THE UNIVERSITY OF QUEENSLAND
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This exam paper must not be removed from the venue

Venue _____
Seat Number _____
Student Number |__|__|__|__|__|__|__|__|
Family Name _____
First Name _____

School of Electrical Engineering & Computer Science
Semester Two Examinations, 2024
CSSE1001 Introduction to Software Engineering

This paper is for St Lucia Campus students.

Examination Duration: 120 minutes

Planning Time: 10 minutes

Exam Conditions:

•No written or printed material permitted
•Casio FX82 series or UQ approved and labelled calculator only
•During Planning Time - Students are encouraged to review and plan responses to the exam questions

Materials Permitted in the Exam Venue:
(No electronic aids are permitted e.g. laptops, phones)

None

Materials to be supplied to Students:
Additional exam materials (e.g. answer booklets, rough paper) will be provided upon request.

1 x Gradescope Bubble Sheet

Instructions to Students:
If you believe there is missing or incorrect information impacting your ability to answer any question, please state this when writing your answer.

Indicate your answer to the multiple choice questions on the GradeScope bubble sheet.
Answer questions 31 to 36 in the spaces provided.

For Examiner Use Only

Question	Mark

Total _____

`Error` is the correct answer for any question with code that throws an error of any kind.

Multiple Choice

Question 1. [1 MARK]

What does the following arithmetic expression evaluate to in Python?

```
18 // 4 % 3
```

A. `1.5`
B. `1`
C. `18`
D. `18.0`
E. None of the above

Question 2. [1 MARK]

What is stored in x when only the following is executed by Python ?

```
x = len("\n\t23\t\n")
```

A. `10`
B. `6`
C. `2`
D. It depends on the number of spaces in a tab.
E. None of the above

Question 3. [1 MARK]

After starting up the Python interpreter, the following code (and only the following code) is entered.

```
if True or x:
    x = 1
else:
    x = 0
```

What error, if any, does this code raise?

A. `TypeError`
B. `ValueError`
C. `NameError`
D. `SyntaxError`
E. This is valid Python code.

Question 4. [1 MARK]

What is the value stored in the variable x after only the following code is run?

```
x = "HelloWorld!"
y = x
y[3] = 'p'
x[-1] = ':'
```

A. `"HelloWorld:"`
B. `"HeploWorld:"`
C. `"HelpoWorld:"`
D. `Error`
E. None of the above.

Question 5. [1 MARK]

What is stored in y after only the following is entered into Python?

```
y = ':'.join('hands \t many'.split('\t'))
```

A. `hands:many`
B. `hands : many`
C. `hands: many`
D. `Error`
E. None of the above

Question 6. [1 MARK]

What is stored in x after only the following code is executed?

```
def foo(xs: list[int], y: int) -> int:
    if len(xs) == 0:
        return 0
    if xs[0] == y:
        return 1 + foo(xs[1:], y)
    return foo(xs[1:], y)

x = foo([1, 3, 3], 3)
```

A. `0`
B. `1`
C. `2`
D. `Error`
E. None of the above

Question 7. [1 MARK]

Given the following code:

```
x = input("Prompt: ")
y = input("Prompt: ")
print(f"x + y = {int(x + y)}")
```

If the user types 5 at the first prompt then 2 at the second prompt, what is printed?

A. `x + y = 7`
B. `x + y = '7'`
C. `x + y = 52`
D. `x + y = '52'`
E. `Error`

Question 8. [1 MARK]

What is stored in `y` after only the following code is executed?

```
1 def g(x, z):
2     x.append(z)
3     return x
4
5 y = ['a', 'b']
6 g(y, 'c').append(g(y.copy(), 'c'))
```

A. `['a', 'b', 'c']`
B. `['a', 'b', 'c', 'c']`
C. `['a', 'b', 'c', 'a', 'b', 'c']`
D. `['a', 'b', 'c', ['a', 'b', 'c', 'c']]`
E. `Error`

Question 9. [1 MARK]

Suppose some code has been styled in accordance with the style guide used in this course. What can be deduced about the name `FooBar`?

`FooBar` is a ...

A. class name
B. instance of a class
C. constant variable
D. method
E. None of the above

Question 10. [1 MARK]

What will be stored in `x` after only the following code has been executed?

```
1 a = "h"
2 if a == "a" or "e" or "i" or "o" or "u":
3     x = "vowel"
4 else:
5     x = "not vowel"
```

A. `"vowel"`
B. `"not vowel"`
C. `x` may be undefined
D. `Error`
E. None of the above

Question 11. [1 MARK]

What is the value of x after only the following has been evaluated?

```
x = "Hello Hello".find("Hello")
```

Given that:

```
S.find(sub[, start[, end]]) -> int

    Return the lowest index in S where substring sub is found,
    such that sub is contained within S[start:end].  Optional
    arguments start and end are interpreted as in slice notation.

    Return -1 on failure.
```

