ES112 Computing Exam. II

August - November 2024
Full marks: 25, Time: 2 hrs.

Name _____
Roll No. _____

- ***Attempt all questions. There is no part marking for any question.***
- ***In MCQs, multiple correct options may exist, all of which must be selected. Incorrect answers incur a 25% negative marking.***
- ***Additional loose sheets can be used only for rough work. However, they should also be tied up and submitted along with this question sheet.***

Q1. (0.5 mark) What is the output of the following Python code?

```
L=[1,2,[1,2,[1,2,[1,2,[1,2]]]]]
print(L[-round(3.14)],L[-1],L[-2],L[1]+L[0])
print(len(L[::-1])**2+len(L+L)**2)
```

Output

```
1 [1, 2, [1, 2, [1, 2, [1, 2]]]] 2 3
45
```

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

```
x = 10
y = 5
z = ((x,x),x,) if (x,x > y,y > x,y) else y
print(z)
```

Output

```
((10, 10), 10)
```

Q3. (1 mark) What is the output of the following Python code?

```
purse = dict()
purse['money'] = 12
purse['candy'] = 3
purse['tissues'] = 75
print(purse)
print(purse['candy'])
purse['candy'] = []
purse['candy']+=purse['candy']
print(len(purse['candy']))
print(purse['candy'])
x=2<<1
x+=2**x**2
print((x,x=='123'))
```

Output

```
{'money': 12, 'candy': 3, 'tissues': 75}
3
0
[]
(65540, False)
```

Q4. (0.5 mark) What is the output of the following Python code?

```
S = 'banana'
print(S.find('a')+S.find('z'))
```

a. `1`
b. `-1`
c. `0`
d. `az`

Ans: **(c)** `0`

Q5. (0.5 mark) What is the output of the following Python code?

```
a = (1, 2, [3, 4])
a[2].append(5)
print(sorted(a[2])[::-2])
```

Output

```
[5, 3]
```

Q6. (0.5 mark) A particular number 454 is written in base 6 representation. The equivalent base-9 representation with the minimum number of base-9 digits is _____**217**_____.

Q7. (0.5 mark) Consider the following Python program. Assume parameters to a function are evaluated from right to left. What is the correct output of the following Python code?

```
def g(p):
    print(p, end="")
    return p

def h(q):
    print(q, end="")
    return q

def f(x, y):
    g(x)
    h(y)

f(g(10), h(20))
```

a. `20101020`
b. `10202010`
c. `20102010`
d. `10201020`

Ans: **(a)** `20101020`

Q8. (0.5 mark) For a Boolean variable `x`, which of the following expressions is/ are `False`?

a. `not x and x`
b. `x or not x`
c. `x and (not x)`
d. `not (x or not x)`

Ans: **(a)** `not x and x`, **(c)** `x and (not x)`, **(d)** `not (x or not x)`

Q9. (1 mark) What is the output of the following Python code?

```
x=dict()
n=3
for i in range(0,2**n):
  r=bin(bin(i<<i)[2:].find('0'))
  print(r[::-1])
```

Output

```
0b0
1b0
1b0
01b0
1b0
1b0
01b0
11b0
```

Q10. (1 mark) What is the output of the following Python code?

```
a = [20.0, 25.0]
p = 0
q = p + 1
pdiff = q - p
vdiff = int(a[q] - a[p])
p=[print(f"{pdiff},{vdiff}"[::-1]),p,a]
print(*[p,[p]])
p=[x for x in p][::-1]
print(tuple(p))
```

Output

```
5,1
[None, 0, [20.0, 25.0]] [[None, 0, [20.0, 25.0]]]
([20.0, 25.0], 0, None)
```

Q11. (0.5 mark) What is the output of the following Python code?

```
sorted,print=print,sorted
x=list(range(7))
L=[sorted(print(x)[::-2])]+x
sorted(L)
```

Output

```
[6, 4, 2, 0]
[None, 0, 1, 2, 3, 4, 5, 6]
```

Q12. (0.5 mark) What is the output of the following Python code?

```
a = 10
b = 20
a, b = b, a + b
print(a, b)
```

Output

```
20 30
```

Q13. (0.5 mark) What is the output of the following Python code?

```
def fun():
  a = 6
  b = 0
  while a < 10:
    a = a // 12 + 1
    a += b
    return
  print(a)
print(fun())
```

a. No output will be produced.
b. None
c. The program gets stuck in an infinite loop.
d. The program prints 6 as output.

Ans: (b) None

Q14. (0.5 mark) What is the output of the following Python code?

```
def func(s):
   return "".join(sorted(s, reverse=True))

print(func("python"))
```

a. hnopty
b. python
c. ytponh
d. Reverse the string.

