Instructions:

1. You are allowed to bring one index card of notes (3in x 5in). Do not submit the index card with the exam.

2. This is a closed book exam. Do not confer with any other person.

3. Computers are not allowed.

4. Calculators are not allowed.

5. Show your work. Partial credit will be given. Grading will be based on correctness, clarity and neatness.

6. I suggest that you read the whole exam before beginning to work any problem. Budget your time wisely.

7. All the programs in the problems must be written in Python.

8. The duration of this exam is 75 minutes.

DO NOT BEGIN THE EXAM UNTIL INSTRUCTED TO DO SO. GOOD LUCK!

Please sign the academic integrity statement:

“On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work. In particular, I certify that I have not received or given any assistance that is contrary to the letter or the spirit of the guidelines for this exam.”

Student Signature: ____________________________________________

PROCTORED EXAM ONLY

Exam Date:

Proctor Name: Proctor Signature:
1. (6 points)
(a) List one difference between a compiler and an interpreter.

Interpreter:
Translates program one statement at a time
No intermediate object code is generated
Continues translating the program until the first error occurs

Compiler:
Scans the entire program and translates it as into machine code
Generates intermediate object code
It generates the error message only after scanning the whole program

(b) What are the numeric data types supported in Python?
Python supports three numeric data types: int (signed integers)
float (floating point real numbers)
complex (complex numbers): a + bj

(c) What is an immutable object in Python?
An immutable object in Python is an object that cannot be modified or changed.

2. (8 points) Complete the following statements by circling the right answer:
(a) The float() function returns a float object from some numbers or strings. This operation is: ___
   i. a logical operation
   ii. an explicit type conversion
   iii. a concatenation
   iv. an implicit type conversion
   v. an enumeration

(b) What is the data type of the following Python expression: 1 + int(3.5)/2:
   i. a string
   ii. an integer
   iii. a boolean
   iv. a float
   v. a division

(c) Which of the following statements produces an error?
   Assume string_1 = "abc" and string_2 = "123":
   i. string_2 = string_1
   ii. string_1 = string_2 + str(456)
   iii. print(string_1 + string_2)
   iv. string_1[2] = "B"

(d) We cannot delete or remove characters from a string because: ___
   i. strings are iterables
   ii. strings are objects
   iii. strings are immutable
   iv. strings are not objects
   v. strings can include white-space characters
3. (10 points) Find the lines of code that are incorrect in this program.

- Write down the incorrect line numbers.
- Write a brief description of the error next to each incorrect line number.

```python
university = "TAMU"
title = "Programming"
prefix = "CSCE"
number = 110
credits = 3

lecture = prefix + str(number)
course = title + prefix + number
letters = len(university)
number = prefix * letters
title = title[::-1]
title[1:4] = "Introduction"
extra = input("Number of extra credits: ")
total = credits + extra
```

- Line 8: We can only concatenate strings, not integers and strings.
- line 12: A string is immutable
- line 14: Unsupported operand + for integer and string
4. (14 points) Consider the following program.

```python
pi = 3.14
a = 23
b = "code"
c = int(pi)
d = 2
print (a % 5)  # Line A
print (a // 5)  # Line B
print ((c >= pi) and (c > d))  # Line C
print ((a == d) or (a != 110))  # Line D
print ("d" in b)  # Line E
print (not ("ce" in b))  # Line F
print (f"number: {d**3}\n")  # Line G
```

(a) (2 points) What is the output of Line A? 3
(b) (2 points) What is the output of Line B? 4
(c) (2 points) What is the output of Line C? False
(d) (2 points) What is the output of Line D? True
(e) (2 points) What is the output of Line E? True
(f) (2 points) What is the output of Line F? True
(g) (2 points) What is the output of Line G? number: 8

5. (14 points) Consider the following program.

```python
x = "code"
y = "software"
print(x[3])  # Line A
print(x[2:] + x[:2])  # Line B
print(x[3] + y[-3])  # Line C
print(y[4:])  # Line D
print(x[1:4])  # Line E
print(y[8 - len(x)])  # Line F
print(y[1::3])  # Line G
```

(a) (2 points) What is the output of Line A? e
(b) (2 points) What is the output of Line B? deco
(c) (2 points) What is the output of Line C? ea
(d) (2 points) What is the output of Line D? ware
(e) (2 points) What is the output of Line E? ode
(f) (2 points) What is the output of Line F? w
(g) (2 points) What is the output of Line G? owe
6. (8 points)

Write a python program that asks a user for two numbers \( a \) and \( b \) in any order. The program should print all the numbers between \( a \) and \( b \) that are even and multiple of 3.

