^ib^jc^k|i not equal to j or j not equal to k}
b.only some strings in L as given in (A)
c.none of the strings in L as given in (A)

d.none of the above

Answer: (B)

Q7(B) Consider further augmenting the grammar with the rules

$S \rightarrow BC1|A1\ B\ C1|B1B|A1\ B1\ B$

The grammar now generates

a.all strings in L={$a^ib^jc^k$|i not equal to j or j not equal to k}

b.only some strings in L as given in (A)

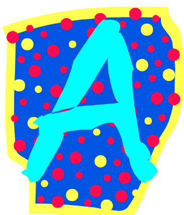
c.none of the strings in L as given in (A)

d.none of the above

Answer(F)

Q7(C) The rule that must be added to the grammar to accept L is

a. S→A1C1
b. S→AC1
c. S→A1B
d. S→SS



Answer(A)

Q8.Consider the dfa M=({Q0,Q1,Q2,Q3},{0,1},q0,δ,F) where the state transition function is given in the table below

	0	***1***
-→Q0	***Q0***	***Q1***
Q1	***Q2***	***Q1***
Q2	***Q2***	***Q2***
Q3	***Q3***	***Q2***

Q8(a) A state that should be in F for 0* to be accepted by the fa is

A)Q0 B)Q1 C)Q2 d) Q3

Q8(b) A further state that should be made final for 0*1* to be accepted is

Q0 B)Q1 C)Q2 D)Q3

Q8(c) The minimal automata after the above to modifications has

3 states B) 2 states C) 4 states D) 1 state

Answer: Q8(a) A; Q8(b) B; Q8(c) A

Q9.Consider the pushdown automata

$M=(\{Q0,Q1,Qf\},\{0,1\},\{Z0,X\},Q0,\delta,\{Qf\})$ where δ is given by

$\delta(Q0,a,Z0)=(Q0,XZ0)$

$\delta(Q0,a,X)=(Q0,XX)$

$\delta(Q0,b,X)=(Q1,\varepsilon)$

$\delta(Q1,\varepsilon,Z0)=(Qf,--)$

Q9(a) A move that must be added to M to accept $L=\{a^n b^n|n>1\}$ is

A) $\delta(Q0,b,X)=(Qf,--)$ *B)* $\delta(Q1,b,X)=(Q1,\varepsilon)$ *C)* $\delta(Q1,b,X)=(Qf,--)$ *D)* $\delta(Q1,b,X)=(Q0,XX)$

Answer: (B)

Q9(b) A move that must further be added to M to accept $L=\{a^m b^n | n<=m, m,n>1\}$ ***is***

A) $\delta(Q0,b,X)=(Qf,--)$ *B)* $\delta(Q1,\varepsilon,X)=(Qf,\varepsilon)$ *C)* $\delta(Q1,b,X)=(Qf,--)$ *D)* $\delta(Q1,b,X)=(Q0,XX)$

Answer: (B)

Q10. Consider the pda $M=(\{Q0,Q1,Qf\},\{0,1\},\{Z0,X\},Q0,\delta,\{Qf\})$ ***where*** δ ***is given by***

$\delta(Q0,0,Z0)=\{(Q0,XZ0)\}$

$\delta(Q0,1,X)=\{(Q1,\varepsilon)\}$

$\delta(Q1,1,X)=\{(Q1,\varepsilon)\}$

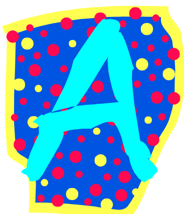
$\delta(Q1,\varepsilon,Z0)=\{(\phi,--)\}$

Q10(a) The move that must be added to M to accept $L=\{0^n1^n|n>1\}$ is

A)$\delta(Q0,0,X)=\{(Q0,XX)\}$ B)$\delta(Q0,0,X)=\{(Q1,XX)\}$

C)$\delta(Q0,0,X)=\{(Q0,XXX)\}$

D) None of the above



Answer:(A)

