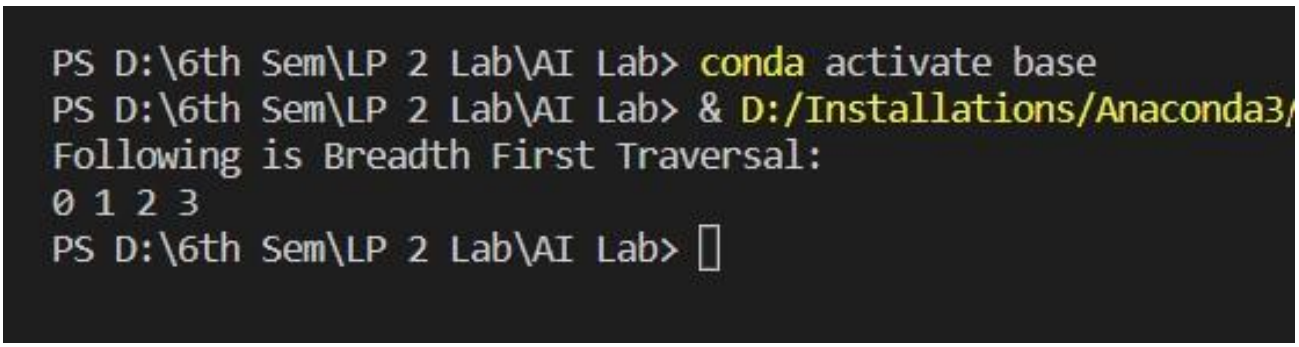
AI – 1.1 BFS Undirected Graph

Code

```
# BFS algorithm in Python import
collections
# BFS algorithm
 def bfs(graph, root):     visited, queue = set(),
collections.deque([root])     visited.add(root)
     while
queue:
        # Dequeue a vertex from queue
vertex = queue.popleft()
print(str(vertex) + " ", end="")
        # If not visited, mark it as visited, and
        # enqueue it         for
neighbour in graph[vertex]:
if neighbour not in visited:
visited.add(neighbour)
queue.append(neighbour)
 if __name__ ==
'__main__':
    graph = {0: [1, 2], 1: [2], 2: [3], 3: [1, 2]}
print("Following is Breadth First Traversal: ")
bfs(graph, 0)
```

Output

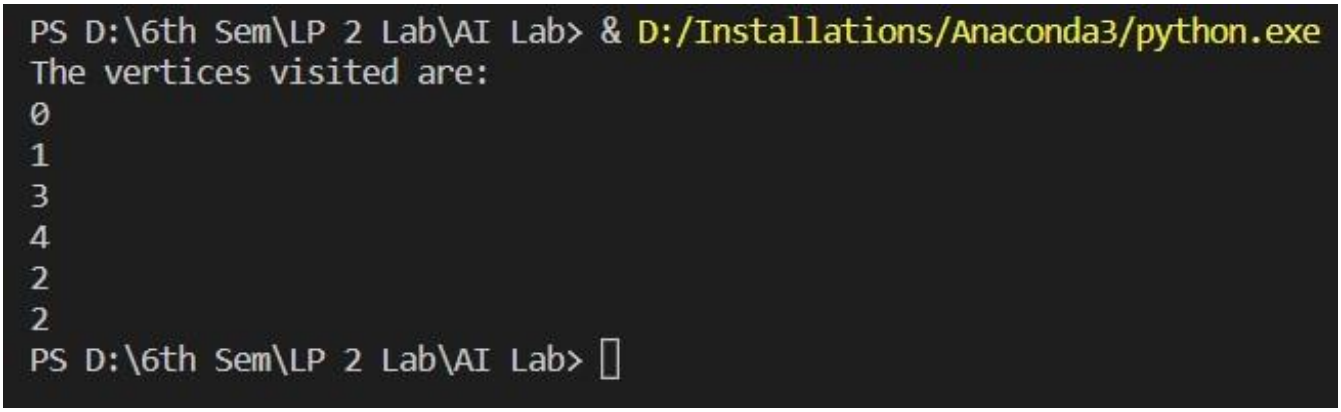


AI– 1.2 DFS Undirected Graph

Code

```
# DFS algorithm in Python
# DFS algorithm def dfs(graph,
start, visited=None):     if visited
is None:         visited = set()
visited.add(start)     print(start)
     for next in graph[start] -
visited:
        dfs(graph, next, visited)
return visited
 graph = {'0': set(['1', '2']),
'1': set(['0', '3', '4']),
         '2': set(['0']),
         '3': set(['1']),
'4': set(['2', '3'])}
dfs(graph, '0')
```