Ans: (c) ytponh

Q15. (1 mark) What is the output of the following Python code?

```
d = dict({str(i): i**2 for i in range(3)})
l = list(i**2 for i in range(3))
t = tuple(i**2 for i in range(3))
print(d.values(),l,t)
d[str(l)]=t+(1,)
print(d)
```

Output

```
dict_values([0, 1, 4]) [0, 1, 4] (0, 1, 4)
{'0': 0, '1': 1, '2': 4, '[0, 1, 4]': (0, 1, 4, 1)}
```

Q16. (1 mark) What is the output of the following Python code?

```
d = {1: {2: {3: "hello"}}}
print(d.get(1, {}).get(2, {}).get(3, "d"))
s = "PythonProgramming"
result = s[:5][::-1] + s[5:]
print(result)
nested_dict = {"a": {"b": {"c": 10}}}
print(nested_dict["a"]["b"]["c"])
d|=d
print(d)
s+=s
print(s,len(s))
```

Output

```
hello
ohtyPnProgramming
10
{1: {2: {3: 'hello'}}}
PythonProgrammingPythonProgramming 34
```

Q17. (0.5 mark) What is the output of the following Python code?

```
m = [{'a':1,'b':2,'c':3}]
m += [{'d':4, 'e':5, 'f':6}]
ans = [a[b] for a in m for b in a][::-2]
print(ans)
```

Output

```
[6, 4, 2]
```

Q18. (0.5 mark) Consider the Python code below.

```
def func(num):
  count = 0
  while num:
      count += 1
      num >>= 1
  return count
```

The value of `func(435)` is _____9_____.

Q19. (2 marks) Consider the following Python code?

```
import math
def fun(x, y, z):
    n1 = 0
    n2 = 0
    flag = 1
    for i in range(z):
        n1 += x[i] * x[i]
        n2 += y[i] * y[i]
    n1 = math.sqrt(n1)
    n2 = math.sqrt(n2)
    for i in range(z):
        x[i] = x[i] / n1
        y[i] = y[i] / n2
    for i in range(z):
        if x[i] != y[i]:
            flag = 0
            break
    return flag
```

Correct options to produce output value 1 is/are:
(P) x = [1,2,3,4]; y = [3,4,5,6]; z = 4
(Q) x = [1,2,3,4]; y = [2,4,6,8]; z = 4
(R) x = [1,2,3,4]; y = [10,20,30,40]; z = 4
(S) x = [1,2,3,4]; y = [1.1,2.1,3.1,4.1]; z = 4

a. P, Q, R, S
b. Q, R, S
c. Q, R
d. R, S

Ans: (c) Q, R

Q20. (2 marks) Consider the Python codes below.

```
def tob(b, arr):
  i = 0
  while b > 0:
    if b % 2:
      arr[i] = 1
    else:
      arr[i] = 0
    b = b // 2
    i += 1
  return i
```

```
def pp(a, b):
  arr = []
  i=0
  while i<20:
    arr.append(0)
    i += 1
  tot = 1
  ex = a
  len_arr = tob(b, arr)
  for i in range(len_arr):
    if arr[i] == 1:
      tot *= ex
    ex *= ex
  return tot
```

The value of `pp(4,8)-pp(2,5)` is _____65504_____.

Q21. (1 mark) Consider the Python code below.

```
A=list()
L=[0,0,0,0,0]
for i in range(4):
  A.append(L)
for i in range(4):
  for j in range(5):
    A[i][j]=10*i+j
A=[j for i in A for j in i]
```

The value of `bin(A[10]<<(1,(1,))[0])` is __0b111100__.

Q22. (1 mark) What is the output of the following Python codes?

```
def jumble(x, y):
  x = 2 * x + y
  return x
```

```
def main():
  x = 2
  y = 5
  y = jumble(y, x)
  x = jumble(y, x)
  print(x,end=str(x)[::-1])
  return 0,jumble(x,y)
```

```
x=main()[-1]+main()[0]+1+main()[1]
print(x)
```

Output

```
266226622662129
```

Q23. (1 mark) Consider the Python code below.

```
def func(A, n, m):
  s = A[0]
  for i in range(1, n-1):
    m = m // s + A[i]
    print('('+chr(i+65)+')',end='')
  return m
```

Let `Z` be a list of 10 elements with `Z[i] = 2` for all i such that `0<=i<=9`. The value returned by the call `func(Z,10,2)` is __(B)(C)(D)(E)(F)(G)(H)(I)3__.

The value actually "returned" by the call func(Z,10,2) is actually 3 for the function call-return mechanism. But the return in the question asked here is in a broad sense wherein the intermediate values once func() is called are also accounted for. Overall, the expected answer to this question is (B)(C)(D)(E)(F)(G)(H)(I)3. However, full marks are also awarded if only 3 is also written as the only answer.

Q24. (1 mark) What is the output of the following Python code?

```
def main():
  i = 1
  j = 1
  while i <= 10:
    if i % 3 != 0:
      j += 2
      i += 1
      continue
    if j % 3 == 0:
      break
    i += 1
  print(i + j)
main()
```

a. 3
b. 5
c. 12
d. 15

Ans: **(d) 15**

Q25. (1 mark) Match the following **features** with the corresponding **collection type** in Python. Each feature may match with one or more collection types.