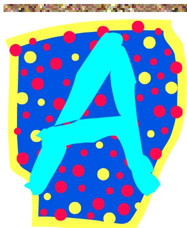
Q10(b) The move in Q10(a) must be modified to accept $L=\{0^m1^n|m<=n<=2m,m,n>1\}$ by

A)$\delta(Q0,0,X)=\{(Q0,XX),(Q0,XXX)\}$

B)$\delta(Q0,0,X)=\{(Q1,XX),(Q0,XX)\}$

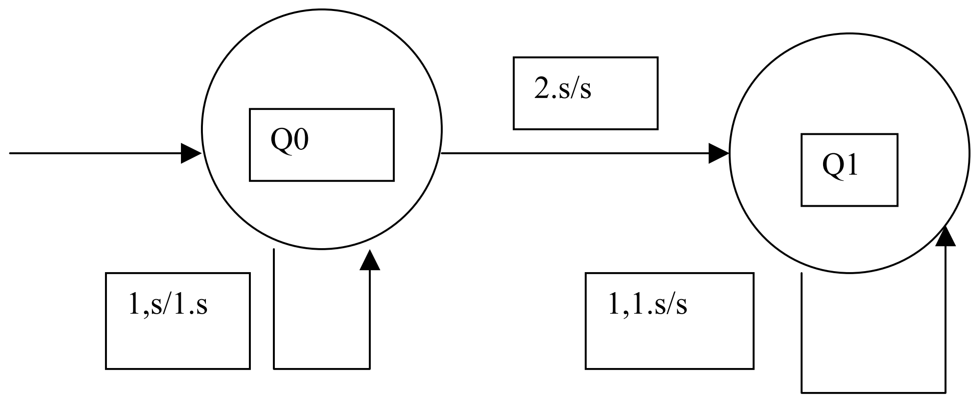
C)$\delta(Q0,0,X)=\{(Q0,XXX),(Q1,XX)\}$

D) None of the above



Answer:(A)

Q11. A push down automaton(pda) is given in the following extended notation of finite state diagrams



The nodes denote the states while the edges denote the moves of the dpa. The edge labels are of the form d.s/s' where d is the input symbol read and s.s' are the stack contents before and after the move. For example, the edge labeled 1,s/s denotes the move from state Q0 to Q0 in which the input symbol 1 is read and pushed to the stack.

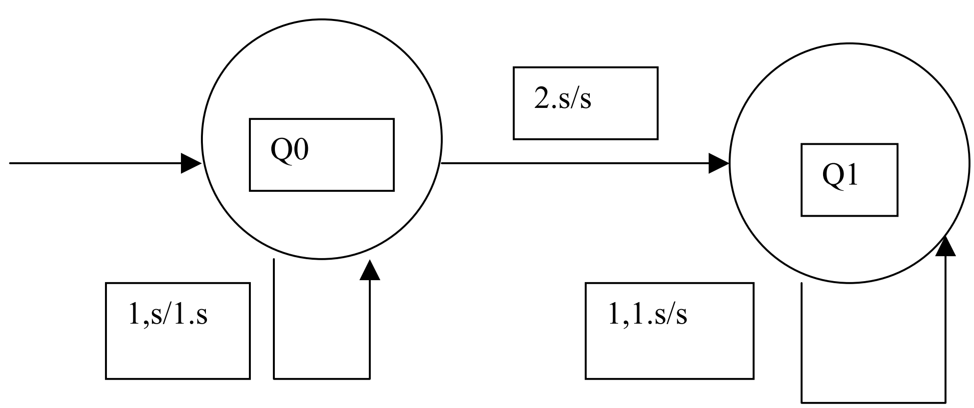
Q11(a) An edge that should be added to the pda to accept L={1^m21^n|m<=n<=2m,n,m>=1} is
A)δ(Q0,1,s/11s)=Q0 B)δ(Q1,1,s/11s)=Q1 C) δ(Q0,1,1.s/11s)=Q0 D) none of the above

