Q1 Notes
0 Points

Academic Honesty

It is a violation of the Academic Integrity Code to look at any reference material other than your textbook and lecture notes, or to give inappropriate help to someone or to receive unauthorized aid by someone in person or electronically via messaging apps such as WhatsApp. Academic Integrity is expected of all students of Hacettepe University at all times, whether in the presence or absence of members of the faculty. Do NOT sign nor take this exam if you do not agree with the honor code.

Moreover, each student is expected to turn on their camera on the related zoom session during the final exam.

Understanding this, I declare I shall not give, use or receive unauthorized aid in this examination and turn on my camera during the exam.

Signature (Specify your name and surname as your signature)

Mehmet Taha USTA MTUSTA

Notes about the exam

- If you think there is an error in the questions, please write `Error` in the provided space for the answer.
- While writing a list in the provided space, you should not use white space between items. A proper answer should be like this: `[1,2,3]` If you do not obey this specification, you won't have full credits.

Q2 Dictionaries
5 Points

Consider the following code.

```python
d = {}
l = 'bc ab cd ab bc ed bc cd ed bc cd'.split()
for i in range(len(l)-1):
    if l[i+1] in d:
        d[l[i+1]].append(l[i])
    else:
        d[l[i+1]] = [ l[i] ]
```

After executing the above, which one of the following expressions evaluates to **cd**?

○ `d['ab'][0]`

○ `d['bc'][1]`

○ `d['cd'][2]`

◉ `d['ed'][1]`

Q3 Recursion
4 Points

Which of the following functions demonstrate linear recursion?

○

Function A

```python
def rec_f(x, y):
    if x < 0 or y < 0:
        return False
    elif rec_f(x-1, y):
        return rec_f(x, y-1)
    return True
```

○

Function B

```python
def rec_f(x):
    if x == 1:
        return
    elif x % 2 == 0:
        return rec_f(x / 2)
```

```
        else:
            return rec_f(3*x + 1)
```

○

Function C

```
def rec_f(x, y):
    if x == 0:
        return y+1
    elif y == 0:
        return rec_f(x-1, 1)
    else:
        return rec_f(x-1, rec_f(x, y-1))
```

○

Function D

```
def rec_f(x):
    if x <= 1:
        return 1
    else:
        return x * rec_f(x-1) * rec_f(x-2)
```

○ Function A

⦿ Function B

○ Function C

○ Function D

Q4 Recursion
5 Points

We are trying to implement a function named foo which prints out all permutations of the elements in a given array arr. For instance, when this function is called with the array $[1,2,3]$, the output would include $(1,2,3),(1,3,2),(2,1,3),(2,3,1),$ $(3,1,2),$ and $(3,2,1)$ although the order of these could be different.

Consider the following incomplete function definition.

```python
def foo(arr, cur=()):
    if len(arr)==0:
        print(cur)
    else:

        _____
```

Which one of the followings should be included to the missing blank so that the function works correctly.

○

Choice a

```python
foo(arr[1:], (arr[0],) + cur)
```

○

Choice b

```python
foo(arr[1:], cur + (arr[0],))
foo(arr[1:], cur)
```

○

Choice c

```python
for i in range(len(arr)):
    foo(arr[:i] + arr[i+1:], cur + (arr[i],))
```

○

Choice d

```python
for i in range(1, len(arr)):
    foo(arr[i:], cur + (arr[i],))
```

○ Choice a

○ Choice b

◉ Choice c

○ Choice d

Q5 Fill in the blanks
8 Points

We are trying to implement a function named `bar` which checks whether a given list of integers is a Fibonacci sequence or not. For instance, `bar([1, 1, 2, 3, 5])` and `bar([1, 1, 2, 3, 5, 8, 13])` should all return `True`. However, `bar([5, 8, 13])`, `bar([2, 2, 2])` and `bar([])` should all return `False`.

Consider the following incomplete function definition.

```
def bar(lst):
    if len(lst) == 0:
        return True
    if ___(1)___:
        return lst == [1]
    if len(lst) == 2:
        return ___(2)___
    return ___(3)___
```

Complete the function by filling in the blank spaces.

(2 pts) What should be written to blank #1?

> len(lst) == 1

(2 pts) What should be written to blank #2?

> lst[0] == 1 and lst[1] == 1

(4 pts) What should be written to blank #3?

> bar(lst[:-1])

Q6 Complexity
4 Points

Based on input size n, which of the following functions has the best asymptotic runtime complexity relative to the others?

