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Family Name _____________________

First Name _____________________

## School of Information Technology and Electrical Engineering

## EXAMINATION

Semester One Final Examinations, 2016

# CSSE7030 Introduction to Software Engineering I

*This paper is for St Lucia Campus students.*

| | |
|---|---|
| Examination Duration: | 120 minutes |
| Reading Time: | 10 minutes |

**Exam Conditions:**

This is a Central Examination

This is a Closed Book Examination - specified materials permitted

During reading time - write only on the rough paper provided

This examination paper will be released to the Library

**Materials Permitted In The Exam Venue:**

**(No electronic aids are permitted e.g. laptops, phones)**

Any unmarked paper dictionary is permitted

Calculators - No calculators permitted

**Materials To Be Supplied To Students:**

1 x Multiple Choice Answer Sheet

**Instructions To Students:**

**Additional exam materials (eg. answer booklets, rough paper) will be provided upon request.**

Answer all questions on the supplied Multiple Choice / True False Answer Sheet. Each question is worth one mark. Total marks: 40

**For Examiner Use Only**

| Question | Mark |
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Total ________

**In all questions, please choose the most appropriate answer if it appears that more than one match. All questions relate to the Python 3 programming language. If an evaluation produces an error of any kind then choose Error as your answer. Different questions can have different numbers of choices. Each question is worth one mark.**

1. What does the expression `2.0 + 11//2` evaluate to?

   (a) 6.5
   (b) 7.0
   (c) 7.5
   (d) 7
   (e) Error

2. What does the expression `2 * ['1', '3']` evaluate to?

   (a) `[2, 6]`
   (b) `['2', '6']`
   (c) `['1', '1', '3', '3']`
   (d) `['1', '3', '1', '3']`
   (e) Error

3. What does the expression `'2' + ['1', '3']` evaluate to?

   (a) `[3, 5]`
   (b) `['3', '5']`
   (c) `['21', '23']`
   (d) `['2', '1', '3']`
   (e) Error

4. What does the expression `list('2') + ['1', '3']` evaluate to?

   (a) `[3, 5]`
   (b) `['3', '5']`
   (c) `['21', '23']`
   (d) `['2', '1', '3']`
   (e) Error

5. After the assignment `x = 'Very Naughty Boy'`, which of the following assigns `'N'` to the variable `y`?

   (a) `y = x[-10]`
   (b) `y = x[-11]`
   (c) `y = x[-12]`
   (d) `y = x[6]`
   (e) More than one of the above is correct.

6. After the assignment `x = 'Very Naughty Boy'`, which of the following assigns `'augh'` to the variable `y`?

   (a) `y = x[5:8]`
   (b) `y = x[5:9]`
   (c) `y = x[6:9]`
   (d) `y = x[6:10]`
   (e) None of the above are correct.

7. After the assignment `x = 'Very Naughty Boy'`, which of the following assigns `'ght'` to the variable `y`?

   (a) `y = x[-8:-5]`
   (b) `y = x[-8:-4]`
   (c) `y = x[-7:-5]`
   (d) `y = x[-7:-4]`
   (e) None of the above are correct.

8. After the assignment `x = 'Very Naughty Boy'`, which of the following assigns `'uaN'` to the variable `y`?

   (a) `y = x[-9:-12:-1]`
   (b) `y = x[4:6:-1]`
   (c) `y = x[6:4:-1]`
   (d) `y = x[4:6:1]`
   (e) More than one of the above is correct.

