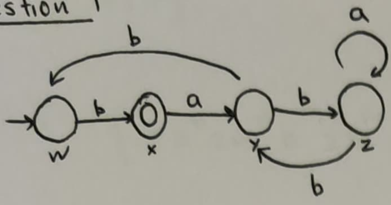
Assignment 11

Question 1



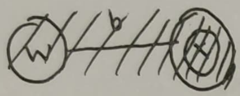
1. Valid characters:

   1. "b"
   2. "babbbb"
   3. "baba^{n}bbb" ~~wr~~ for $n \geq 1$
   4. "babb"

Alphabet accepted:

$\{a, b\}$

2.



$W \rightarrow bX$

$X \rightarrow aY \mid \lambda$

$Y \rightarrow bZ \mid bW$

$Z \rightarrow bY \mid aZ$

?

W B

X A

Y B

3.

```
data Alphabet = a | b
      deriving (Show)

type Sequence = [Alphabet]

data State = W | X | Y | Z

automation :: State -> Sequence -> Bool
automation W (a : xs) = False  → this line not required
automation W (b : xs) = automation X xs
automation X [] = True
automation X [a : xs] = automation Y xs
automation Y [b : xs] = automation W xs
automation Y [b : xs] = automation Z xs
automation Z [a : xs] = automation Z xs
automation Z [b : xs] = automation Y xs
automation _ _ = False

accept :: sequence -> Bool
accept sequence = automation W sequence

ex1 = [A] -- False
ex 2 = [B,A,B,B,B,B] -- True
ex 3 = [B] -- True
ex 4 = [] -- False
```

stion 2

$\Sigma = \{a, b, z\}$

$L(G) = \{ z a^n z a^n b^m z b^m z, n, m \in N \}$

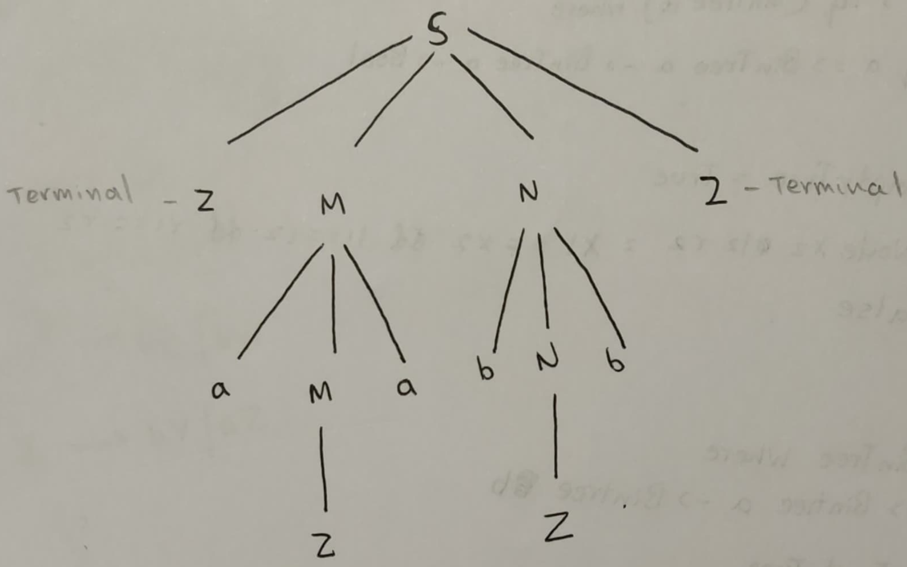
$S \rightarrow z\ M\ N\ z$

$M \rightarrow a\ M\ a \mid z$

$N \rightarrow b\ N\ b \mid z$

String: zzbbzbbz

Parse Tree



Question 3

```
data BinTree a = EmptyTree | Node a (BinTree a) (BinTree a)

instance (Show a) => Show (Bin Tree a ) where
  -- show : Show a => BinTree a -> String
  Show EmptyTree = " "
  show (Node x l r) = "("++ show x ++ show l ++ show r ++ ")"

  --Included function
  insertTree ::(Ord a) => a -> BinTree a -> BinTree a

  -- example
  tree :: BinTree Integer

1. instance (Eq a) => Eq (BinTree a) where
   -- (==) :: Eq a => BinTree a -> BinTree a -> Bool

   EmptyTree == EmptyTree = True
   Node x1 l1 r1 == Node x2 l2 r2 = x1 == x2 && l1==l2 && r1== r2
   _ == _ = False

2. instance Functor BinTree where
  --fmap :: (a->b) -> Bintree a -> Bintree b
  fmap _ EmptyTree = EmptyTree
  fmap f (Node x1 l1 r1) = Node (f x1) (fmap f l1) (fmap f r1)
```