○ $4n^2$

◉ $4000n + 65$

○ $5n^3 + 2000n$

○ $2^n - \log n + 20$

Q7 Classes
6 Points

Consider the following code.

```python
class A:
    def B(self, value):
        self.C = value

f = A()
```

After executing the above, which of the following is equivalent to the expression `f.B(10)`?

○ `A.B(self, 10)`

◉ `A.B(f, 10)`

○ `self.bar(f,10)`

○ None of the above

Q8 Classes
8 Points

Consider the following Python program.

```python
class A():
    x=1

    def __init__(self, n):
        self.y = n
        A.x += 2

class B(A):
    x = 5
    y = 3

    def __init__(self,n):
        sum=n
        super().__init__(n)
        sum+=self.y+self.x
        self.y=sum

a=A(__(1)__)
b=B(__(2)__)
```
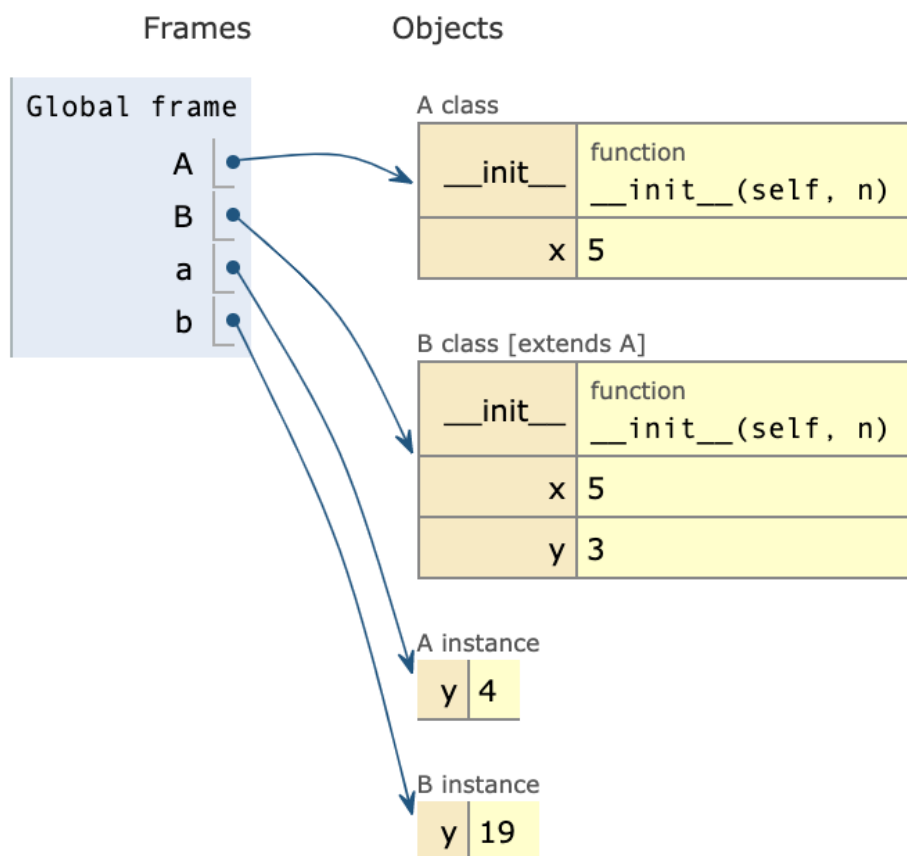
Suppose that after executing the above, the global frame looks like the following:

Please answer the following questions to reach out this result.

Q8.1

4 Points

What should be written to blank #1?

> 4

Q8.2

4 Points

What should be written to blank #2?

> 7

Final Exam - Part 2

● **GRADED**

STUDENT
MEHMET TAHA USTA

TOTAL POINTS
32 / 40 pts

QUESTION 1
Notes   **0** / 0 pts

QUESTION 2
Dictionaries   **5** / 5 pts

QUESTION 3
Recursion   **4** / 4 pts

QUESTION 4
Recursion   **5** / 5 pts

QUESTION 5
Fill in the blanks   **0** / 8 pts

QUESTION 6

Complexity **4** / 4 pts

QUESTION 7

Classes **6** / 6 pts

QUESTION 8

Classes **8** / 8 pts

8.1 (no title) **4** / 4 pts

8.2 (no title) **4** / 4 pts