The next 2 questions refer to the following definition.

```
def g(x, z):
    x = x + [z]
    return x
```

9. What is the value of `y` after the following is evaluated?

   ```
   y = [1, 2, 3]
   y.extend(g(y, 4))
   ```

   (a) `[1, 2, 3, 4]`

   (b) `[1, 2, 3, 4, 4]`

   (c) `[1, 2, 3, 1, 2, 3, 4]`

   (d) `[1, 2, 3, 4, 1, 2, 3, 4]`

   (e) `[1, 2, 3, 4, 1, 2, 3, 4, 4]`

10. What is the value of `y` after the following is evaluated?

    ```
    y = [1, 2, 3]
    y.extend(g(list(y), 4))
    ```

    (a) `[1, 2, 3, 4]`

    (b) `[1, 2, 3, 4, 4]`

    (c) `[1, 2, 3, 1, 2, 3, 4]`

    (d) `[1, 2, 3, 4, 1, 2, 3, 4]`

    (e) `[1, 2, 3, 4, 1, 2, 3, 4, 4]`

11. After the assignment `x = ’a\t\tb\tc\td\t\n’`, what does the expression `x.strip().split()` evaluate to?

    (a) `[’a’, ’’, ’b’, ’c’, ’d’, ’’]`
    (b) `[’a’, ’’, ’b’, ’c’, ’d’, ’\n’]`
    (c) `[’a’, ’b’, ’c’, ’d’]`
    (d) `[’a’, ’b’, ’c’, ’d’, ’’]`
    (e) `[’a’, ’b’, ’c’, ’d’, ’\n’]`

12. What is the value of `y` after the following is evaluated?

```
d = {’id_1’: {’type’:’animal’,  ’name’:’Wallaby’,
              ’pos’:[[[100,200], 1460245992.4755974]],
              ’id’:’id_1’, ’gender’:’female’, ’tracker_id’:’1234’},
     ’id_2’: {’type’:’plant’, ’id’:’id_2’, ’pos’:[150,500], ’name’:’Blackbutt’}}

y = d.get(’id_1’, {}).get(’tracker_id’, ’’)
```

    (a) `None`
    (b) `{}`
    (c) `’’`
    (d) `’1234’`
    (e) Error

13. What is the value of `y` after the following is evaluated?

```
d = {’id_1’: {’type’:’animal’,  ’name’:’Wallaby’,
              ’pos’:[[[100,200], 1460245992.4755974]],
              ’id’:’id_1’, ’gender’:’female’, ’tracker_id’:’1234’},
     ’id_2’: {’type’:’plant’, ’id’:’id_2’, ’pos’:[150,500], ’name’:’Blackbutt’}}

y = d.get(’id_2’, {}).get(’tracker_id’, ’’)
```

    (a) `None`
    (b) `{}`
    (c) `’’`
    (d) `’1234’`
    (e) Error

The next 3 questions refer to the following definition.

```
def md(x,y):
    a, b = x // y, x % y
    return (a,b)
```

14. What is the value of `n` after the following is evaluated?

    ```
    n = md(md(20,3))
    ```

    (a) `(0, 0)`
    (b) `(3, 0)`
    (c) `(3, 1)`
    (d) `(6, 2)`
    (e) Error

15. What is the value of `n` after the following is evaluated?

    ```
    m1,m2 = md(3,20)
    n = md(m1, m2)
    ```

    (a) `(0, 0)`
    (b) `(3, 0)`
    (c) `(3, 1)`
    (d) `(6, 2)`
    (e) Error

16. What is the value of `n` after the following is evaluated?

    ```
    m1, m2 = md((3,20))
    n = md((m1, m2))
    ```

    (a) `(0, 0)`
    (b) `(3, 0)`
    (c) `(3, 1)`
    (d) `(6, 2)`
    (e) Error

The next 4 questions refer to the following definition.

```
def fd(xs, n, m):
    s = xs[n]
    n += 1
    r = []
    while n < m:
        if xs[n] != s:
            r.append((s, xs[n]))
            s = xs[n]
        n += 1
    return r
```

17. What is the value of x after the following is evaluated?

```
x = fd('ATAA__TT', 0, 8)
```

   (a) `[]`
   (b) `[('A', 'A'), ('_', '_'), ('T', 'T')]`
   (c) `[('A', 'T'), ('T', 'A'), ('A', '_'), ('_', 'T')]`
   (d) `[('A', 'T'), ('T', 'A'), ('_', '_'), ('T', 'T')]`
   (e) Error

