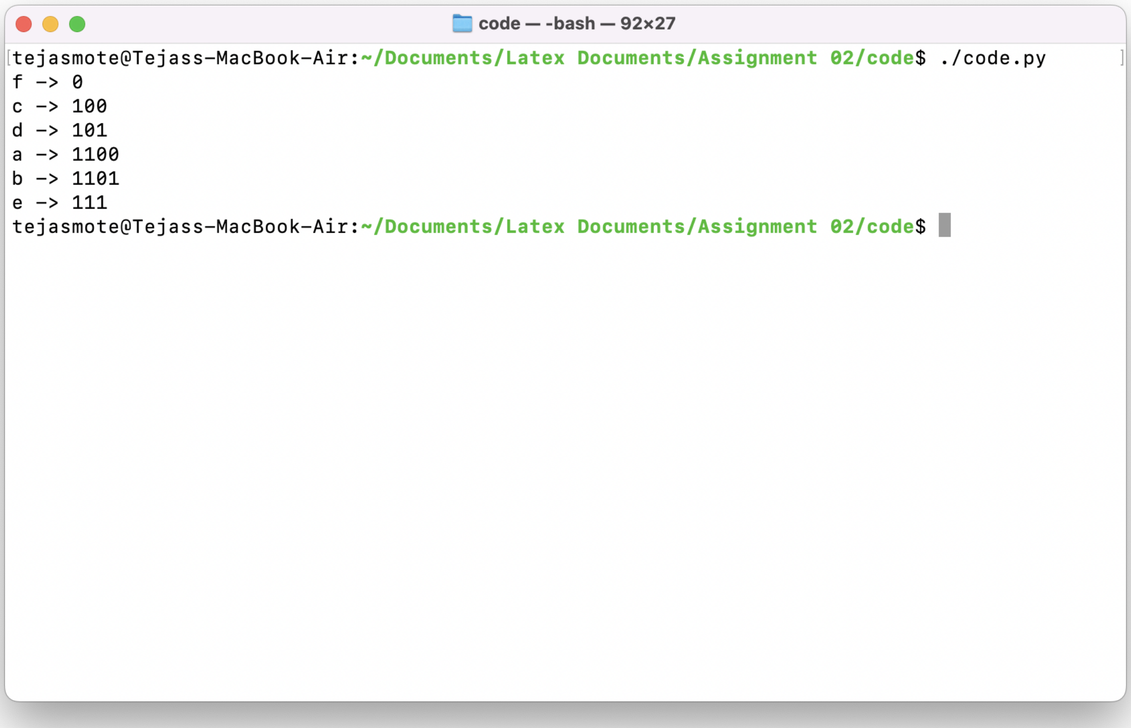
Assignment Number A02

Name: Tejas Dattatray Mote
Branch: Computer Engineering
Roll number: BCA-09
Subject: Design Analysis of Algorithms

```python
#!/usr/bin/env python3

# A Huffman Tree Node
import heapq

class node:
   def __init__(self, freq, symbol, left=None, right=None):
      # frequency of symbol
      self.freq = freq

      # symbol name (character)
      self.symbol = symbol

      # node left of current node
      self.left = left

      # node right of current node
      self.right = right

      # tree direction (0/1)
      self.huff = ''

   def __lt__(self, nxt):
      return self.freq < nxt.freq

# utility function to print huffman
# codes for all symbols in the newly
# created Huffman tree

def printNodes(node, val=''):

   # huffman code for current node
   newVal = val + str(node.huff)

   # if node is not an edge node
   # then traverse inside it
   if(node.left):
      printNodes(node.left, newVal)

   if(node.right):
      printNodes(node.right, newVal)
      # if node is edge node then
      # display its huffman code

   if(not node.left and not node.right):
      print(f"{node.symbol} -> {newVal}")

# characters for huffman tree
chars = ['a', 'b', 'c', 'd', 'e', 'f']

# frequency of characters
freq = [5, 9, 12, 13, 16, 45]

# list containing unused nodes
nodes = []

# converting characters and frequencies
# into huffman tree nodes
for x in range(len(chars)):
   heapq.heappush(nodes, node(freq[x], chars[x]))

while len(nodes) > 1:
   # sort all the nodes in ascending order
   # based on their frequency
   left = heapq.heappop(nodes)
   right = heapq.heappop(nodes)

   # assign directional value to these nodes
   left.huff = 0
   right.huff = 1

   # combine the 2 smallest nodes to create
   # new node as their parent
   newNode = node(left.freq+right.freq, left.symbol+right.symbol, left, right)

   heapq.heappush(nodes, newNode)

# Huffman Tree is ready!
printNodes(nodes[0])
```

Program 1: Implementation of Huffman Encoding using a greedy strategy in Python



```
tejasmote@Tejass-MacBook-Air:~/Documents/Latex Documents/Assignment 02/code$ ./code.py
f -> 0
c -> 100
d -> 101
a -> 1100
b -> 1101
e -> 111
tejasmote@Tejass-MacBook-Air:~/Documents/Latex Documents/Assignment 02/code$
```

Figure 1: Output of The Program