Output



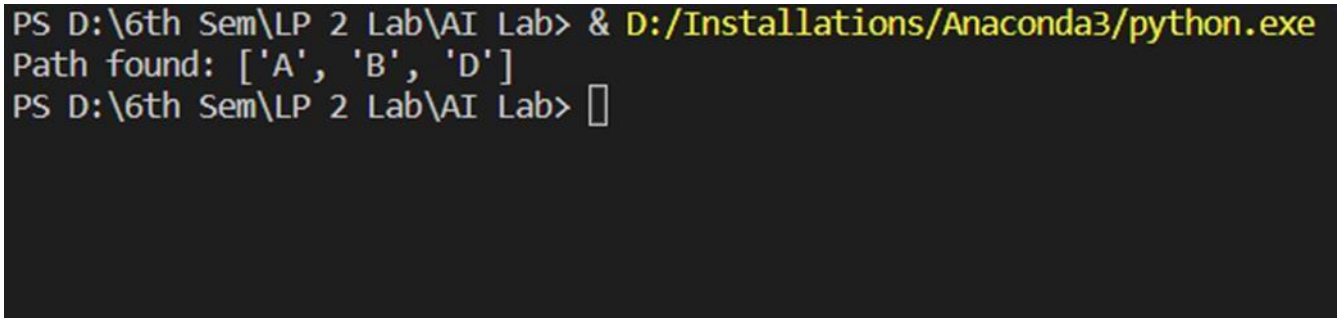
AI- 2 A Star algorithm Code

```
from collections import deque class
Graph:
    # example of adjacency list (or rather map)
def __init__(self, adjacency_list):
        self.adjacency_list = adjacency_list
     def get_neighbors(self,
v):
        return self.adjacency_list[v]

    # heuristic function with equal values for all nodes
def h(self, n):         H = {
            'A': 1,
            'B': 1,
            'C': 1,
            'D': 1
        }
return H[n]
     def a_star_algorithm(self, start_node,
stop_node):
 # open_list is a list of nodes which have been visited, but who's
neighbors haven't all been inspected, starts off with the start node
# closed_list is a list of nodes which have been visited and who's
neighbors have been inspected         open_list =
set([start_node])         closed_list = set([])

  # g contains current distances from start_node to all other nodes the
default value (if it's not found in the map) is +infinity         g =
{}         g[start_node] = 0

        # parents contains an adjacency map of all nodes
parents = {}         parents[start_node] = start_node
while len(open_list) > 0:
            n = None
```

```
   # find a node with the lowest value of f() - evaluation function
for v in open_list:                 if n == None or g[v] + self.h(v)
< g[n] + self.h(n):
                    n = v;
             if n == None:
print('Path does not exist!')
return None


  # if the current node is the stop_node
  # then we begin reconstructin the path from it to the start_node
if n == stop_node:                 reconst_path = []
while parents[n] != n:
                    reconst_path.append(n)
n = parents[n]
reconst_path.append(start_node)
reconst_path.reverse()                print('Path found:
{}'.format(reconst_path))                return
reconst_path


            # for all neighbors of the current node do
for (m, weight) in self.get_neighbors(n):
     # if the current node isn't in both open_list and closed_list
# add it to open_list and note n as it's parentif m not in open_list and m
not in closed_list:
                    open_list.add(m)
parents[m] = n                      g[m]
= g[n] + weight                 #
otherwise, check if it's quicker to
first visit n, then m and if it is,
update parent data and g data and if the
node was in the closed_list, move it to
open_list                 else:
if g[m] > g[n] + weight:
```

```
g[m] = g[n] + weight
parents[m] = n
                        if   m   in   closed_list:
closed_list.remove(m)
open_list.add(m)

            # remove n from the open_list, and add it to closed_list
because all of his neighbors were inspected
open_list.remove(n)             closed_list.add(n)
print('Path does not exist!')         return None
         adjacency_list
= {
'A': [('B', 1), ('C', 3), ('D', 7)],
'B': [('D', 5)],
'C': [('D', 12)]
} graph1 = Graph(adjacency_list)
graph1.a_star_algorithm('A','D')
```