18. What is the value of x after the following is evaluated?

```
x = fd('ATAA__TT',  0, -1)
```

   (a) `[]`
   (b) `[('A', 'A'), ('_', '_'), ('T', 'T')]`
   (c) `[('A', 'T'), ('T', 'A'), ('A', '_'), ('_', 'T')]`
   (d) `[('A', 'T'), ('T', 'A'), ('_', '_'), ('T', 'T')]`
   (e) Error

19. What is the value of x after the following is evaluated?

```
x = fd('ATAA__TT', 2, 7)
```

   (a) `[]`
   (b) `[('A', '_'), ('_', 'T')]`
   (c) `[('A', 'A'), ('_', '_'), ('T', 'T')]`
   (d) `[('T', 'A'), ('_', '_'), ('T', 'T')]`
   (e) Error

20. What is the value of x after the following is evaluated?

```
x = fd('ATAA__TT', 2, 4)
```

   (a) `[]`
   (b) `[('A', 'A')]`
   (c) `[('A', '_')]`
   (d) `[('A', 'A'), ('A', '_')]`
   (e) Error

The next 3 questions refer to the following definition.

```
def hti(xs, v, h):
    i = h
    inc = 0
    n = len(xs)
    while xs[i] is not None:
        if xs[i] == v:
            return
        inc += 1
        i = (i+inc) % n
    xs[i] = v
```

21. What is the result of the following evaluation? In particular, if the evaluation does not have an error, what will the value of `xs` be after the evaluation?

```
xs = [4, None, 5, 6, None, 7, None, 8]
hti(xs, 5, 7)
```

    (a) The evaluation terminates without error with `xs == [4, 5, 5, 6, None, 7, None, 8]`
    (b) The evaluation terminates without error with `xs == [4, None, 5, 6, None, 7, 5, 8]`
    (c) The evaluation terminates without error with `xs == [4, None, 5, 6, None, 7, None, 8]`
    (d) The evaluation does not terminate
    (e) An `IndexError` exception is raised.

22. What is the result of the following evaluation? In particular, if the evaluation does not have an error, what will the value of `xs` be after the evaluation?

```
xs = [4, None, 5, 6, None, 7, None, 8]
hti(xs, 6, 7)
```

    (a) The evaluation terminates without error with `xs == [4, None, 5, 6, None, 7, None, 8]`
    (b) The evaluation terminates without error with `xs == [4, 6, 5, 6, None, 7, None, 8]`
    (c) The evaluation terminates without error with `xs == [4, None, 5, 6, None, 7, 6, 8]`
    (d) The evaluation does not terminate
    (e) An `IndexError` exception is raised.

23. What is the result of the following evaluation? In particular, if the evaluation does not have an error, what will the value of `xs` be after the evaluation?

```
xs = [4, None, 5, 6, None, 7, 8]
hti(xs, 6, 6)
```

    (a) The evaluation terminates without error with `xs == [4, None, 5, 6, None, 7, 8]`
    (b) The evaluation terminates without error with `xs == [4, 6, 5, 6, None, 7, 8]`
    (c) The evaluation terminates without error with `xs == [4, None, 5, 6, 6, 7, 8]`
    (d) The evaluation does not terminate
    (e) An `IndexError` exception is raised.

The next 3 questions refer to the following definition that is missing three lines of code. The function `add_row_sums` below reads data from a CSV (Comma Separated Values) file and returns a list whose elements are the list of numbers in each row together with their sums. We assume the file contains rows of floating point numbers separated by commas (and possibly including spaces) and each row has the same number of floats. Below is an example of such a file and the result of applying the function to that file. (Note: the output in the example is split over two lines so that it will fit on the page.)