Answer: (A)

Q11(b) An edge that should further be added to the pda to accept L={1^m21^n|m<=n<=2m,m,n>=1} is
A) δ(Q0,1,s/111s)=Q0   B) δ(Q1,1,s/111s)=Q1   C) δ(Q0,1,1.s/111s)=Q0   D) none of the above

Answer: (A)

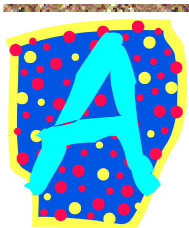
Q12. A push down automaton(pda) is given in the following extended notation of finite state diagrams



The nodes denote the states while the edges denote the moves of the dpa. The edge labels are of the form d.s/s' where d is the input symbol read and s.s' are the stack contents before and after the move. For example, the edge labeled 1,s/s denotes the move from state Q0 to Q0 in which the input symbol 1 is read and pushed to the stack.

Q12(A) The edges that should be added to the pda to accept L={w2wR|w in (0+1)* and wR is the reversal of w} by empty store are

- ***A)*** δ***(Q0,0,s)=Q0 and*** δ***(Q1,0,0.s/s)=Q1***
- ***B)*** δ***(Q1,0,0.s/s)=Q0 and*** δ***(Q0,0,0.s/s)=Q0***
- ***C)*** δ***(Q0,0,s/s)=Q1 and*** δ***(Q1,0,s/s)=Q1***
- ***D) None of the above***



Answer (A)

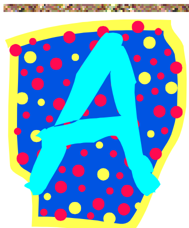
Q12(B) The edges that should further be added to the pda to accept LUL1 where L1 is given as L1={wwR|w in (0+1)*} by empty store are

A) δ(Q0,1,1.s/s)=Q1 and δ(Q0,0,0.s/s)=Q1

B) δ(Q0,1,1.s/s)=Q0 and δ(Q0,0,0.s/s)=Q0

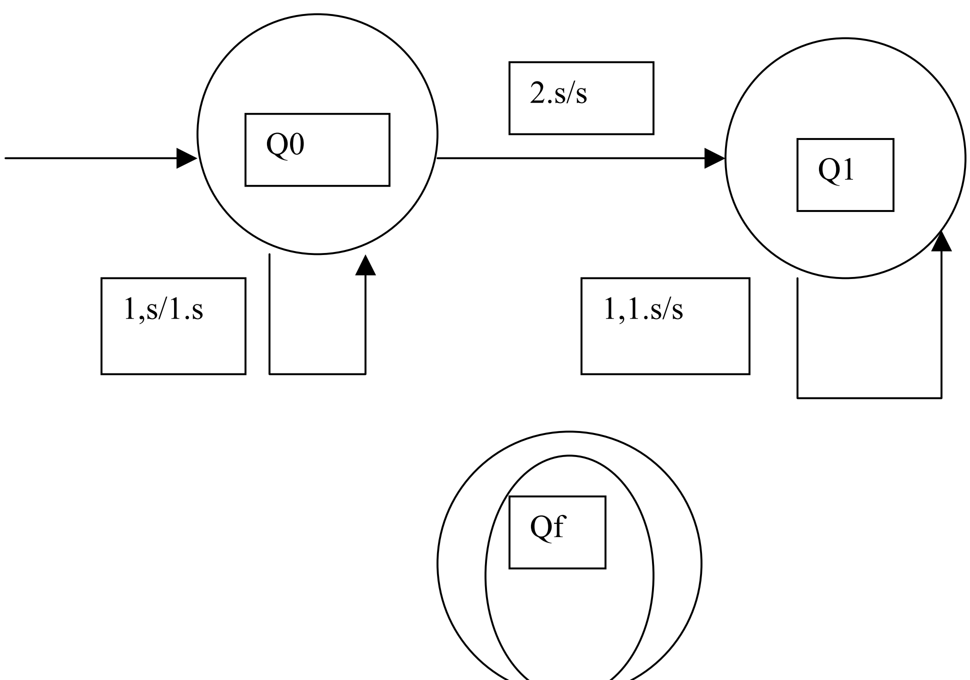
C) δ(Q0,1,1.s/11.s)=Q1 and δ(Q0,0,0.s/00.s)=Q1