Output

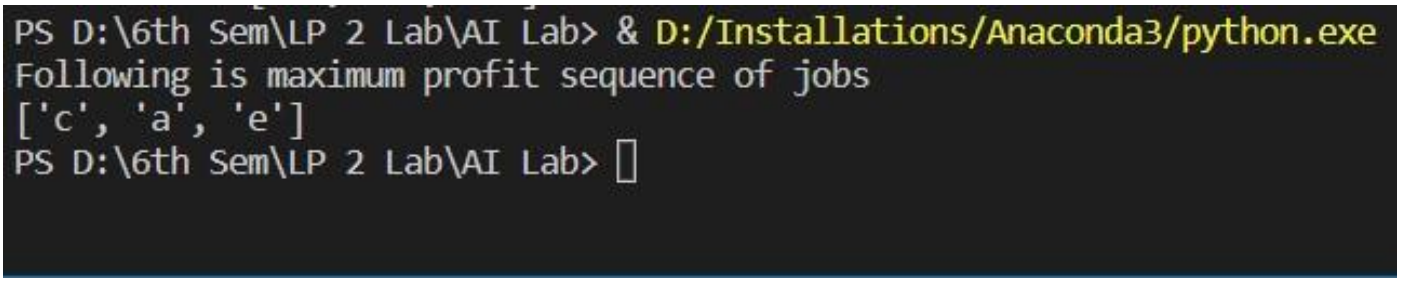


AI- 3 Greedy Search Algorithm- Job Scheduling Problem Code

```
# Program to find the maximum profit
# job sequence from a given array
# of jobs with deadlines and profit
# function to schedule the jobs take 2 #
arguments array and no of jobs to schedule
def printJobScheduling(arr, t):

     # length of array
n = len(arr)

     # Sort all jobs according to   #
decreasing order of profit     for i in
range(n):           for j in range(n - 1 -
i):            if arr[j][2] < arr[j +
1][2]:
                    arr[j], arr[j + 1] = arr[j + 1], arr[j]

     # To keep track of free time slots
result = [False] * t

     # To store result (Sequence of jobs)
job = ['-1'] * t

     # Iterate through all given jobs
for i in range(len(arr)):           #
Find a free slot for this job
          # (Note that we start from the           # last
possible slot)           for j in range(min(t - 1,
arr[i][1] - 1), -1, -1):

               # Free slot found
```

```
                if result[j] is False:
            result[j] = True
job[j] = arr[i][0]
                    break
     # print the sequence
print(job)

# Driver COde arr = [['a', 2,
100], # Job Array
     ['b', 1, 19],
     ['c', 2, 27],
     ['d', 1, 25],
     ['e', 3, 15]]
print("Following is maximum profit sequence of jobs")
# Function Call printJobScheduling(arr,
3)
```

