1. Convert the following grammar to a PDA that accepts the same language.

$S \rightarrow 0S1 \mid A$

$A \rightarrow 1A0 \mid S \mid \varepsilon$

Solution:

The CFG can be first simplified by eliminating unit productions:

$S \rightarrow 0S1 \mid 1S0 \mid \varepsilon$

Now we will convert this CFG to GNF:

$S \rightarrow 0SX \mid 1SY \mid \varepsilon$

$X \rightarrow 1$

$Y \rightarrow 0$

The PDA can be:

R1: $\delta(q, \varepsilon, S) = \{(q, 0SX) \mid (q, 1SY) \mid (q, \varepsilon)\}$

R2: $\delta(q, \varepsilon, X) = \{(q, 1)\}$

R3: $\delta(q, \varepsilon, Y) = \{(q, 0)\}$

R4: $\delta(q, 0, 0) = \{(q, \varepsilon)\}$

R5: $\delta(q, 1, 1) = \{(q, \varepsilon)\}$

2. Design the Following Finite Automata.

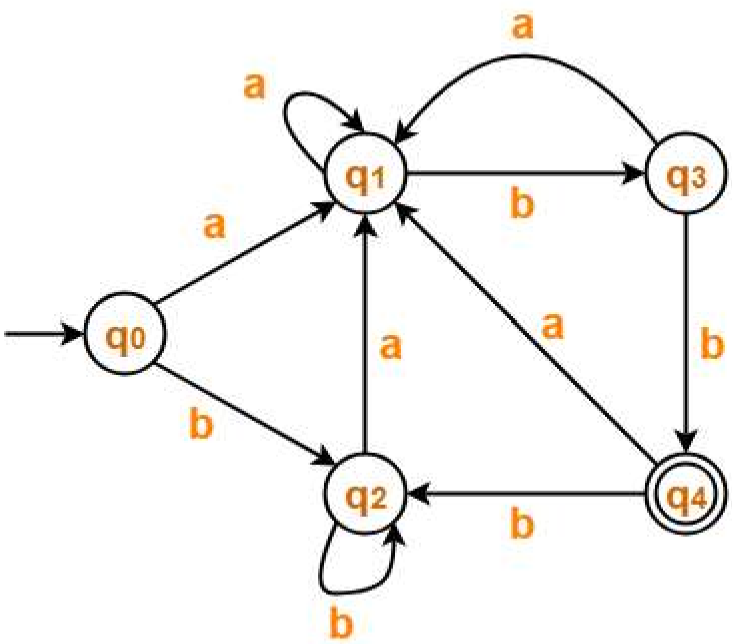
A) Design a FA with {0, 1} accepts the only input 101.

b) Design an NFA with {0, 1} accepts all string ending with 01.

c) Design an NFA with {0, 1} in which double 11 is followed by double 00.

d) Design an NFA in which all the string contain a substring 1110.

3. Minimize the given DFA. Using Table Filling Method OR Equivalence method.



Q4. Write Procedure for converting NFA to DFA. Convert the Following NFA to DFA shown in Figure-1

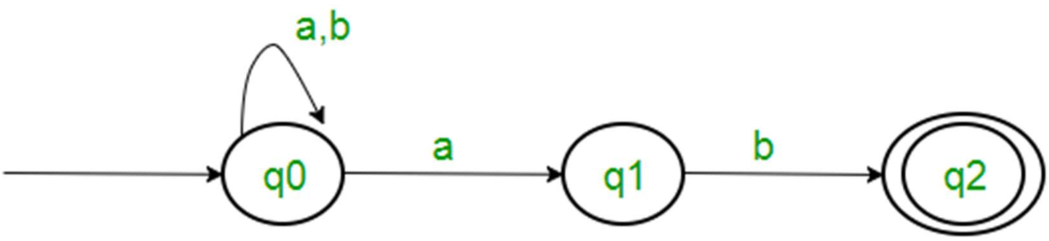


Figure 1

Q5. Describe Type-3 ,Type-2 ,Type-1 and Type-0. Grammar with Example.