E) None of the above



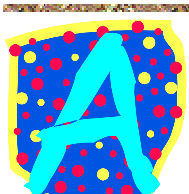
Answer:(A)

Q13. A push down automaton(pda) is given in the following extended notation of finite state diagrams (Z0 is the bottom stack marker)



The nodes denote the states while the edges denote the moves of the dpa. The edge labels are of the form d.s/s' where d is the input symbol read and s.s' are the stack contents before and after the move. For example, the edge labeled 1,s/s denotes the move from state Q0 to Q0 in which the input symbol 1 is read and pushed to the stack.

Q13(a)Edges that should be added to the pda to accept L={1^m21^n|m<=n<=2m,n,m>=1}by final state are
A)δ(Q0,1,s/11s)=Q0 and δ(Q1,ε,Z0.s/s)=Qf
B)δ(Q1,1,s/11s)=Q1 and δ(Q1,ε,Z0.s/s)=Qf   C) δ(Q0,1,1.s/11s)=Q0 and δ(Q1,ε,Z0.s/s)=Qf   D) none of the above



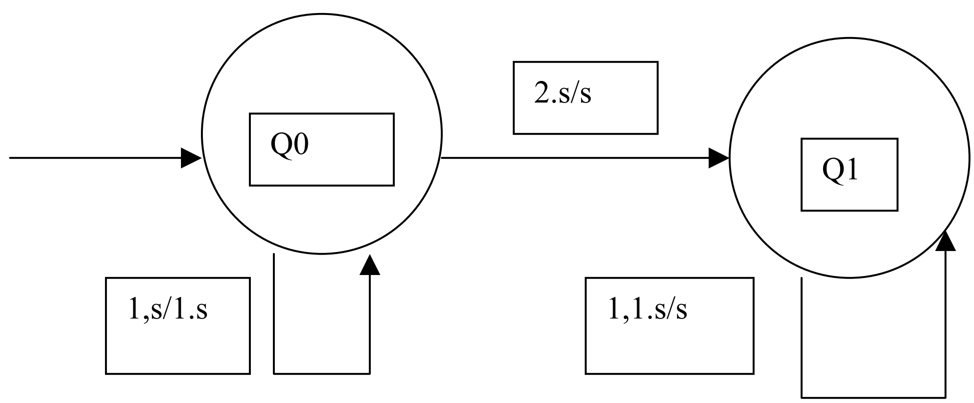
Answer: (A)

Q13(b) An edge that should further be added to the pda to accept L={1^m21^n|m<=n<=2m,m,n>=1} by final state are

A) $\delta(Q0,1,s/111s)=Q0$ and $\delta(Q1,\varepsilon,Z0.s/s)=Qf$
B) $\delta(Q1,1,s/111s)=Q1$ and $\delta(Q1,\varepsilon,Z0.s/s)=Qf$ C) $\delta(Q0,1,1.s/111s)=Q0$ and $\delta(Q1,\varepsilon,Z0.s/s)=Qf$ D) none of the above

Answer: (A)

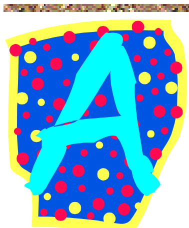
Q14. A push down automaton(pda) is given in the following extended notation of finite state diagrams (Z0 is the bottom stack marker)



The nodes denote the states while the edges denote the moves of the dpa. The edge labels are of the form d.s/s' where d is the input symbol read and s.s' are the stack contents before and after the move. For example, the edge labeled 1,s/s denotes the move from state Q0 to Q0 in which the input symbol 1 is read and pushed to the stack.