Output



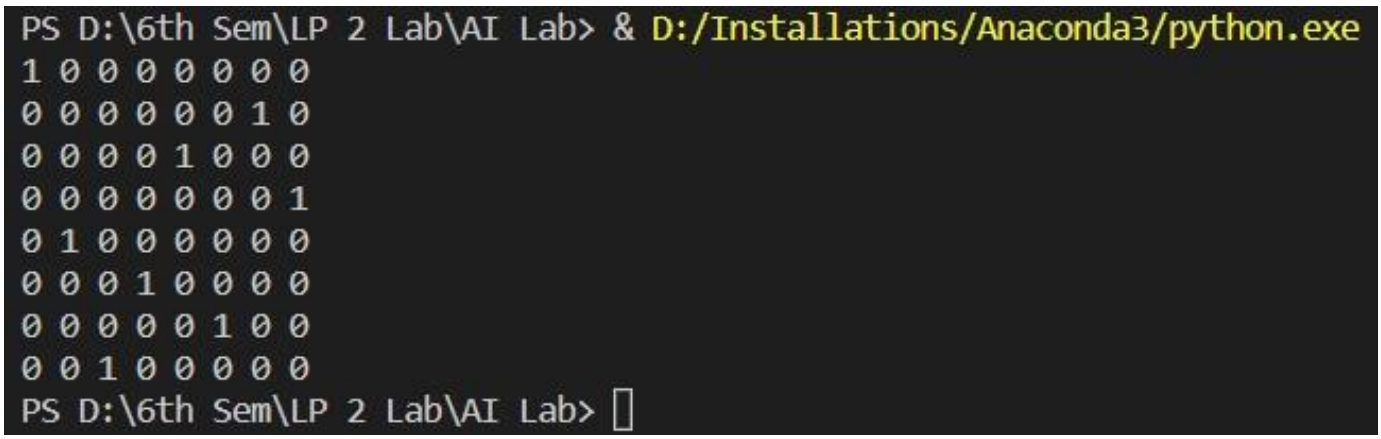
AI- 4. N-queens problem Code

```
import io import random import string import warnings
import numpy as np from sklearn.feature_extraction.text
import TfidfVectorizer from sklearn.metrics.pairwise import
cosine_similarity import warnings
warnings.filterwarnings('ignore') import nltk from
nltk.stem import WordNetLemmatizer
# nltk.download('popular', quiet=True)
# nltk.download('punkt')
# nltk.download('wordnet')
 with open('chatbot.txt','r', encoding='utf8', errors ='ignore') as
fin:
    raw = fin.read().lower()

#Tokenisation sent_tokens =
nltk.sent_tokenize(raw) word_tokens =
nltk.word_tokenize(raw)

# Preprocessing lemmer =
WordNetLemmatizer() def
LemTokens(tokens):
    return [lemmer.lemmatize(token) for token in tokens]
remove_punct_dict = dict((ord(punct), None) for punct in
string.punctuation) def LemNormalize(text):
    return
LemTokens(nltk.word_tokenize(text.lower().translate(remove_punct_dict)))
# Keyword Matching
GREETING_INPUTS = ("hello", "hi", "greetings", "sup", "what's
up","hey","Helo")
GREETING_RESPONSES = ["hi", "hey", "hi there", "hello", "I am glad! You
are talking to me"]
 def greeting(sentence):     for word in
sentence.split():         if word.lower()
in GREETING_INPUTS:
            return random.choice(GREETING_RESPONSES)
```

```
 def
response(user_response):
    robo_response=''
    sent_tokens.append(user_response)
    TfidfVec = TfidfVectorizer(tokenizer=LemNormalize,
stop_words='english')     tfidf =
TfidfVec.fit_transform(sent_tokens)     vals =
cosine_similarity(tfidf[-1], tfidf)
idx=vals.argsort()[0][-2]     flat = vals.flatten()
flat.sort()     req_tfidf = flat[-2]
if(req_tfidf==0):
        robo_response=robo_response+"I am sorry! I don't understand you"
return robo_response     else:
        robo_response = robo_response+sent_tokens[idx]
return robo_response
 flag=True
print("ROBO: My name is Robo. I will answer your queries about
Investments. If you want to exit, type Bye!") while(flag==True):
    user_response = input()
    user_response=user_response.lower()
if(user_response!='bye'):         if(user_response=='thanks' or
user_response=='thank you' ):
            flag=False
print("ROBO: You are welcome..")         else:
if(greeting(user_response)!=None):
                print("ROBO: "+greeting(user_response))
else:
                print("ROBO: ",end="")
res = response(user_response)
nlines = res.count('\n')                 if
nlines > 0:
                    res = res.split("\n",1)[1]
print(res)
sent_tokens.remove(user_response)     else:
```

```
        flag=False          print("ROBO:
Bye! take care..")
```

