Task 1.1 [2m]

```
# Task 1.1
def charToNum(char):
    num = ord(char) - ord('A')    #2
    return num
```

Task 1.2 [7 m]

```
# Task 1.2
def encrypt(text, key):  # [7 marks]
    encrypted = []
    len_key = len(key)

    for i in range(len(text)): #1
        if text[i]== ' ':
            newChar = '!' #1

        #if 'A' <= text[1] <= 'Z':
        else:
            textnum = charToNum(text[i])
            keynum = charToNum(key[i%len_key])  #1
            newnum = (textnum + keynum) % 26   #1
            newChar = chr(newnum + ord('A'))   #1
        encrypted.append(newChar)  #1

    return ''.join(encrypted)     #1

print(encrypt("HELLO WORLD", "ABLE"))
```

Task 1.3 [3m]

```
# Task 1.3
infile = open("TASK1.txt",'r')
outfile = open("ENCRYPTED.txt",'w')
lines = infile.readlines()  # 1
for line in lines:
    encrypted = encrypt(line, "JPJC")  #1m
    outfile.write(encrypted + '\n')   #1
infile.close()
outfile.close()

#read from encrypted text file
file = open('ENCRYPTED.txt')
lines = file.readlines()
for line in lines:
    line = line.strip()
    print(line)
file.close()
```

Show output from ENCRYPTED.txt file **[1m]**

```
OXAG!SAKUA!CC!WQXCG
YDY!ZJRB!IQKB!OTRSJAG
BJARAXBG!EJTCN!HXG!VDIXT!IXFJN
```

Task 2.1 [16m]

```
import random

def createIsland(rowsize, colsize): # [2m]
   grid = [['.' for i in range(colsize)] for i in range(rowsize)]  #1
   grid[0][0] = '*'  #1
   return grid

def plantCoconuts(grid):  # [4m]
   count=0
   while count<3:       # 0, 1, 2  - 1m
      row = random.randint(0, len(grid)-1)      #1
      col = random.randint(0, len(grid[0])-1)
      if grid[row][col] == '.':  #1
         grid[row][col] = 'C'    #1
         count += 1
   return grid

def display(grid):  #[1m]
   for row in grid:
      print(' '.join(row))
   print()

def move(grid, curr, direct, dist, score):  # [9m]

   row = curr[0]
   col = curr[1]

   # plot path with *, except if has 'C' [4]
   if direct == 'R':
      for i in range(dist):
         if grid[row][col+1+i] != 'C':
            grid[row][col+1+i] = '*'
   elif direct == 'L':
      for i in range(dist):
         if grid[row][col-1-i] != 'C':
            grid[row][col-1-i] = '*'

   elif direct == 'U':
      for i in range(dist):
         if grid[row-1-i][col] != 'C':
                grid[row-1-i][col] = '*'
    elif direct == 'D':
        for i in range(dist):
            if grid[row+1+i][col] != 'C':
                grid[row+1+i][col] = '*'
    # update endpoint  [2]
    if direct == 'U':
        row -= dist
    elif direct == 'D':
        row += dist
    elif direct == 'L':
        col -= dist
    elif direct == 'R':
        col += dist

    # eat coconut if endpoint has 'C' [2]
    if grid[row][col]=='C':
        grid[row][col]='E'
        score += 1

    print("(row, col), score =", (row, col), score)  # print
    return (grid, (row, col), score)  # return tuple [1]
```

Task 2.2 [10 m]

```
# main
grid = createIsland(10, 15)  # create island -1m
grid = plantCoconuts(grid)   # plant 3 coconut tree -1m
curr = (0,0)  # initialise player starting position and score -1m
score = 0
win = False
display(grid)  # display grid

for i in range(8):  # game loop -1m
  # print player's current location & score -1m
    print("You are at position:", curr, ' Coconut eaten:', score)
    direct, dist = input("Enter your move (L/R/U/D distance):").split(' ')  # user input -1m
    dist = int(dist)
    grid, curr, score = move(grid, curr, direct, dist, score)  #1
    display(grid)
    if curr == (9,14) and score==3:  #1
        win = True
        break

if win: #1
    print("You have won!")
    print("You have reached finish point and eaten 3 coconuts.")
else: #1
    print("Sorry you did not win")
    if curr != (9,14):
        print("You did not reached the finish point.")
    if score<3:
        print("You have not eaten enough coconuts.")
```