A. `0`
B. `6`
C. `-1`
D. `None`
E. `ValueError`

Question 12. [1 MARK]

What exception should be used at `<Error>` to complete the function according to its specification?

```
def get_element(xs: list[int], index: int) -> int:
    """
    Retrieves the element at the provided index in the list.
    Continues prompting the user until a valid index is entered.
    """
    try:
        return xs[index]
    except <Error>:
        return get_element(xs, int(input("Enter a valid index: ")))
```

A. `TypeError`
B. `NameError`
C. `IndexError`
D. `KeyError`
E. `ValueError`

Question 13. [1 MARK]

What is the value of `b` after the following code is executed?

```
def f(x):
    a = 5
    x = x / a
    return a+x

a = 10
b = f(a)
```

A. `7`
B. `7.0`
C. `15.0`
D. `15`
E. Error

Question 14. [1 MARK]

What replaces `#sub1` and `#sub2` in the following code to ensure that `button` displays when the code is run and the text `Clicked!` is printed each time the button is pressed? Note that `Error` is not a valid answer for this question; if any option would cause an error to occur, it is not the correct answer.

```
import tkinter as tk

def foo():
    print("Clicked!")

window = tk.Tk()
button = tk.Button(window, text="Click Me!", #sub1)
#sub2

window.mainloop()
```

A. `#sub1`: `command=foo()` and `#sub2`: `button.pack()`
B. `#sub1`: `command=foo` and `#sub2`: `button.display()`
C. `#sub1`: `command=foo` and `#sub2`: `button.pack()`
D. `#sub1`: `command=foo()` and `#sub2`: `button.display()`
E. None of the above.

Question 15. [1 MARK]

What is the value of y after the following statements are evaluated?

```
x = ['hello', 'HELLO', 'world', 'WORLD']
y = x[-1][-5]
```

A. `'d'`
B. `'D'`
C. `'w'`
D. `'W'`
E. Error

Question 16. [1 MARK]

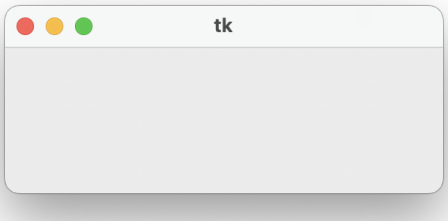
What is the value of x after only the following code is executed?

```
def foo(num1: int, num2: int):
    if num1 == 0:
        return num1 * num2
    print(num2)

x = foo(3, 4.0)
```

A. `12`
B. `4.0`
C. `12.0`
D. `None`
E. Error

Question 17. [1 MARK]



What line of code should replace `#sub` in order to generate the window illustrated above? Note that `Error` is not a valid answer for this question; if any option would cause an error to occur, it is not the correct answer.

```
import tkinter as tk
root = tk.Tk()
#sub
root.mainloop()
```

A. `root.geometry("300x100")`
B. `root.geometry(300x100)`
C. `root.geometry("100x300")`
D. `root.geometry(100x300)`
E. None of the above

Question 18. [1 MARK]

Consider an instance attribute named `self._name`, declared in the `__init__` method of a class. According to the style guide followed in this course, what can be said about `self._name`?

A. It should store the name of the class as a string.
B. It should not be accessed or modified directly outside the defining class.
C. It can store a mutable object but should never be mutated.
D. More than one of the above.
E. None of the above.

Question 19. [1 MARK]

What is stored in x after only the following is entered into Python?

```
x = (1, 2) + (2, 3)
```

A. `(1, 2, 3)`
B. `(3, 5)`
C. `(1, 2, 2, 3)`
D. `[(1, 2), (2, 3)]`
E. Error

Question 20. [1 MARK]

What error (if any) will the following code produce when executed by Python?

```
def concatenate(xs: list[int], ys: list[int]) -> list[int]:
    return xs + ys

concatenate(' ', '2a')
```

A. `SyntaxError`
B. `TypeError`
C. `NameError`
D. `ValueError`
E. This is valid Python code.

Question 21. [1 MARK]

What is the value of `ys` after only the following has been evaluated?

```
z = lambda x: x ** 2
xs = [3, 4, 5, 6]
ys = [z(x) for x in xs if x < 5]
```

A. `[3, 4, 5]`
B. `[9, 16, 25]`
C. `[3, 4]`
D. `[9, 16]`
E. Error

Question 22. [1 MARK]

What is the value of x after running the following code?

```
cs = 'abc'
for i, char in enumerate(cs):
    x = i * char
```

A. `'abc'`
B. `'abbccc'`
C. `'bcc'`
D. `'cc'`
E. `Error`

Question 23. [1 MARK]

After the assignment `s1 = "Hello World"` which of the following statements assigns `"o W"` to `s2`?

