Desk Number   _____

Student Number   _____

Student Name   _____

School of Science and Engineering

FINAL EXAMINATION

December 18, 2022

CSC1001 Introduction to Computer Science

Examination Duration: 120 minutes

Reading Time: 10 minutes

This examination has __3__ questions.

Exam Conditions:

This is a FORMAL Examination

This is a RESTRICTED OPEN BOOK Exam.   Maximum of one (1) sheet of handwritten notes double sided are permitted

Materials Permitted In The Exam Venue:

Maximum of one (1) sheet of handwritten notes double sided are permitted. **NO OTHER MATERIALS PERMITTED**

Any calculators without the functionalities of programming and file storage are permitted.

Materials To Be Supplied To Students:

1 × 12 Page Answer Booklet

Question 1. (15 × 2% = 30%)

Pick the correct option in each of the following sub-questions. Note that only ONE option is correct.

1. Hexadecimal number 2DF8.3 and binary number 10111100.101 equal to decimal numbers:

   B (handwritten)

   A. 11768.1875 and 188.125   B. 11768.1875 and 188.625

   C. 12518.6875 and 172.125   D. 12518.6875 and 172.625

2. What is printed by the following statements?

   A (handwritten)

   ```
   1.  s = "python rocks"
   2.  print(s[1] * s.index("n"))
   ```
   A. yyyyy   B. 55555   C. y5   D. TypeError

3. What keyword do you use to specify code to execute if there is an error when the body of the "try" executes?

   B (handwritten)

   A. catch   B. except   C. exception   D.error

4. What is printed when the following code is run?

   D (handwritten)

   ```
   1.  a = (1, 2, 3, 4)
   2.  print(a[1:-1])
   ```
   A. Error, tuple slicing doesn't exist   B. [2,3,4]   C. (2,3,4)   D. (2,3)

5. Which of the following can be used to open a file called "myText.txt" in write-only mode?

   C (handwritten)

   A. outfile = open("myText.txt", w)

   B. outfile = open("myText.txt", "write")

   C. outfile = open("myText.txt", "w")

   D. outfile = open("myText.txt")

6. Which of the following does not correctly create an object instance?

   D (handwritten)

   A. puppy = Dog("Jamie")   B. dog = Dog("Jamie")

   C. jamie = Dog()   D. pupper = new Dog("Jamie")

7. Concerning the class and object in Python, which of the following statements is correct?

   D (handwritten)

   A. The IDs of two objects are the same if all attributes of them are equal.

   B. We can change the ID of an object while the program is running.

   C. Objects created from a same class will always contain identical data fields.

   D. A class is a contract, also sometimes called a template or blueprint.

8. Which of the following statements is incorrect about the following code?

```
1.  class People():
2.    def __init__(self, name):
3.      self.name = name
4.    def namePrint(self):
5.      print(self.name)
6.  person1 = People("Sally")
7.  person2 = People("Louise")
8.  person1.namePrint()
```

A. person1 and person2 are two different instances of the People class.

B. The __init__ method is used to set initial values for data fields.

C. 'self' can be removed from def namePrint(self):

D. person2 has a different value for 'name' from person1.

9. Given the below code, what would be printed (ignore newlines and spacing between sentences)?

```
1.  class Person:
2.      def work(self):
3.          print("A person can work.")
4.
5.      def food(self):
6.          print("A person eats food.")
7.
8.  class Employee(Person):
9.      def work(self):
10.         print("An employee works.")
11.
12. p1 = Person()
13. p2 = Employee()
14. p1.work()
15. p2.work()
16. p1.food()
17. p2.food()
```

A. A person can work. An employee works. A person eats food. A person eats food.

B. A person can work. A person can work. An employee works. A person eats food.

C. A person can work. An employee works. A person eats food.

D. A person can work. A person can work. An employee works. A person eats food. A person eats food.

10. How can we call a method 'method()' in a parent class?

A. parent().method()

B. super().method()

C. parent.method()

D. super.method()

11. Which statement about inheritance is incorrect?

C

   A. Inheritance is a key idea of Object-oriented programming (OOP).

   B. The child class is also called a subclass or a derived class.

   C. Private members of a class can be inherited.

   D. We can define new class attributes in a subclass.

12. Which of the following can be done with LinkedList?

   A. Implementation of Stacks and Queues.

   B. Implementation of Binary Trees.

   C. Implementation of Data Structures that can store a list of objects.

   D. All of the above.
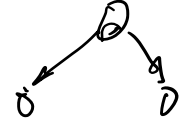
13. What is the information, which a LinkedList's Node must store?