Show output of game with a win or lost [1m]

Task 3.1, 3.2, 3.3, 3.4 [3m, 18m, 4m, 2m]

```
# Task 3.1 [3m]
class Node:
    def __init__(self, value):  #1m
        self.value = value      #1m
        self.left = None        #1m
        self.right = None

# Task 3.2 [18m]
class Tree:
    def __init__(self, node):
        self.root = node #1m

    def insert(self, val):
        if self.root is None: #1m empty BST
            self.root = val
        else:
            current_node = self.root #1m

            while True:
                if val.value < current_node.value: #1m compare
                    if current_node.left is None: #1m update pointer when leaf reached
                        current_node.left = val
                        break
                    else:
                        current_node = current_node.left #1m
                else:
                    if current_node.right is None: #1m update pointer when leaf reached
                        current_node.right = val
                        break
                    else:
                        current_node = current_node.right #1m

    def in_order_traversal(self):
        self.in_order_recursive(self.root)

    def in_order_recursive(self, node):
        if node is not None: #1m
            self.in_order_recursive(node.left)    #1m Visit left subtree
            print(node.value, end = " ")         #1m Visit node itself
            self.in_order_recursive(node.right)   #1m Visit right subtree
    def pre_order(self, node, result):
        if node:
            result.append(node.value)
            self.pre_order(node.left, result)
            self.pre_order(node.right, result)

    def pre_order_traversal(self):
        result = []
        self.pre_order(self.root, result)
        return result


    def helper(self,node, prev): #uses a reversed pre-order traversal
        if node == None: #1m
            return prev

        prev = self.helper(node.right, prev) #1m
        prev = self.helper(node.left, prev) #1m

        node.right = prev #1m
        node.left = None #1m
        prev = node #1m

        return prev

    def flatten(self):
        self.helper(self.root, None)

# Task 3.3 – [4m]
# Main Program
BST = Tree(Node(5)) #1m copy the code
BST.insert(Node(3))
BST.insert(Node(2))
BST.insert(Node(4))
BST.insert(Node(7))
BST.insert(Node(8))

print("In-order Traversal:", end = " ")
BST.in_order_traversal() #2m including correct output
print()
print("Pre-order Traversal:", BST.pre_order_traversal())

BST.flatten() #1m
```

Task 3.4 [2m]

```
print("Linked list Traversal:", end = " ")

current = BST.root #2m including correct output
while current:
    print(current.value, end = " ")
    current = current.right
```

```
In-order Traversal: 2 3 4 5 7 8
Pre-order Traversal: [5, 3, 2, 4, 7, 8]
Linked list Traversal: 5 3 2 4 7 8
```

Task 4.1 [3m]

```
# Task 4.1
import sqlite3

conn = sqlite3.connect("Airport.db")

# sql statement - 2m
query = '''
CREATE TABLE `Flight` (
        `flightNum`     TEXT,
        `departure`     TEXT,
        `destination`   TEXT,
        `departureTime`         TEXT,
        `arrivalTime`   TEXT,
        PRIMARY KEY(`flightNum`)
)'''

conn.execute(query)
conn.commit()
conn.close()     # execute and conn - 1m
```

Task 4.2 [5 + 1m]

```
# Task 4.2
import sqlite3
conn = sqlite3.connect("Airport.db")

# read from file – 1m
infile = open("TASK4.txt",'r')
lines = infile.readlines()

for line in lines[1:]:
  line = line.strip().split(',')    # strip and split data - 1m

  # insert into DB  - 2m
  query = '''INSERT INTO Flight VALUES (?,?,?,?,?)'''

  conn.execute(query,  (line[0], line[1], line[2], line[3], line[4] ))

conn.commit()
conn.close()
infile.close()    # Commit, close conn, close file - 1m
```

Values inserted into Database [1m]

Task 4.3 [3m]

```
# 4.3
from flask import *

app = Flask(__name__)

@app.route('/')
def index():
   return render_template("index.html")   #1m

app.run()
```

HTML file - Accept any correct implementation (Textbox, hyperlink, etc..) **- 2m**