Q6. Design DFA with {0, 1} accepts

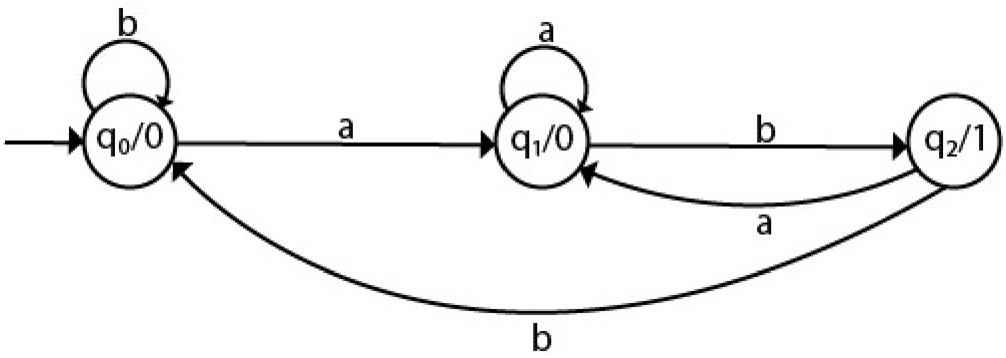
a) even number of 0s and even number of 1s.

b) even number of 0s and odd number of 1s.

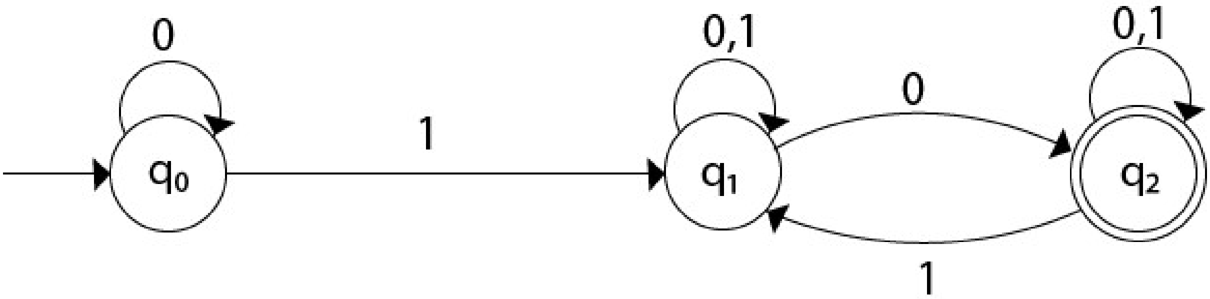
c) odd number of 0s and even number of 1s.

d) odd number of 0s and odd number of 1s.

Q7. Convert the given Moore machine into its equivalent Mealy Machine.



Q8. Define DFA and covert the given NFA into DFA.



Q9. Prove Ardens's Theorem. Find the regular expression corresponding to figure.

Q.10 Prove that every finite language is regular with example. State Kleens Theorem.

Q11. Let M1 and M2 be the FA that accept languages L1 and L2 then find L1^L2.

Q12. Construct FA for a regular expressions:

1. (a+b)*ab(a*+b)*
2. aab(a+b)* baaa*

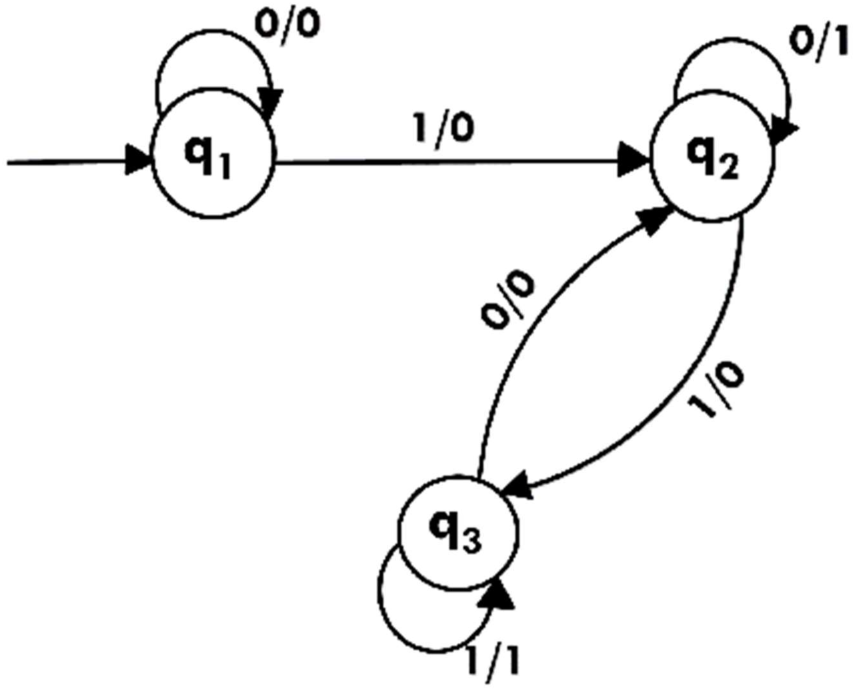
Q13. Write Regular Expressions for the following languages of all strings in {x,y}*

(i) Strings that contains odd number of x.

(ii) Strings that begin or end with xx or yy.

Q14. Use the pumping lemma to show that following language is not regular: L = {xyx, x ε {0,1}* and y is R}

Q.15 Explain Mealy machine. Convert the following mealy machine in its equivalent Moore machine



Q 16. State Moore Machine in terms of tuples. Explain the Procedure to Convert Mealy Machine into Moore Machine with the help of an example.

Q.17. Explain the procedure of Minimizing Automata with the help of example of your own choice.

Q18. Minimize the following FA.

	a	b
->A	B	A
B	A	C
C	D	B
D	D	A
E	D	F
*F	G	E
*G	F	G
*H	G	D

Q.19. Define NFA. Explain Conversion of NFA -є into NFA without є with example.

Q.20. Discuss the following terms with Example.

a) Alphabets

b) String

c) Symbols

d) Language

e) Grammar

Q 21. Construct a PDA for language L = {0^n1^n2^m3^m; n=1, m=1}

Q22. Explain Non deterministic PDA with example.

Q. 23 Explain two stack Pushdown Automata with example.

Q24. Differentiate between Deterministic PDA and Non Deterministic PDA. (CO4)

Q25. Construct a PDA that accepts the language L over {0, 1} by empty stack which accepts all the string of 0's and 1's in which a number of 0's are twice of number of 1's.

Q26. Design a PDA for accepting a language {a^n b^2n n=1}

Q 27. Compare FM and PDA. Construct a PDA accepting all palindromes over {a, b}.

Q. 28. Explain about the graphical notation of PDA. Construct an equivalent PDA for the following CFG.

$S \rightarrow aAB\ bBA$

$A \rightarrow bS\ a$

$B \rightarrow aS\ b$

Q.29 Design a PDA for the following CFG :

S ----> ε

S ----> SS

S ----> (S)

Show the transition relation on string ( ) ( ) for constructed PDA.

Q30. Construct a CFG equivalent to the following PDA.

PDA={(p, q), (0, 1), δ, p, q, (Z, X)}, where p is initial state, q is final state.

δ is defined as

δ(p,0,Z)=(p,XZ),

δ(p,0,X)=(p,XX),

δ(p,1,X)=(q,ϵ),

δ(p,1,X)=(p,ϵ),

δ(p,ϵ,Z)=(p,ϵ).

Q31. Construct PDA from the following Grammar

S→0BB

B→0S/1S/0.

Show Instantaneous description for the string 010000 is generated for PDA?