C

   A. The address of the next node if it exists.

   B. The value of the current node.

   C. Both (A) and (B).

   D. None of the above.

14. What is the time complexity of the binary search algorithm?

C

   A. O(n)   B. O(1)   C. O(log n)   D. O(n^2)

15. What is the time complexity of the following code?

```
1.  def solve():
2.      s = "scaler"
3.      n = len(s)
4.      for i in range(n):
5.          s = s + s[i]
6.      print(s)
```

   A. O(n)   B. O(n^2)   C. O(1)   D. O(log n)

Question 2. (10 × 4% = 40%)

Pick the correct option/s in each of the following sub-questions. Note that there may be MULTIPLE correct options for each sub-question.

16. Which of the following is/are the python reserved word?

AC

   A. not   B. self   C. True   D. false

17. Given the code below, which of the following statements is/are true?

AD

```
1.  class Rectangle:
2.      def __init__(self, e1, e2, e3):
3.          self.e1 = e1
4.          self.e2 = e2
5.          self.e3 = e3
6.          self.area = None
7.      def _cal_area(self):
8.          self.area = self.e ** 2 * 3 ** 0.5
9.  class Equilateral_Rectangle(Rectangle):
10.     def __init__(self, e):
11.         self.e = e
12.         super().__init__(e, e, e)
13.     def _cal_area(self):
14.         self.area = self.e ** 2 * 3 ** 0.5 / 4
15. rect = Equilateral_Rectangle(3**0.25)
16. rect._cal_area()
17. print(rect.area)
```

A. e is an attribute of the object "rect".

~~B.~~ e1 is not an attribute of the object "rect".

C. The output of the print() is about 3 (maybe 2.999999… since it's float type).

D. The output of the print() is about 0.75 (maybe 0.749999… since it's float type).

18. Given the following code snippet, which of the statement(s) is/are correct?

BC

```
1.  class Dog:
2.      def __init__(self, name, age):
3.          self.name = name
4.          self.age = age
5.  class JackRussellTerrier(Dog):
6.      pass
7.  class Dachshund(Dog):
8.      pass
9.  class Bulldog(Dog):
10.     pass
11. miles = JackRussellTerrier("Miles", 4)
12. buddy = Dachshund("Buddy", 9)
13. jack = Bulldog("Jack", 3)
14. jim = Bulldog("Jim", 5)
```

A.

>>> isinstance(miles, Dog)

False

B.

>>> isinstance(jack, Dachshund)

False

C.

>>> isinstance(miles, Bulldog)

False

D.

>>> isinstance(jack, Dog)

False

19. Which of the following statements is wrong about the class and inheritance?

AB

A. The __str__() method is a private method which returns a string description for the object.

B. Private members of a class can be inherited and accessed.

C. The inheriting class is called a subclass.

D. Inheritance is one of the features of OOP.

20. Concerning the following two programs, which of the following statement/s is/are correct?

ACD

```
1.  class Animal:
2.      def getInfo(self):
3.          return "Animal"
4.      def print(self):
5.          print(self.getInfo())
6.  class Dog(Animal):
7.      def getInfo(self):
8.          return "Dog"
9.  Animal().print()
10. Dog().print()
```

```
1.  class Animal:
2.      def __getInfo(self):
3.          return "Animal"
4.      def print(self):
5.          print(self.__getInfo())
6.  class Dog(Animal):
7.      def __getInfo(self):
8.          return "Dog"
9.  Animal().print()
10. Dog().print()
```

A. The output of the first program is:

    Animal

    Dog

B. The output of the second program is:

    Animal

    Dog

C. In the first program, the getInfo() method will be overridden in class Dog().

D. In the second program, the __getInfo() method will not be overridden in class Dog().

21. Which of the following data structure has a sequential structure?

BCD

A. Strings   B. Lists   C. Trees   D. Queues

22. Assume that the elements 1, 3, 5, 7, and 9 are pushed onto the stack in sequence. If the first popped element is 4, the last popped element could be:

A

A. 1   B. 3   C. 5   D. 9

23. Concerning Stack and Queue, which of the following statement(s) is/are correct?

AC B

A. Data are saved sequentially in a stack.

B. We can sometimes get the element in the bottom of a stack directly.

C. A queue can be implemented not based on a list.

D. Data can always be inserted at the head of a queue directly.

24. Which of the following statement(s) is/are correct?

~~A.~~ Calculating the factorial can only be done by using a recursive algorithm.

B. A recursive algorithm can have more than one base case that is non-recursive.

C. The base case in a recursive algorithm must return something.

D. We can move all elements from a stack to a queue by using the recursion.

[handwritten: B D]

25. Which of the following statement(s) is/are correct?

A. In a binary tree, each node must have at least one child node.

B. In a binary tree, a node can have single child node.

C. A binary tree must have at least one node with two child nodes.

D. In a binary tree, a node can have at most two child nodes.

[handwritten: B D]

Question 3. (6%+7%+8%+9%=30%)

Answer the following questions.

26. Concerning the following program:

```python
1.  def insertion(lst):
2.      for i in range(0, len(lst) - 1):
3.          j = i
4.          temp = lst[i + 1]
5.          while lst[j] < temp and j >= 0:
6.              lst[j + 1] = lst[j]
7.              j = j - 1
8.          lst[j + 1] = temp
9.      return L
10. L = [3, 5, 2, 1, 6, 4, 9, 8]
11. insertion(L)
12. print(L)
```

Answer the following questions

(1) What is the output of this program? (3') *[handwritten: $L = [9, 8, 6, 5, 4, 3, 2, 1]$]*

(2) What is the time complexity of this program? Prove it briefly. (2'+1')

27. Concerning the following programming, which aims to sort a given list by using
Bubble Sort algorithm. Please fill in the blanks in the code. Note that in one blank
location, only one line of code should be filled. You cannot use ";" to combine several
lines of code to make them in one line. (1' * 7)

[handwritten above: $O(n^2)$]

```python
1.  def bubble(lst):
2.      lst_len = # 1. ___len(lst)___ code
3.      while lst_len > 0:
4.          for i in range(# 2. ___lst_len-1:1:-1___ ):
5.              if # 3. ___lst[i] > lst[i-1]___
6.                  # 4. ___c = lst[i]___
7.                  # 5. ___lst[i] = lst[i-1]___
8.                  # 6. ___lst[i-1] = c___
9.              # 7. ___lst_len = lst_len-1___
10.     return lst
11. L = [3, 5, 6, 2, 1, 7, 9, 8, 4]
12. print(bubble(L))
```

28. Given a non-negative integer n, write two programs to calculate the nth element (counting from 0) of a Fibonacci list [1, 1, 2, 3, 5, 8, …], using recursive and non-recursive, respectively. (8')

(1) Recursive program: *def F(n):*

F[n] = F[n-1] + [n-2]

(s) Non-recursive program: (4')

29. Concerning the following code snippet, answer the questions.

```
1.  class Tree:
2.      def __init__(self):
3.          self.element = None
4.          self.left = None
5.          self.right = None
6.
7.  def Search(t):
8.      if t:
9.          print(t.element)
10.     if (t.left is None) and (t.right is None):
11.         return
12.     else:
13.         if t.right is not None:
14.             Search(t.right)
15.         if t.left is not None:
16.             Search(t.left)
```

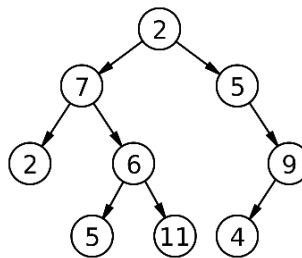(1) What does this code snippet aim to do? (3')

DFS all element in the tree from right to left

(2) What is the time complexity of the Search() function? (3')

O(n)

(3) If the input t refers to the root of the following tree, what would be the outputs of Search()? (3')

2, 5, 9, 4,
7, 6, 11, 5, 2

END OF EXAMINATION