ES112 Computing Exam. I

August - November 2024

E1	25 Marks

Time: 2 hours
Attempt all questions.

Name _____

Roll No. _____

Q1. (0.5 mark) Which of the following expressions represents integer division in Python?

    a. `10 / 3`

    b. `10 // 3` ✔

    c. `10 % 3`

    d. `10 ** 3`

    e. `10 + 3`

Q2. (0.5 mark) What is the output of the following Python code?

```
x = 3
y = 2
result = (x * y) + (x // y) - (x % y)
print(~result)
```

Output

```
-7
```

Q3. (0.5 mark) What is the output of the following Python code?

```
x = 10
y = 5
result = (x > y) and not (x % y)
print(result)
```

Output

```
True
```

Q4. (0.5 mark) Which of the following is used to assign a value to a variable in Python?

    a. `==`

    b. `=` ✔

    c. `!=`

    d. `=>`

    e. All of the above

Q5. (0.5 mark) Which is the output of the following Python code:

```
i = 0
while True:
  i += 1
  if i == 10:
    break
    continue
  print(i, end=',')
```

    a. `1,2,3,4,5,6,7,8,9,` ✔

    b. `1,2,3,4,5,6,7,8,9,10`

    c. `1,2,3,...,∞`

    d. `1,2,3,...,∞,`

Q6. (0.5 mark) Which of the following assigns a floating-point value to `x`?

    a. `x = 10.5` ✔

    b. `x = int(10)`

    c. `x = "10.5"`

    d. `x = 10 + 5`

    e. None of the above

Q7. (0.5 mark) In the following code, what will be the result?

```
i = 0
while True:
    i += 1
    if i==10:
        continue
        break
    print(i, end=',')
```

    a. The code will print numbers from `1` to `9` and then stop.

    b. The code will print numbers from `1` to `9`, skip `10`, and continue indefinitely. ✔

    c. The code will stop execution when `i==10`

    d. The code will throw an error because `continue` and `break` are used together.

Q8. (0.5 mark) What is the output of the following Python code?

```
x = 7
y = 3
result = (x < y) + ~1
print(result)
```

Output

```
-2
```

Q9. (0.5 mark) Which of the following expressions evaluates to `True`?
   a. `5 + 2 > 10`
   b. `10 - 2 == 7`
   c. `3 * 3 < 9`
   d. `2 ** 3 == 9`
   e. `not (0)` ✔
   f. None of the above

Q10. (0.5 mark) How many times will the `while` loop condition be evaluated:

```
i=1 #Assume n>1
while i<n:
   i=i+1
```

   a. `n-1`
   b. `n` ✔
   c. `n+1`
   d. `n-2`

Q11. (0.5 mark) What role does debugging play in computer programming?

Debugging plays a foundational role of correcting our computer programs should there be any deviation in their expected behaviour.

Q12. (0.5 mark) Which of the following is a valid variable name in Python?
   a. `2ndValue`
   b. `value@3`
   c. `value_2` ✔
   d. `value#1`

Q13. (0.5 mark) In Python, what is the output of the following code?

```
print(type(3.14))
```

   a. `<class 'int'>`
   b. `<class 'str'>`
   c. `<class 'float'>` ✔
   d. `<class 'complex'>`

Q14. (0.5 mark) Where in the computer is a variable such as `x` stored after the following Python line finishes execution?

```
x = print(print(print('')))
```

   a. Central processing unit
   b. Main Memory ✔
   c. Secondary Memory
   d. Input Devices
   e. Output Devices

Q15. (0.5 mark) What is the result of the following expression:

```
x = (10 + 5) * 2?
```

   a. `30`
   b. `20`
   c. `25`
   d. `15`
   e. `SyntaxError: invalid syntax` ✔
   f. None of the above

Q16. (0.5 mark) What will be the output of the following code?

```
for i in range(5):
    print(i, end=' ')
```

   a. `0 1 2 3 4` ✔
   b. `1 2 3 4 5`
   c. `0 1 2 3 4 5`
   d. `5`

Q17. (0.5 mark) In Python 3.x, find the value of the following expression:

```
round(-1.5)+round(2.5)    0
```

Q18. (0.5 mark) Which of the following is used to explicitly transfer control back to the caller in Python without modifying the control flow within a loop?

    a. `break`
    b. `return` ✔
    c. `exit`
    d. `continue`

Note: Since this question has insufficient data, full marks (+0.5) have been awarded to all students.

Q19. (0.5 mark) What is the output of the following Python code?

```
x = 6+-9**2**2
print(x)
```

Output

```
-6555
```

Q20. (0.5 mark) Fill in the blank (left column) to get the output (right column) for user input value `5`

Code	Output
`input,print=`**`print,input`** `input(int(print())+1)` `input(5=='5')`	6 False

Q21. (1 mark) The 8-bit two's complement representation of the value (`-13>>2`) is:

11111100

Q22. (1 mark) If `x=15`, `y=7`, `z=0`, find the values (right col.) of expressions in the following table:

Expression	Value
`not (z or z)`	**True**
`x & y`	7
`x or y`	15
`y or x`	7

Q23. (1 mark) Write a Python program to print the factorial of the first 10 natural numbers. Do not use any built-in functions. Usage of loop is a must.

```
def fact(n):
    result = 1
    i = 1
    while i <= n:
        result *= i
        i += 1
    return result

num = 1
while num <= 10:
    print(fact(num))
    num += 1
```

