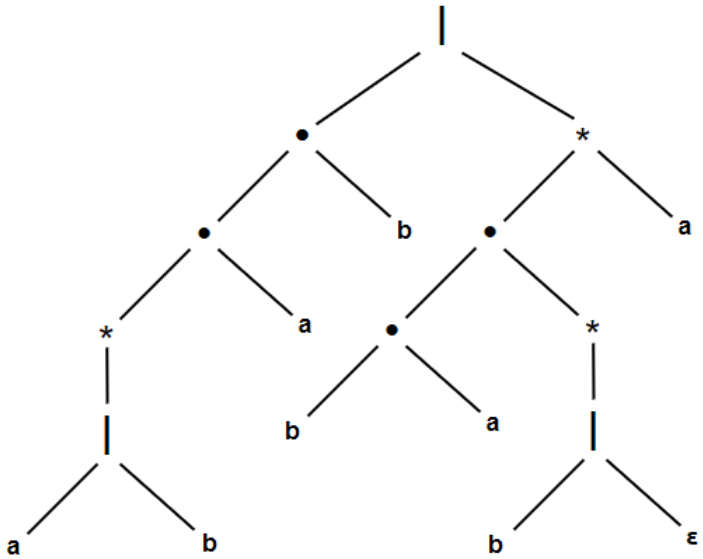
Solution for Assignment 3

1. (10%) Construct the expression tree for the following regular expression

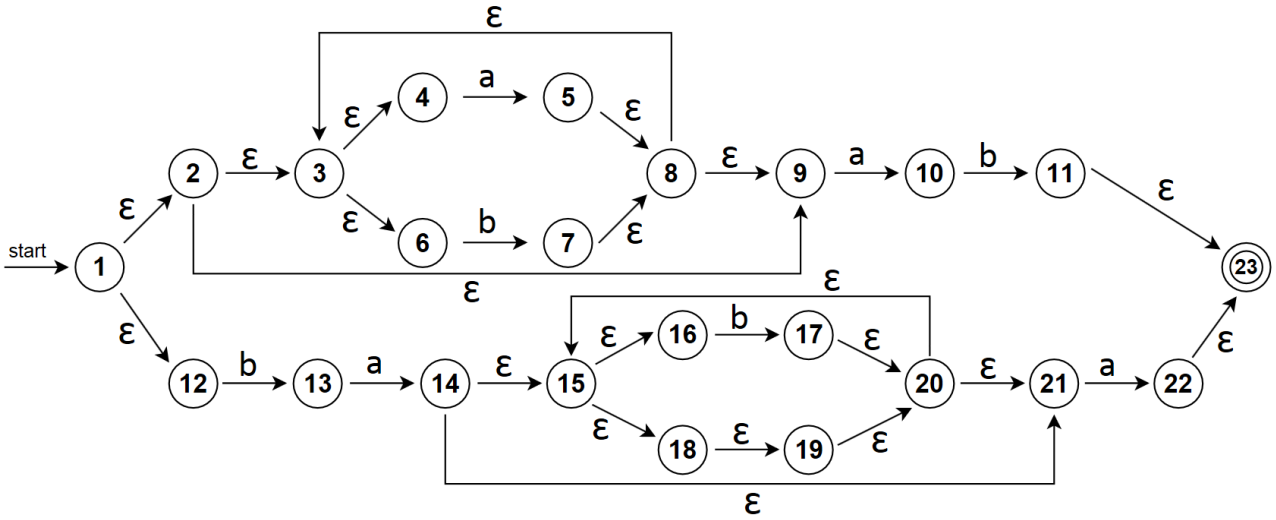
(a | b)* a b | b a (b | ε)* a

Ans:



2. (40%) Construct a NFA for the regular expression using the Thompson's construction algorithm.

Ans:



3. (50%) Convert the NFA into a DFA using the subset construction algorithm.

Ans:

ε-closure({1}) = {1,2,3,4,6,9,12} = A

ε-closure(move(A,a)) = ε-closure({5,10}) = {5,10,8,3,4,6,9} = B

ε-closure(move(A,b)) = ε-closure({7,13}) = {7,13,8,3,4,6,9} = C

ε-closure(move(B,a)) = ε-closure({5,10}) = {5,10,8,3,4,6,9} = B

ε-closure(move(B,b)) = ε-closure({11,7}) = {11,7,23,8,3,4,6,9} = D

ε-closure(move(C,a)) = ε-closure({14,5,10}) = {14,5,10,15,16,18,19,20,21,8,3,4,6,9} = E

ε-closure(move(C,b)) = ε-closure({7}) = {7,8,3,4,6,9} = F

ε-closure(move(D,a)) = ε-closure({5,10}) = {5,10,8,3,4,6,9} = B

ε-closure(move(D,b)) = ε-closure({7}) = {7,8,3,4,6,9} = F

ε-closure(move(E,a)) = ε-closure({22,5,10}) = {22,10,5,23,8,3,4,6,9} = G

ε-closure(move(E,b)) = ε-closure({11,17,7}) = {11,17,7,23,20,15,16,18,19,21,8,3,4,6,9} = H

ε-closure(move(F,a)) = ε-closure({5,10}) = {5,10,8,3,4,6,9} = B

ε-closure(move(F,b)) = ε-closure({7}) = {7,8,3,4,6,9} = F

ε-closure(move(G,a)) = ε-closure({5,10}) = {5,10,8,3,4,6,9} = B

ε-closure(move(G,b)) = ε-closure({11,7}) = {11,7,23,8,3,4,6,9} = D

ε-closure(move(H,a)) = ε-closure({22,5,10}) = {22,10,5,23,8,3,4,6,9} = G

ε-closure(move(H,b)) = ε-closure({17,7}) = {17,7,20,15,16,18,19,21,8,3,4,6,9} = I

ε-closure(move(I,a)) = ε-closure({22,5,10}) = {22,10,5,23,8,3,4,6,9} = G

ε-closure(move(I,b)) = ε-closure({17,7}) = {17,7,20,15,16,18,19,21,8,3,4,6,9} = I

	a	b
A = {1,2,3,4,6,9,12}	B	C
B = {5,10,8,3,4,6,9}	B	D
C = {7,13,8,3,4,6,9}	E	F
D = {11,7,23,8,3,4,6,9}	B	F
E = {14,5,10,15,16,18,19,20,21,8,3,4,6,9}	G	H
F = {7,8,3,4,6,9}	B	F
G = {22,10,5,23,8,3,4,6,9}	B	D
H = {11,17,7,23,20,15,16,18,19,21,8,3,4,6,9}	G	I
I = {17,7,20,15,16,18,19,21,8,3,4,6,9}	G	I