The following is an example of a data file (`values.txt`).

```
1.2,  1 ,2.3, 1.4, 0.1
0.7,1.5, 1.2, 2.4, 0.1
2.1,0.7, 1.4, 2.0, 0.1
```

The following is an example of the use of the function.

```
>>> add_row_sums(’values.txt’)
[[1.2, 1.0, 2.3, 1.4, 0.1, 6.0], [0.7, 1.5, 1.2, 2.4, 0.1, 5.9],
 [2.1, 0.7, 1.4, 2.0, 0.1, 6.3]]
>>>
```

The definition of the `add_row_sums` function with three missing lines is given below.

```
def add_row_sums(filename):
    fd = open(filename, ’r’)
    data = []
    for line in fd:
        parts = line.split(’,’)
        line_data = []
        for p in parts:
            ## line 1 ##
        data.append(line_data)
    result = []
    row_len = len(data[0])
    for row in range(len(data)):
        rowsum = 0
        for index in range(row_len):
           ## line 2 ##
        ## line 3 ##
     return data
```

24. What is the required code for `## line 1 ##`?

    (a) `line_data.append(p)`

    (b) `line_data.extend(p)`

    (c) `line_data.append(float(p.strip()))`

    (d) `line_data.extend(float(p.strip()))`

    (e) More than one of the above is correct.

25. What is the required code for `## line 2 ##`?

    (a) `rowsum = data[index][row]`

    (b) `rowsum = data[row][index]`

    (c) `rowsum += data[index][row]`

    (d) `rowsum += data[row][index]`

    (e) More than one of the above is correct.

26. What is the required code for `## line 3 ##`?

    (a) `data.append(rowsum)`

    (b) `data[row].append(rowsum)`

    (c) `data[index].append(rowsum)`

    (d) `data[row][index].append(rowsum)`

    (e) More than one of the above is correct.

The next three questions refer to the following partial definition of a `Player` class.

```
class Player(object):
    def __init__(self, name, health):
        self._name = name
        self._health = health

    def update_health(self, amount):
        """Update the players health by amount (may be negative)"""
        ## line 1 ##

    def get_health(self):
        """Return the players health."""
        ## line 2 ##
```

Assume that the following has been evaluated.

```
frodo= Player('Frodo', 10)
```

27. What is the required code for `## line 1 ##` so that the method satisfies the comment?

    (a) `health += amount`

    (b) `_health += amount`

    (c) `self.health += amount`

    (d) `self._health += amount`

    (e) More than one of the above is correct.

28. What is the required code for `## line 2 ##` so that the method satisfies the comment?

    (a) `print(self.health)`

    (b) `return self.health`

    (c) `print(self._health)`

    (d) `return self._health`

    (e) More than one of the above is correct.

29. Which of the following correctly updates the health by `-10` for the object `frodo`?

    (a) `frodo.update_health(-10)`

    (b) `update_health(frodo, -10)`

    (c) `frodo.update_health() += -10`

    (d) `update_health(frodo) +=  -10`

    (e) More than one of the above is correct.

The five questions on the following page refer to the class definitions and assignments given below.

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

    def g(self, x):
        return self.f(x)

    def f(self, x):
        return 2*x

class B(A):
    def g(self, y):
       return 2*y + self.x

class C1(B):
    def __init__(self, x, y):
       super().__init__(x)
       self.y = y

    def f(self, x):
        return super().f(x) + self.y

class C2(B):
    def __init__(self, x, y):
        super().__init__(x)
        self.y = y + x

    def g(self, x):
        return x + self.x

a = A(2)
b = B(2)
c1 = C1(2, 1)
c2 = C2(1, 2)
```

30. What does the expression `b.g(2)` evaluate to?
    (a) `3`
    (b) `4`
    (c) `6`
    (d) `7`
    (e) Error

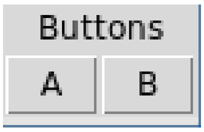
31. What does the expression `a.f(3)` evaluate to?
    (a) `3`
    (b) `4`
    (c) `6`
    (d) `7`
    (e) Error

32. What does the expression `b.f(2)` evaluate to?
    (a) `3`
    (b) `4`
    (c) `6`
    (d) `7`
    (e) Error

33. What does the expression `c1.f(3)` evaluate to?
    (a) `3`
    (b) `4`
    (c) `6`
    (d) `7`
    (e) Error

34. What does the expression `c2.g(2)` evaluate to?
    (a) `3`
    (b) `4`
    (c) `6`
    (d) `7`
    (e) Error

The next two question relate to the following definitions. In our GUI application we decide we need a widget that contains two buttons and that this widget is to appear within the main window of the application below the label as shown in the diagram below. This is what the application looks like at startup.