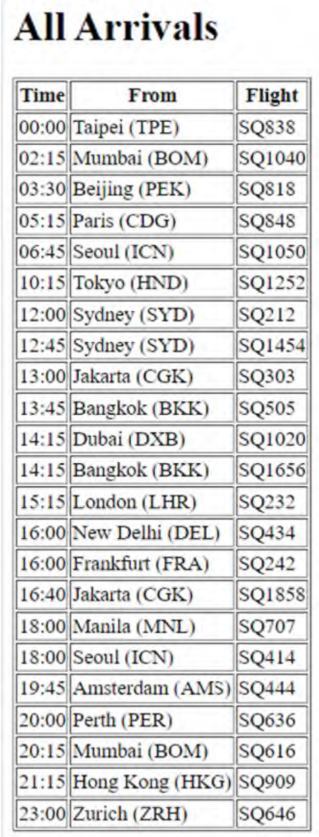
```
<h1>Menu</h1>

<a href="/allArrivals">1.View all Arrivals</a><br>

<a href="/allDepartures">2.View all Departures</a><br>

<a href="/query">3.Query Flight</a><br>
```

Task 4.4 **[6m]**

```
@app.route('/allArrivals')
def allArrivals():
   conn = sqlite3.connect("Airport.db")
   query = "SELECT arrivalTime, departure, flightNum \
   FROM Flight \
   WHERE destination = 'Singapore (SIN)' \
   ORDER BY arrivalTime ASC    "   # SQL statement 2 marks

   cursor = conn.execute(query)
   result = cursor.fetchall()  # execute sql and fetch result 1m
   conn.close()

   return render_template("allArrivals.html", result = result)  #1m
```

```
<h1>All Arrivals</h1>
<table border=1>
<tr>  <th>Time</th><th>From</th><th>Flight</th>
</tr>
{% for flight in result %}  <!-- jinja for loop and table 1m --!>
<tr>      <td>{{ flight[0] }}</td>
          <td>{{ flight[1] }}</td>
          <td>{{ flight[2] }}</td>
</tr>  <!-- jinja values/placeholders 1m --!>
{% endfor %}
</table>
```

Output in html - 1 mark



All Arrivals

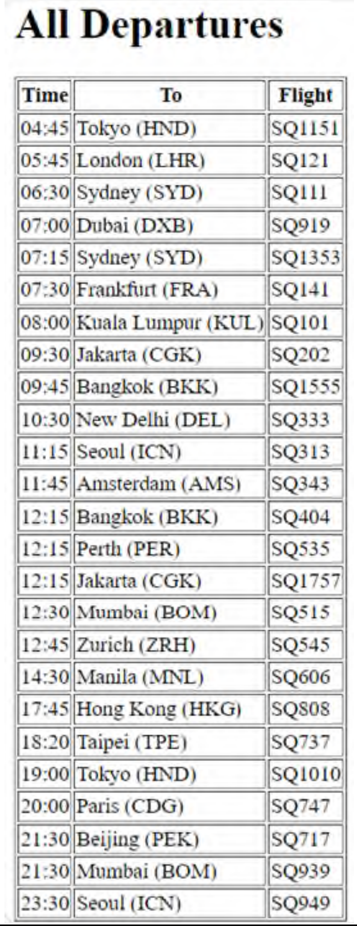
Time	From	Flight
00:00	Taipei (TPE)	SQ838
02:15	Mumbai (BOM)	SQ1040
03:30	Beijing (PEK)	SQ818
05:15	Paris (CDG)	SQ848
06:45	Seoul (ICN)	SQ1050
10:15	Tokyo (HND)	SQ1252
12:00	Sydney (SYD)	SQ212
12:45	Sydney (SYD)	SQ1454
13:00	Jakarta (CGK)	SQ303
13:45	Bangkok (BKK)	SQ505
14:15	Dubai (DXB)	SQ1020
14:15	Bangkok (BKK)	SQ1656
15:15	London (LHR)	SQ232
16:00	New Delhi (DEL)	SQ434
16:00	Frankfurt (FRA)	SQ242
16:40	Jakarta (CGK)	SQ1858
18:00	Manila (MNL)	SQ707
18:00	Seoul (ICN)	SQ414
19:45	Amsterdam (AMS)	SQ444
20:00	Perth (PER)	SQ636
20:15	Mumbai (BOM)	SQ616
21:15	Hong Kong (HKG)	SQ909
23:00	Zurich (ZRH)	SQ646