Q32. Construct the PDA accepting the language L={(ab)^n n=1} by empty stack.

Q33. Compare Deterministic and Non deterministic PDA. Is it true that non deterministic PDA is more powerful than deterministic PDA? Justify your answer.

Q34. Convert grammar S→aSA, A→bSa , S → Λ to pda that accepts the same language by empty stack.

Q35. Write down the rules for Construction of PDA equivalent of CFG.

S ---> aSa

S ---> bSb

S ----> c

Q36. Construct a deterministic pda accepting L={w ∈ {a,b}* | the number of a's in w equal number of b's in w} by final state.

Q37. Design PDA for Language W c W^R, W ∈ (a , b) *

Q38. Construct PDA from the following Grammar.

S →aB

B→ bA/b

A →aB

Q39. A PDA is more powerful than a finite automaton. Justify this statement.

Q40. Construct a PDA which recognizes all strings that contain equal number of 0's and 1's.

Q41. Construct Pushdown automata for L = { a^(2*m)c^(4*n)d^n b^m m,n ≥ 0}

Q42. Construct a PDA for language L = {wcw' w={0, 1}*} where w' is the reverse of w.

Q43. Design a non deterministic PDA for accepting the language L = {a^n b^n n=1}

Q44. Construct a PDA for language L = {0^n 1^m 2^m 3^n n=1, m=1}

Q45. Construct PDA for the language of all strings of 0's and 1's where number of 1's is less than number of 0's accepting by final state.

Q46. Explain push down automata with an example.

Q47. Convert to PDA, CFG with productions

S -> aAS/bAB/aB,

A -> bBB/aS/a,

B -> bA/a

Q48. How will you convert PDA into CFG? Give Examples

Q49. Describe the following in detail: (CO1)

(a) Language of NFA and DFA

(b) ε- Closure of a State

(c) NFA with ε transition

(d) Accepters and Transducers

Q50. Draw an NFA that accepts a language L over an input alphabet ∑ = {a, b} such that L is the set of all strings where 3rd symbol from the right end is **'b'**. Also convert the same to DFA.

Q51. Design DFA for Following Languages:

(a) Design a FA with ∑ = {1, 2} which accepts those string which starts with 0 and ends in 1.

(b) Draw a DFA that accepts a language L over input alphabets ∑ = {a, b} such that L is the set of all strings that does not contain 'ba' as substring.

(c) Design a FA with ∑ = {0, 1} that accepts those string where number of 1's are even.

(d) Design a FA with ∑ = {0, 1} accepts the only input 101.

Q52. Describe the procedure to convert NFA with epsilon to without epsilon?

Q53. a) Describe Multi tape Turing and Universal Machines.

Explain informally how they can simulate the moves of a Turing Machine(with proper examples.).

Q54. Discuss halting problem in Turing Machine? Prove that halting problem of turing machine is undecidable.

Q55. Explain PCP problem. Show that the PCP with two lists x = (b, bab^3, ba) and y = (b^3, ba, a) has a solution. Give the solution sequence.

Q56. Design a Turing Machine to accept the strings having equal number of 0's and 1's.Describe all instantaneous descriptions (ID) from initial ID:q001011 with respect to constructed Turing Machine (assume q as initial state).

Q57. Explain various types of Turing Machines with example.

Q58. Convert following Left linear grammar into FA. Also write right linear grammar

A -> Ba/Ab/b

B -> Ca/Bb

C -> Aa/Cb

Q59. Is the following grammar is ambiguous? Justify your answer.

S→ S+S/S – S/id

Q60. Describe the following : (CO3)

(i) Eliminating the Use Less Symbols in CFG

(ii) Removal of Unit Production in CFG

(iii) Removal of Null - Production in CFG

Find the Reduced Grammar that is equivalent to the CFG given below :

S ---> AB

A ---> a

B ---> C / b

C ---> D

D ----> E

E -----> a