```
class ButtonsFrame(tk.Frame):
    def __init__(self,parent):
        super().__init__(parent.root)
        b1 = tk.Button(self, text="A")
        b2 = tk.Button(self, text ="B")
        b1.pack()
        b2.pack()

class MainWindow(object):
    def __init__(self, root):
        self.root = root
        label = tk.Label(root, text="Buttons")
        label.pack(expand=1)
        bf = ButtonsFrame(self)
        bf.pack(side=tk.LEFT, fill=tk.BOTH,expand=1)
```

35. When the window is resized to make it larger, what will happen to the label?

    (a) The label will stay where it is relative to the top-left corner of the window.
    (b) The label will stay at the left but be centred vertically
    (c) The label will stay at the top but will share vertical space with the buttons
    (d) The label will be centred vertically and share vertical space with the buttons

36. When the window is resized to make it larger, what will happen to the buttons in the horizontal direction?

    (a) Both buttons stay at the left (in their initial configuration)
    (b) Both buttons will stay together but be centered horizontally
    (c) Button A will stay at the left with Button B centered horizontally to the right of Button A
    (d) Buttons A and B share the horizontal space between them.

The following 2 questions refer to the following definition that is missing an argument and a line of code. A GUI application uses the following class that inherits from the `Canvas` class. When the left mouse button is pressed the x, y coordinates of where the mouse was clicked is printed. So, for example, when the mouse is clicked at the point `(10, 20)` the output

```
(10, 20)
```

will appear in the interpreter window.

```
class ClickCanvas(tk.Canvas):
    def __init__(self, master):
        super().__init__(master)
        self.bind("<Button-1>",  ## arg ##)

    def showXY(self, e):
        ## line ##
```

37. What is the required expression for `## arg ##`

    (a) `showXY(self)`

    (b) `showXY(self, e)`

    (c) `self.showXY`

    (d) `self.showXY()`

    (e) `self.showXY(e)`

38. What is the required code for `## line ##` so that the method behaves as required.

    (a) `print(e.x, e.y)`

    (b) `print((e.x, e.y))`

    (c) `print(e)`

    (d) `print((e))`

    (e) More than one of the above is correct.

This question relates to the incomplete **recursive** function definition below that calculates the prime factors of an integer in non-decreasing order.

The following gives examples of calling the function.

```
>>> prime_factors(12)
[2, 2, 3]
>>> prime_factors(17)
[17]
>>> prime_factors(25)
[5, 5]
>>> prime_factors(15)
[3, 5]
```

39. What expression needs to replace `####` in order to complete the following **recursive** definition for the following `prime_factors` function.

```
def prime_factors(n):
    """Return the prime factors of n in non-decreasing order

    prime_factors(int) -> list(int)

    Precondition: n > 1
    """
    for i in range(2, n):
        if n % i == 0:
            ####
    return [n]
```

(a) `return prime_factors(n//i) + [i]`

(b) `return [i] + prime_factors(n//i)`

(c) `return [i].extend(prime_factors(n//i))`

(d) `return prime_factors(n//i).append(i)`

(e) More than one of the above is correct.

40. What is the value of `y` after the following has been evaluated?

```
def s(xs):
    return [''.join([xs[i][j] for i in range(len(xs))]) for j in range(len(xs[0]))]

y = s(["Hi", "There"])
```

(a) `['Hi', 'Th']`

(b) `['HiTh']`

(c) `['HT', 'ih']`

(d) `['TH', 'hi']`

(e) Error

**END OF EXAMINATION**