Task 4.5 **[2m]**

```
@app.route('/allDepartures')
def allDepartures():
  conn = sqlite3.connect("Airport.db")
  query = "SELECT departureTime, destination, flightNum \
  FROM Flight \
  WHERE departure = 'Singapore (SIN)' \
  ORDER BY departureTime ASC "  # sql statement 1 m
  cursor = conn.execute(query)
  result = cursor.fetchall()
  conn.close()
  return render_template("allDepartures.html", result = result)
```

```
  <h1>All Departures</h1>
  <table border=1>
  <tr>  <th>Time</th><th>To</th><th>Flight</th>
  </tr>
  {% for flight in result %}
  <tr>   <td>{{ flight[0] }}</td>
         <td>{{ flight[1] }}</td>
         <td>{{ flight[2] }}</td>
  </tr>  <!-- jinja values/placeholders 1m --!>
  {% endfor %}
  </table>
```

Output in html - 1 mark



All Departures

Time	To	Flight
04:45	Tokyo (HND)	SQ1151
05:45	London (LHR)	SQ121
06:30	Sydney (SYD)	SQ111
07:00	Dubai (DXB)	SQ919
07:15	Sydney (SYD)	SQ1353
07:30	Frankfurt (FRA)	SQ141
08:00	Kuala Lumpur (KUL)	SQ101
09:30	Jakarta (CGK)	SQ202
09:45	Bangkok (BKK)	SQ1555
10:30	New Delhi (DEL)	SQ333
11:15	Seoul (ICN)	SQ313
11:45	Amsterdam (AMS)	SQ343
12:15	Bangkok (BKK)	SQ404
12:15	Perth (PER)	SQ535
12:15	Jakarta (CGK)	SQ1757
12:30	Mumbai (BOM)	SQ515
12:45	Zurich (ZRH)	SQ545
14:30	Manila (MNL)	SQ606
17:45	Hong Kong (HKG)	SQ808
18:20	Taipei (TPE)	SQ737
19:00	Tokyo (HND)	SQ1010
20:00	Paris (CDG)	SQ747
21:30	Beijing (PEK)	SQ717
21:30	Mumbai (BOM)	SQ939
23:30	Seoul (ICN)	SQ949

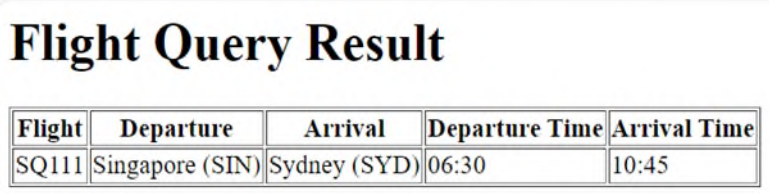
Task 4.6 **[5m]**

```
@app.route('/queryFlight')
def queryFlight():
    return render_template("flightQuery.html")

@app.route('/query', methods=["POST"])
def query():
    num = request.form["flightNum"]
    print(num)

    conn = sqlite3.connect("Airport.db")

    query = "SELECT * \
    FROM Flight \
    WHERE flightNum = ? "  # correct sql statement 1m

    cursor = conn.execute(query, (num,))
    result = cursor.fetchall()
    conn.close()
    return render_template("queryResult.html", result=result)
```

```
<h1>Flight Query</h1>

<form action="/query" method="POST"> <!-- Correct form and components 2m --!>
        <input type="TEXT" name="flightNum">
        <input type="Submit">
</form>
```

```
<h1>Flight Query Result</h1>
<table border=1>
<tr>  <th>Flight</th><th>Departure</th><th>Arrival</th><th>Departure Time</th><th>Arrival Time</th>
</tr>
{% for flight in result %}
<tr>    <td>{{ flight[0] }}</td>
        <td>{{ flight[1] }}</td>
        <td>{{ flight[2] }}</td>
        <td>{{ flight[3] }}</td>
        <td>{{ flight[4] }}</td> <!-- jinja values/placeholders 1m --!>
</tr>
{% endfor %}
</table>
```

Output html - 1m



Flight Query Result

Flight	Departure	Arrival	Departure Time	Arrival Time
SQ111	Singapore (SIN)	Sydney (SYD)	06:30	10:45