Features	Collection Type
(P) Mutable	(1) List
(Q) Immutable	(2) Tuple
(R) Allows duplicate elements	(3) Dictionary
(S) Keys must be immutable	
(T) Ordered (as of Python 3.7+)	

a. **(P)**⟶(1),(3); **(Q)**⟶(2); **(R)**⟶(1),(2); **(S)**⟶(3); **(T)**⟶(1),(2),(3)
b. **(P)**⟶(1),(3); **(Q)**⟶(2); **(R)**⟶(1),(2),(3); **(S)**⟶(3); **(T)**⟶(1),(2)
c. **(P)**⟶(1); **(Q)**⟶(2); **(R)**⟶(1),(2); **(S)**⟶(3); **(T)**⟶(1),(2),(3)
d. **(P)**⟶(1); **(Q)**⟶(2),(3); **(R)**⟶(1),(2); **(S)**⟶(1); **(T)**⟶(1),(2),(3)

Ans: **(a) (P)⟶(1),(3); (Q)⟶(2); (R)⟶(1),(2); (S)⟶(3); (T)⟶(1),(2),(3)**

Q26. (1 mark) Match the following **file operations** in Python with their correct **descriptions**. Each operation may match with one or more descriptions.

File Operations	Descriptions
(P) Open a file in "w" mode	(1) This mode opens the files for reading only.
(Q) Open a file in "r" mode	(2) This mode opens the file for both reading and writing. First read the file then write.
(R) Open a file in "a" mode	(3) This mode opens the file for both reading and writing. First overwrite the contents then read.
(S) Open a file in "r+" mode	(4) This mode opens the file for writing only.
(T) Open a file in "w+" mode	(5) This mode opens the file for writing, appending to the end of file if it exists.

a. **(P)**⟶(1); **(Q)**⟶(2); **(R)**⟶(3); **(S)**⟶(4), (5); **(T)**⟶(1)
b. **(P)**⟶(4),(5); **(Q)**⟶(2); **(R)**⟶(3); **(S)**⟶(1); **(T)**⟶(5)
c. **(P)**⟶(1), (5); **(Q)**⟶(2); **(R)**⟶(3); **(S)**⟶(4); **(T)**⟶(5)
d. **(P)**⟶(4); **(Q)**⟶(1); **(R)**⟶(5); **(S)**⟶(2); **(T)**⟶(3)
e. **(P)**⟶(4); **(Q)**⟶(2); **(R)**⟶(3); **(S)**⟶(1),(4); **(T)**⟶(5)

Ans: **(d) (P)⟶(4); (Q)⟶(1); (R)⟶(5); (S)⟶(2); (T)⟶(3)**

Q27. (1 mark) Identify whether the following **code snippets** represent Infinite Loops or Definite Loops, and match them with their correct **descriptions**.

Code Snippets	Descriptions
(P) `while True:` `  print("Hello")`	(1) May run indefinitely if the terminating condition is not met.
(Q) `for i in range(5):` `  print(i)`	(2) Executes zero iterations due to invalid range.
(R) `while f(x) < 10:` `  x -= 1`	(3) Runs indefinitely until manually stopped.
(S) `for i in range(0,10,-1):` `  print(i)`	(4) Executes a fixed number of iterations.

a. **(P)**⟶(1),(3); **(Q)**⟶(2); **(R)**⟶(1),(3); **(S)**⟶(4)
b. **(P)**⟶(3); **(Q)**⟶(4); **(R)**⟶(1); **(S)**⟶(2)
c. **(P)**⟶(3); **(Q)**⟶(1); **(R)**⟶(4); **(S)**⟶(2)
d. **(P)**⟶(1),(3); **(Q)**⟶(2); **(R)**⟶(1),(3); **(S)**⟶(4)

Ans: **(b) (P)⟶(3); (Q)⟶(4); (R)⟶(1); (S)⟶(2)**

Q28. (1 mark) What is the output of the following Python code?

```
x = 8
y = 20
z = 15
if (x + y) % 5 == 0 and z != 10:
   print("Cond. 1: Both conds are True")
elif (x * y) // 4 == 40 or y % 3 == 0:
   print("Cond. 2: At least one cond is True")
else:
   print("Cond. 3: All conds are False")
```

a. Cond. 1: Both conds are True
b. Cond. 2: At least one cond is True
c. Cond. 3: All conds are False
d. The code will raise an error

Ans: **(b) Cond. 2: At least one cond is True**

Q29. (0.5 mark) What is the output of the following Python code?

```
A=[]
A.append(round(-0.5))
A.append(round(0.5))
A.append(round(1.5))
A.append(round(2.5))
A.append(round(3.5))
print(A)
```

a. `[0, 0, 1, 2, 3]`
b. `[0, 0, 2, 2, 4]`
c. `[-1, 0, 2, 2, 4]`
d. `[-1, 1, 2, 3, 4]`

Ans: (b) `[0, 0, 2, 2, 4]`

Q30. (1 mark) What is the output of the following code in **`python3`**?

```
status = 417
match status:
  case 404:
    print("Not found")
    break
  case _:
    print("Welcome to ES112")
```

a. `Welcome to ES112`
b. `Not found`
c. None of the above

Ans: (c) None of the above

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