Q14(A) The edges that should be added to the pda to accept L={w2wR|w in (0+1)* and wR is the reversal of w} by final state are

- ***F)*** $\delta(Q0,0,s)=Q0$ ***and*** $\delta(Q1,0,0.s/s)=Q1$ ***and*** $\delta(Q1,\varepsilon,Z0.s/s)=Qf$
- ***G)*** $\delta(Q1,0,0.s/s)=Q0$ ***and*** $\delta(Q0,0,0.s/s)=Q0$ ***and*** $\delta(Q1,\varepsilon,Z0.s/s)=Qf$
- ***H)*** $\delta(Q0,0,s/s)=Q1$ ***and*** $\delta(Q1,0,s/s)=Q1$ ***and*** $\delta(Q1,\varepsilon,Z0.s/s)=Qf$
- ***I) None of the above***



Answer (A)

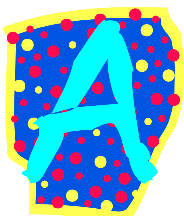
Q14(B) The edges that should further be added to the pda to accept LUL1 where L1 is given as L1={wwR|w in (0+1)*} by final state are

A) δ*(Q0,1,1.s/s)=Q1 and* δ*(Q0,0,0.s/s)=Q1 and* δ*(Q1,*ε*,Z0.s/s)=Qf*

B) δ*(Q0,1,1.s/s)=Q0 and* δ*(Q0,0,0.s/s)=Q0 and* δ*(Q1,*ε*,Z0.s/s)=Qf*

C) δ*(Q0,1,1.s/11.s)=Q1 and* δ*(Q0,0,0.s/00.s)=Q1 and* δ*(Q1,*ε*,Z0.s/s)=Qf*

J) None of the above



Answer:(A)

Q15. Consider the dfa given below

M={A,B,C,D},{0,1},A,*δ*,{D}) where* δ *is given the state transition table

	0	*1*
→*A*	*A*	*B*
B	*C*	*B*
C	*A*	*D*
**D*	*A*	*B*

Q15(A) The move that should be modified to accept (0+1)*101 is

A) δ(D,0)=C B) δ(D,0)=D C) δ(D,0)=B D) None of the above

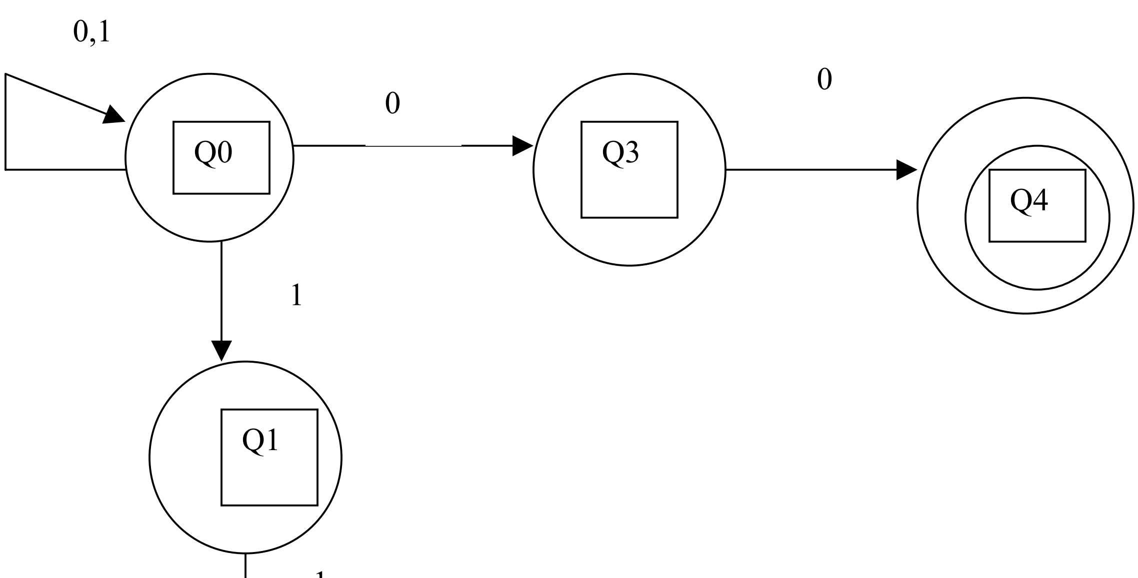
Answer: (A)