Output



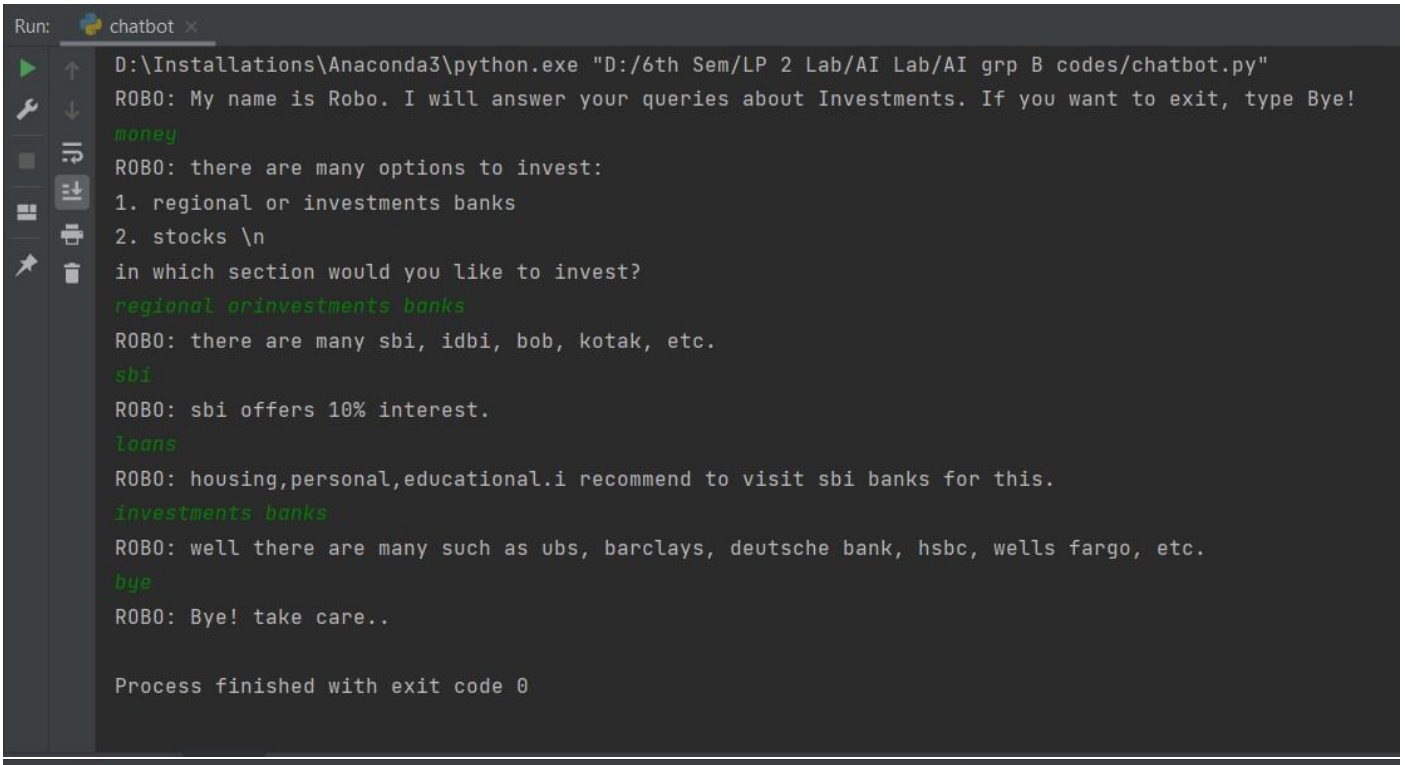
AI-5 Chatbot Application in Python

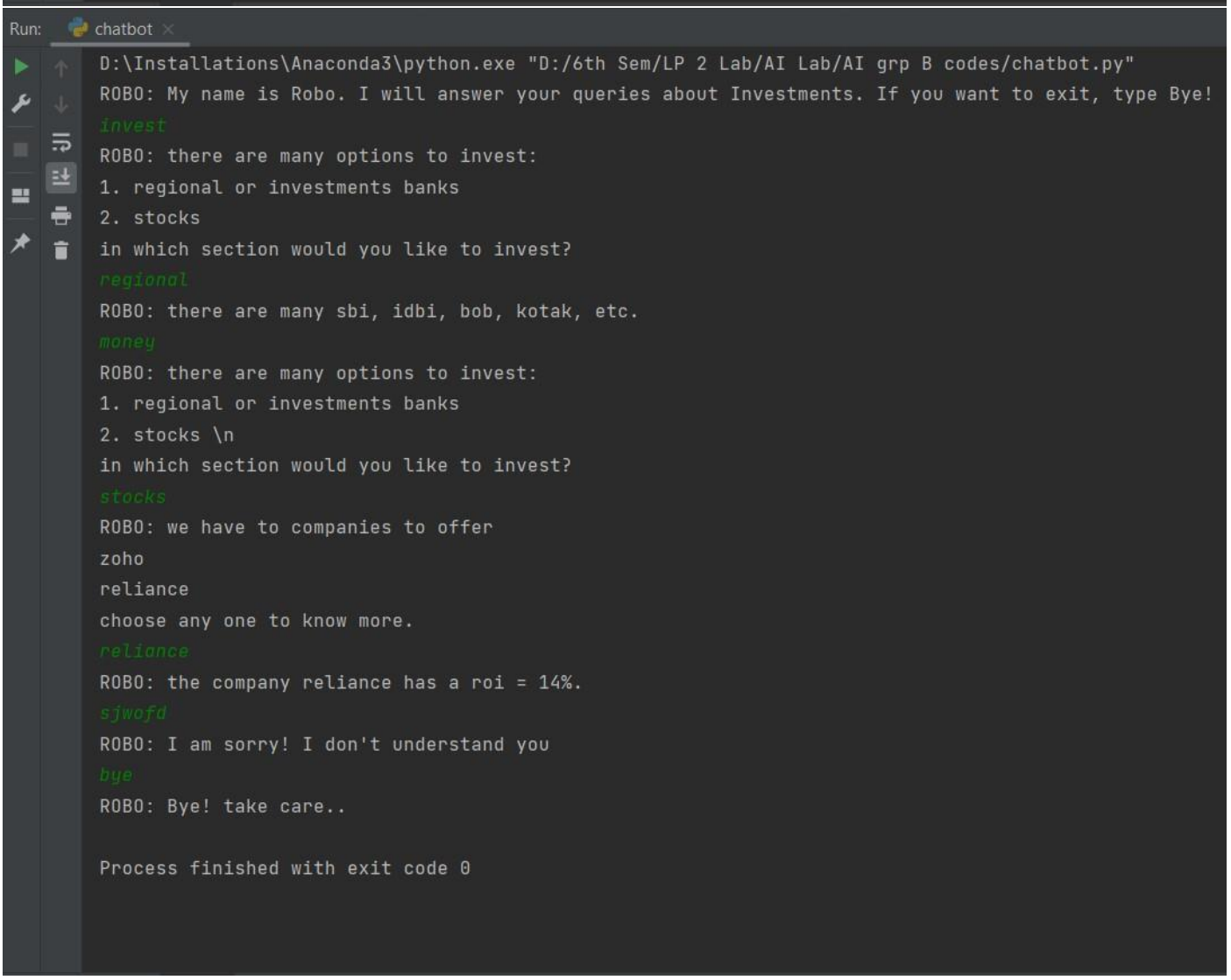
Code

```
import io import random import string import warnings
import numpy as np from sklearn.feature_extraction.text
import TfidfVectorizer from sklearn.metrics.pairwise import
cosine_similarity import warnings
warnings.filterwarnings('ignore') import nltk from
nltk.stem import WordNetLemmatizer
# nltk.download('popular', quiet=True)
# nltk.download('punkt')
# nltk.download('wordnet')
 with open('chatbot.txt','r', encoding='utf8', errors ='ignore') as
fin:
    raw = fin.read().lower()

#Tokenisation sent_tokens =
nltk.sent_tokenize(raw) word_tokens =
nltk.word_tokenize(raw)

# Preprocessing lemmer =
WordNetLemmatizer() def
LemTokens(tokens):
    return [lemmer.lemmatize(token) for token in tokens]
remove_punct_dict = dict((ord(punct), None) for punct in
string.punctuation) def LemNormalize(text):
    return
LemTokens(nltk.word_tokenize(text.lower().translate(remove_punct_dict)))
# Keyword Matching

GREETING_INPUTS = ("hello", "hi", "greetings", "sup", "what's
up","hey","Helo")
GREETING_RESPONSES = ["hi", "hey", "hi there", "hello", "I am glad! You
are talking to me"]
```

```
 def greeting(sentence):     for word in
sentence.split():         if word.lower()
in GREETING_INPUTS:
            return random.choice(GREETING_RESPONSES)
 def
response(user_response):
    robo_response=''
    sent_tokens.append(user_response)
    TfidfVec = TfidfVectorizer(tokenizer=LemNormalize,
stop_words='english')     tfidf =
TfidfVec.fit_transform(sent_tokens)     vals =
cosine_similarity(tfidf[-1], tfidf)
idx=vals.argsort()[0][-2]     flat = vals.flatten()
flat.sort()     req_tfidf = flat[-2]
if(req_tfidf==0):
        robo_response=robo_response+"I am sorry! I don't understand you"
return robo_response     else:
        robo_response = robo_response+sent_tokens[idx]
return robo_response
 flag=True
print("ROBO: My name is Robo. I will answer your queries about
Investments. If you want to exit, type Bye!") while(flag==True):
    user_response = input()
user_response=user_response.lower()
if(user_response!='bye'):         if(user_response=='thanks' or
user_response=='thank you' ):
            flag=False
print("ROBO: You are welcome..")         else:
if(greeting(user_response)!=None):
                print("ROBO: "+greeting(user_response))
else:
                print("ROBO: ",end="")
res = response(user_response)
```

```
nlines = res.count('\n')                if
nlines > 0:
                    res = res.split("\n",1)[1]
print(res)
sent_tokens.remove(user_response)     else:
        flag=False          print("ROBO:
Bye! take care..") Output
```


