

1.) Write down the output to the screen when the program in Figure 1 is run. Place your answer in the box.

2.) Determine the value of the variable x_5 after the program shown in Figure 1 is run and place your answer in the box.

Figure 1 – Questions 1 and 2

```
a = 6
b = 9
c = 12

if (a+b*c <= a*c+a*b):
    a += 1
    b -= 2
    c /= 4

    if (c > 15):
        print("ECE 296")
        x_5 = a*(b/c)**a+a
    else:
        print("Engr. 296")
        x_5 = a*b**c+a

else:
    a -= 2
    b *= 3
    c /= 4
    if (c > 2):
        print("SIUC")
        x_5 = a**c*(b-a)
    else:
        print("Saluki")
        x_5 = (a*b)+c*a**2
```

3.) Write down exactly what is displayed when the following two lines are entered in the Python Shell. Write your answer in the box.

```
>>> string1 = 'Southern Illinois University'
>>> string1[7:-2:6]
```

4.) Determine the value of the following expression and place your answer in the box:

$2^{2*2*3+2-4}/2$

5.) Write down exactly what is displayed when the following two lines are entered in the Python Shell. Write your answer in the box.

```
>>> list1=[3*x + 5 for x in range(3,13,3)]
>>> list1
```

6.) Express the assignment $x = \frac{y^2+z}{y^2z+yz^2y}$ using Python syntax and place your answer in the box.

7.) Which of the following is displayed when the following is entered in the Python Shell?

```
>>> z = [(1,2,3), ['Mon', 'Wed', 'Fri'], [2.2, 3.3, 4.4]]
>>> z[2][1]
```

8.) What is displayed when the Python program in Figure 2 is run? Write answer in the box.

Figure 2 – Question 8

```
for x in range(1,3):  
    z = [x+x*y+y for y in range(2,4)]  
    print(z,end = ' ')
```

9.) What is displayed when the following Python program in Figure 3 is run? Place answer in box.

Figure 3 – Question 9

```
n = 1  
m = 1  
while (n + m) <= 7:  
    if 2*m-n >= n:  
        x = m*n + 3  
        n += 2  
    else:  
        x = m**n  
        m += 1  
  
    print(x, end = ' ')
```

10.) What is displayed when the following Python program in Figure 4 is run? Place answer in box.

Figure 4 – Question 10

```
fx = 1  
y = 0  
for x in range(1,5):  
    y = y + 2/fx  
    fx = fx*x  
  
print('y =', y)
```

11.) Determine the value of $x[0]$ when the program in Figure 5 is run. Place your answer in the box.

12.) Determine the value of $x[1]$ when the program in Figure 5 is run. Place your answer in the box.

Figure 5 – Questions 11 and 12

```
def fe_fun1(a):  
    """FE function 1"""  
  
    m = 0  
    c = 0  
    for n in a:  
        m = m + n*c  
        c += 2  
    if c == 0:  
        return [0, 0]  
    else:  
        return [c, m*c]
```

```
my_numbers = [1,2,3,4,5]  
x = fe_fun1(my_numbers)
```

13.) Determine the value of y when the program in Figure 6 is run. Place your answer in the box.

Figure 6 – Question 13

```
def fe_fun2(x, n, a = 2, b = 0):  
    """FE function 2"""  
  
    y = 0  
    for m in range(n):  
        y = y + a*x + b + m  
  
    return y  
  
y = fe_fun2(2,3)
```

14.) The two required functions in all Arduino sketches are (circle one choice only):

- a. start() and run()
- b. setup() and loop()
- c. begin() and cycle()
- d. define() and operate()
- e. none of the above.

15.) The Arduino produces “simulated” analog outputs using (circle one choice only):

- a. pulse code modulation
- b. pulse position modulation
- c. amplitude modulation
- d. pulse width modulation
- e. none of the above.

16.) Which of the following is the manufacturer of the PLC’s we used in the lab (circle one choice only):

- a. Allen-Bradley
- b. Hewlett-Packard
- c. Texas Instruments
- d. Google
- e. none of the above.

17.) Which of the following is the manufacturer of the software we used to program the PLC’s we used in the lab (circle one choice only):

- a. IBM
- b. Microsoft
- c. Rockwell
- d. Oracle
- e. none of the above.

Questions 18 – 20.) Consider the program with classes Shape, Triangle, and Rectangle as shown in Figure 7.

Figure 7 – Questions 18 - 20

```
class Shape:
    """Class for geometric shapes"""

    def __init__(self, name, color):
        self.name = name
        self.color = color

    def description(self):
        print(self.name + ' is colored ' + self.color)

class Triangle(Shape):
    """Class for triangles"""

    def __init__(self, name, color, sidel, side2, side3):
        Shape.__init__(self, name, color)
        self.sidel = sidel
        self.side2 = side2
        self.side3 = side3

    def description(self):
        print(self.name + ' is colored ' + self.color)
        print('Sidel is:', self.sidel)
        print('Side2 is:', self.side2)
        print('Side3 is:', self.side3)

    def area(self):
        s = (self.sidel+self.side2+self.side3)/2
        if (self.sidel >= s) | (self.side2 >= s) | (self.side3 >= s):
            print('Not a triangle')
            return 0
        else:
            from math import sqrt
            area = sqrt(s*(s-self.sidel)*(s-self.side2)*(s-self.side3))
            return area

class Rectangle(Shape):
    """Class for rectangles"""

    def __init__(self, name, color, sidel, side2):
        Shape.__init__(self, name, color)
        self.sidel = sidel
        self.side2 = side2

    def description(self):
        print(self.name + ' is colored ' + self.color)
        print('Sidel is:', self.sidel)
        print('Side2 is:', self.side2)

    def area(self):
        area = self.sidel*self.side2
        return area

s1 = Shape('Cube', 'Red')
t1 = Triangle('Triangle #1', 'Green', 3, 4, 6)
r1 = Rectangle('Rectangle #1', 'Blue', 6, 9)
```

18.) What is output to the screen when the following command is entered in the Python shell? Place answer in box.

```
>>> s1.description()
```

19.) What is output to the screen when the following command is entered in the Python shell? Place answer in box. You can round your answer to four digits after the decimal point.

```
>>> t1.area()
```

20.) What is output to the screen when the following command is entered in the Python shell? Place answer in box.

```
>>> r1.description()
```