Q24. (1 mark) What is the output of the following Python code for user input `3`?

```
n=int(input())
i=1
while i<=n:
    j=1
    if i%2==0:
        while j<=n//2:
            print('*',end='')
            j=j+1
    j=1
    while j<=i:
        print(round(j**(1/i),j),end=' ')
        j=j+1
    print('')
    i=i+1
```

Output

```
1.0
*1.0 1.41
1.0 1.26 1.442
```

Even if we assume (hard-code in terms of Python) 2**(⅓) = 1.259, 3**(⅓) = 1.442, the output will still be the same for the given input `3`. This is illustrated through the following code.

```
...  #code has been suppressed for illustration
while i<=n:
    ...  #code has been suppressed for
illustration
    while j<=i:
        if i==3 and j==2:
            print(round(1.259,j),end=' ')
        elif i==3 and j==3:
            print(round(1.442,j),end=' ')
```

```
        else:
            print(round(j**(1/i),j),end=' ')
        j=j+1
    print('')
    i=i+1
```

```
1.0
*1.0 1.41
1.0 1.26 1.442
```

Q25. (1 mark) For the following Python code, what is the Syntax error, and after fixing the same, is there any other error? Explain in the provided space only.

```
def average(a, b)
  tot = a + b
  avg = total / 3
  print("The avg. is: " + str(avg))
x = 10
y = 20
average(x, y)
```

1. **Syntax error: The function definition is missing a colon (:)**

2. **Name error: 'total' not defined**

3. **Logic error: should divide by 2, not 3**

Q26. (2 marks) Write a Python program to take a non-negative decimal (base 10) integer n, and a target base k as input from the user. Perform decimal to base-k conversion, and print the result.

```
n=int(input())
k=int(input())
s=0
p=0
while n>0:
    q=int(n/k)
    r=n%k
    s=s+(r*(10**p))
    p=p+1
    n=q

print(s)
```

Q27. (2 marks) What will be the value of x after the following code finishes execution?

```
x = 4
y = 7
z = 2
x = (y // z + x * z) ** z % (x + y)
y = (x % z) * y + z
```

Output

```
0
```

Q28. (2 marks) What will the following Python program print?

```python
def Amar(val):
    if val % 3 == 0:
        print("Amar: Three's company!")
    else:
        print("Amar: Not divisible by 3.")

def Akbar(val):
    if val > 50:
        print("Akbar: That's a big number!")
    else:
        print("Akbar: Keep trying!")

def Anthony(val):
    if val % 2 == 0:
        print("Anthony: Even Steven!")
    else:
        print("Anthony: Odd one out!")
x = 45
y = 62
z = 21

if x > y and x > z:
    Amar(x)
    Akbar(y)
    Anthony(z)
elif y > x and y > z:
    Akbar(y)
    Amar(x)
    Anthony(z)
else:
    Anthony(z)
    Amar(x)
    Akbar(y)
```

Output

```
Akbar: That's a big number!
Amar: Three's company!
Anthony: Odd one out!
```

Q29. (2 marks) What is the output of the following Python code?

```python
def g(x):
  return x**2

def f(x):
  return g(x)+1

try:
  x=1
  while x%5:
    print(f"{g(f(~x))}")
    x=x+1
  5/0
except:
  try:
    print("iitgn")
    5/0
    try:
      5/0
      print("palaj")
    except:
      print('adalaj')
  except:
    print(print('*'))
```

Output

```
25
100
289
676
iitgn
*
None
```
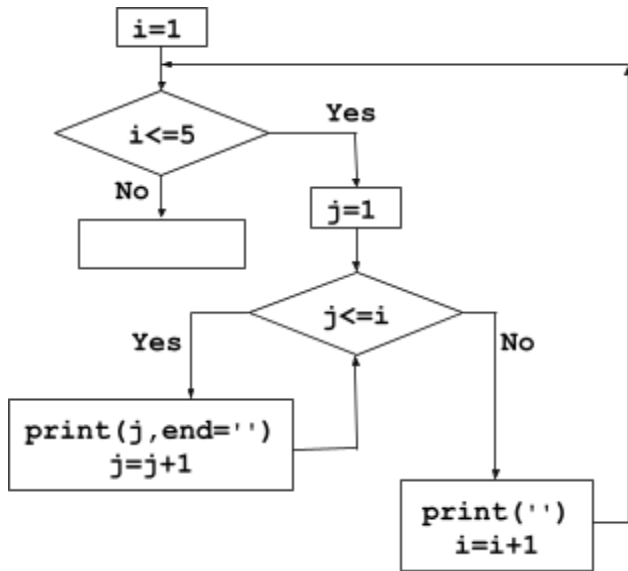
Q30. (2 marks) Draw the Control Flow of the following Python program and write the output:

Program	Output

`i=1`
`while i<=5:`
`  j=1`
`  while j<=i:`
`    #empty '' below`
`    print(j,end='')`
`    j=j+1`
`  #empty '' below`
`  print('')`
`  i=i+1`
	`1`
	`12`
	`123`
	`1234`
	`12345`

Control Flow (flowchart)

```
                    i=1
                     │
                     ▼
              ◇ i<=5 ◇ ──Yes──┐
                │              │
               No             ▼
                │            j=1
                ▼              │
            ┌──────┐           ▼
            │      │      ◇ j<=i ◇ ──No──┐
            └──────┘    Yes   │          │
                         │    │          │
                         ▼    │          ▼
              ┌──────────────┐      ┌──────────┐
              │print(j,end='')│     │ print('')│
              │   j=j+1       │     │  i=i+1   │
              └──────────────┘      └──────────┘
```

--------------------------------X--------------------------------