Run:
chatbot
D:\Installations\Anaconda3\python.exe "D:/6th Sem/LP 2 Lab/AI Lab/AI grp B codes/chatbot.py"
ROBO: My name is Robo. I will answer your queries about Investments. If you want to exit, type Bye!
money
ROBO: there are many options to invest:
1. regional or investments banks
2. stocks \n
in which section would you like to invest?
regional orinvestments banks
ROBO: there are many sbi, idbi, bob, kotak, etc.
sbi
ROBO: sbi offers 10% interest.
loans
ROBO: housing,personal,educational.i recommend to visit sbi banks for this.
investments banks
ROBO: well there are many such as ubs, barclays, deutsche bank, hsbc, wells fargo, etc.
bye
ROBO: Bye! take care..
Process finished with exit code 0


Run:
chatbot
D:\Installations\Anaconda3\python.exe "D:/6th Sem/LP 2 Lab/AI Lab/AI grp B codes/chatbot.py"
ROBO: My name is Robo. I will answer your queries about Investments. If you want to exit, type Bye!
invest
ROBO: there are many options to invest:
1. regional or investments banks
2. stocks
in which section would you like to invest?
regional
ROBO: there are many sbi, idbi, bob, kotak, etc.
money
ROBO: there are many options to invest:
1. regional or investments banks
2. stocks \n
in which section would you like to invest?
stocks
ROBO: we have to companies to offer
zoho
reliance
choose any one to know more.
reliance
ROBO: the company reliance has a roi = 14%.
sjwofd
ROBO: I am sorry! I don't understand you
bye
ROBO: Bye! take care..
Process finished with exit code 0