Q15(B) The minimal finite auotmata after the modification has

a) 3 states b) 4 states c) 2 states d) 1 state

Answer: (B)

Q16. Consider the fa given below



Q16(A) The moves that should be added to the finite automata to ensure all strings with 00 and 11 as a substring are accepted are

a) $\delta(q2,0)=q2, \delta(q2,1)=q2, \delta(q4,0)=q4, \delta(q4,1)=q4$

b) $\delta(q2,0)=q1, \delta(q2,1)=q2, \delta(q4,0)=q4, \delta(q4,1)=q4$

c) $\delta(q2,0)=q2, \delta(q2,1)=q1, \delta(q4,0)=q4, \delta(q4,1)=q4$

d) $\delta(q2,0)=q2, \delta(q2,1)=q2, \delta(q4,0)=q4, \delta(q4,1)=q2$

Answer(A)

Q16(B) The minimal finite automata after the modifications has

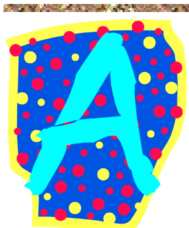
a) 3 states b) 4 states c) 5 states d) 6 states

Answer: (C)

Q17. Ashok is given a grammar G,
$S \rightarrow aSb|ab|\varepsilon$

Q17(a) He modifies the grammar with the production $S \rightarrow aS$. The resulting language L generated by the grammar is

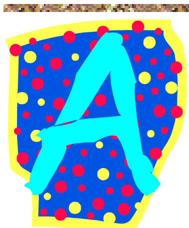
A)$\{a^nb^n|n>0\}$
B)$\{a^mb^n|m>n,m,n>1\}$
C)$\{a^mb^n|m>n, m,n>0\}$
D) None of the above



Answer: (C)

Q17(b) He further adds the production $S \rightarrow bS$
The resulting grammar generates the language L2 which is

a) finite set b) regular set c) context free but not regular d)empty set



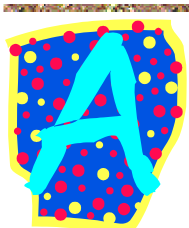
Answer: (B)

Q18. Consider the finite automata M given below

	0	***1***
→Qs	***R***	***Q1***
R	***R***	***R***
Q0	***Q0***	***Q1***
Q1	***Q2***	***Q3***
Q2	***Q4***	***Q0***
Q3	***Q1***	***Q2***
Q4	***Q3***	***Q4***

Q18(A) A state to be made final to accept the set of all strings starting with a 1 that interpreted as the binary representation of an integer are congruent to 2 modulo 5 is

A)Q0 B)Q1 C)Q2 D)Q3



Answer (C)

Q18(B) A state to be further made final to accept the set of all strings starting with a 1 that interpreted as the

binary representation of an integer are congruent to 2 or 3 modulo 5 is

A)Q2 B)Q3 C)Q4   D)Q1

Answer: (B)

Q18(C) A further modification is made to make all states except R final. The resulting fa accepts the set

a)1(0+1)* b)(0+1)* c)0(0+1)* d) none of the above

Answer: (A)