A. `s2 = s1[4:7]`
B. `s2 = s1[4:-4]`
C. `s2 = s1[-7:-4]`
D. All of the above
E. None of the above

Question 24. [1 MARK]

Consider the following assignments.

```
xss = ['abcdef', 'ABCDEF', 'ghijkl']
yss = ['def', 'DEF']
```

How many of the following expressions are equivalent to `yss`?

```
[xs[-3:] for xs in xss[0:2]]
[xs[3:] for xs in xss[0:-1]]
[xs[-3:] for xs in xss[-3:-1]]
[xs[3:] for xs in xss[-3:2]]
```

A. `0`
B. `1`
C. `2`
D. `3`
E. `4`

Question 25. [1 MARK]

How many stars (*) are in `output.txt` after calling `foo` without generating an `error`?

```
1 def foo() -> None:
2     xs = ['*', '**', '***']
3     for x in xs:
4         with open("output.txt", "w") as f:
5             f.write(2*x)
6     return
```

A. `0`
B. `3`
C. `6`
D. `12`
E. Impossible to deduce without knowing the initial contents of `output.txt`.

Question 26. [1 MARK]

What is stored in `y` after only the following code is executed.

```
1 def foo(xs: list[str]) -> list[str]:
2     if xs:
3         xs.append(" ")
4         return xs
5     return []
6
7 y = foo([""])
```

A. `["", " "]`
B. `[" "]`
C. `[""]`
D. `[]`
E. `Error`

Question 27. [1 MARK]

What is the best description of the behaviour of the following function?

```
1 def bar(d1: dict, d2: dict) -> bool:
2         for x in d1:
3               if x not in d2 or d1[x] != d2[x]:
4                     return False
5         return True
6
```

A. bar only returns `True` when all keys in `d2` exist in `d1` and `False` otherwise.
B. bar only returns `True` when all key-value pairs in `d1` exist in `d2` and `False` otherwise.
C. bar always returns `False`.
D. bar always returns `True`.
E. bar always throws errors

Question 28. [1 MARK]

What is the value of `xs` after running the following code?

```
1 xs = [['12'], {1: '1'}]
2 xs[1] = {xs[0] : '2'}
```

A. `[['12'], {['12']: '2'}]`
B. `[['12'], {['1']: '2'}]`
C. `[['12'],{'12': '2'}`
D. `Error`
E. None of the above.

Question 29. [1 MARK]

What is the value of `y` after running the following code?

```
1 xs = 'hello'
2 y = (xs[0])[0]
```

A. `'hello'`
B. `'h'`
C. `''`
D. `Error`
E. None of the above

Question 30. [1 MARK]

Which statement is false?

A. Type-hints are not enforced by Python.
B. Python prohibits the user from changing constant variables.
C. Functions can be defined inside of functions.
D. Every for loop can be written as a while loop
E. None of the above

The following will be used to match your exam with your name. Please use BLOCK LETTERS and write as legibly as possible.

Student Number

Family Name

Given Name

Fill in the Blank

The next five questions refer to the following class definitions.

```
class A(object) :
    def __init__(self, x) :
        self._x = 2*x

    def f(self, x) :
        return x + self._x

    def g(self, x) :
        return 2 * self.f(x) - x

class B(A) :
    def f(self, x) :
        return self._x - x

class C(B) :
    def __init__(self, x, y) :
        super().__init__(x)
        self._y = y + 2

class D(B) :
    def __init__(self, x, y) :
        super().__init__(x)
        self._x += 2*y
        self._y = self._x + y

    def f(self, x) :
        return self._y + x

    def g(self, x) :
        return super().g(x) - x

a = A(1)
b = B(2)
c = C(1, 1)
d = D(2, 1)
```

Question 31. [1 MARK]

What does `a.f(2)` return?

Question 32. [1 MARK]

What does `b.g(1)` return?

Question 33. [1 MARK]

What does `c.f(3)` return?

Question 34. [1 MARK]

What does `d.f(3)` return?

Question 35. [1 MARK]

What does `d.g(1)` return?

Full solution

Question 36. [5 MARKS]

Implement the following function according to its specification. Do not include a docstring.

```
def remove_adjacent_pairs(cs: str) -> str:
    """ Given a string cs, return the string obtained after removing all adjacent
    pairs of duplicate characters from cs. This process should be repeated until no
    adjacent duplicate pairs remain.

    Parameters:
        cs: A string that needs to be processed.

    Returns:
        A modified version of cs where all adjacent pairs of duplicate characters
        have been removed.

    Examples:
    >>> remove_adjacent_pairs("abbaca")
    'ca'
    >>> # The above occurs because "abbaca" -> "aaca" -> "ca".

    >>> remove_adjacent_pairs("aaac")
    'ac'

    >>> remove_adjacent_pairs("azxxzy")
    'ay'
    >>> # The above occurs because "azxxzy" -> "azzy" -> "ay".

    >>> remove_adjacent_pairs("aabbcc")
    ''
    """
```

Write your answer on the next page.

Write your answer on the next page.

Write your answer on the next page.

Write your answer here:

END OF EXAMINATION