- Include \( a \) if \( a \) is even and multiple of 3.
- Include \( b \) if \( b \) is even and multiple of 3.
- All the numbers must be printed on the same line.

Sample output:

```python
a: 6
b: 60
Numbers: 6 12 18 24 30 36 42 48 54 60
```

Sample output:

```python
a: 28
b: 9
Numbers: 12 18 24
```

Sample output:

```python
a: 12
b: 31
Numbers: 12 18 24 30
```

```python
low = int(input("a: "))
high = int(input("b: "))

if low > high:
    low, high = high, low

print(f"numbers: ", end="")
for n in range(low, high + 1):
    if n % 2 == 0 and n % 3 == 0:
        print(f"{n}", end=" ")
```
7. (6 points)

Write a Python program that asks a user for a number n. The program should count and print the number of even and odd numbers between 0 and n (n included).

Sample output:

```
1 n: 10
2 There are 6 even numbers between 0 and 10
3 There are 5 odd numbers between 0 and 10
```

Sample output:

```
1 n: 15
2 There are 8 even numbers between 0 and 15
3 There are 8 odd numbers between 0 and 15
```

```
n = int(input("n: "))
count_odd = 0
count_even = 0
for x in range(n + 1):
    if x % 2 == 0:
        count_even += 1
    else:
        count_odd += 1
print(f"There are {count_even} even numbers between 0 and {n}\")
print(f"There are {count_odd} odd numbers between 0 and {n}\")
```
8. (10 points) Write a Python program which asks a user for a word and performs letters manipulation.

- If the word is empty, the program should print the message *empty!*
- Otherwise, if the word has between one and four letters, the program should print the reversed word.
- Otherwise, the program should print a word made of the first two and the last two letters of the original word.

Sample output:

```
1 Enter a word: 
2 Result: empty!
```

Sample output:

```
1 Enter a word: bio
2 Result: oib
```

Sample output:

```
1 Enter a word: memory
2 Result: mery
```

```
word = input("Enter a word: ")
if len(word) == 0:
    print(f"Result: empty!")
elif len(word) > 0 and len(word) <= 4:
    print(f"Result: {word[::-1]}")
else:
    print(f"Result: {word[0:2] + word[-2:]}")
```
9. (13 points) Consider the following program.

```python
x = 11  # Line A
y = 7

if x < 3 :
    y = y + 1
else :
    x = x - 2
    if x <= 3:
        y += 3

if x == y:
    x = x + 1

if x != y:
    x = x + 1

print(x)  # Line B
print(y)   # Line C
```

(a) (3 points) Write the execution order of the lines in this program. 1, 2, 4, 6, 7, 8, 11, 14, 15, 17, 18

(b) (2 points) What is output of Line B? 10

(c) (2 points) What is output of Line C? 7

(d) (3 points) Replace Line A with `x = 9`. What is the output of the program? 9, 7

(e) (3 points) Replace Line A with `x = 5`. What is the output of the program? 4, 10
10. (6 points)

What is the expected output for this program?

```python
n = 4
f = 1
if n < 0:
    print("n must be positive")
elif n == 0:
    print(1)
else:
    for i in range(1, n + 1):
        f = f * i
    print(f)
```

11. (5 points)

What is the expected output for this program?

```python
for i in range(6, 8):
    for j in range(3):
        if (j == 1):
            continue
        print(f"{i},{j}")
```

```
6,0
6,2
7,0
7,2
```
12. Extra credit (3 points)

Write a program that computes the sum \( \sum_{i=3}^{n} i^2 = 9 + 16 + 25 + \ldots n^2 \), where \( n \) is specified by the user.

```python
n = int(input("n: "))
sum = 0
for i in range(3, n + 1):
    sum = sum + i**2
```