KATHMANDU UNIVERSITY
End Semester Examination [C]
November/December, 2023

Marks Scored:

Level : B.Pharm.
Year : I
Course : COMP 117
Semester : II
Exam Roll No. :
Time: 30 mins.
F. M. : 10

Registration No.:
Date 28 NOV 2023

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Mark [X] in the most appropriate option.

1. What is the key element required for a recursive function to avoid infinite recursion?
   [ ] A base case that terminates the recursion
   [ ] A loop that controls the number of recursive calls
   [ ] A large amount of memory to handle recursive calls
   [ ] An external condition that stops the recursion

2. What will be the output of the following code: print(7 % 3)?
   [ ] 2 [ ] 3 [ ] 4 [ ] 1

3. Which of the following is **NOT** a valid Python data type?
   [ ] int [ ] float [ ] string [ ] Character

4. What does the range(5) function generate?
   [ ] [0, 1, 2, 3, 4] [ ] [1, 2, 3, 4, 5] [ ] [5, 4, 3, 2, 1] [ ] [0, 1, 2, 3]

5. In Python, what is the role of default parameter values in a function?
   [ ] They set the initial value of a variable.
   [ ] They make the parameter optional, assuming a default value if not provided.
   [ ] They enforce a specific data type for the parameter.
   [ ] They allow the parameter to accept multiple values.

6. What is the scope of a variable defined inside a function?
   [ ] It can be accessed from anywhere in the program
   [ ] It can only be accessed within the function where it is defined
   [ ] It is a global variable
   [ ] It is automatically assigned a value by Python

7. What is the difference between a parameter and an argument in Python?
   [ ] Parameters are used when defining a function, while arguments are used when calling it
   [ ] Parameters are used to store data, while arguments are used for loops.
   [ ] Parameters and arguments are the same in Python.
   [ ] Python does not use parameters or arguments.

8. What will be the output of the following Python code?

```
number = 10
if number % 2 == 0
  print(f"{number} is even.")
else
  print(f"{number} is odd.")
```

[ ] 10 is even [ ] 10 is odd [ ] error [ ] underterminded

9. Which of the following words cannot be a variable in python language?

[ ] _val [ ] val [ ] try [ ] _try_

10. What will be the output of the following Python code?

```
a = int(input("Enter an integer: "))
b = int(input("Enter an integer: "))
if a <= 0:
  b = b +1
else:
  a = a + 1
```

A. if inputted number is a negative integer then b = b +1
B. if inputted number is a positive integer then a = a +1
C. Both A and B
D. None of the mentioned above

[ ] A only [ ] x [ ] B only [ ] D only

11. Output of 7^10 is

[ ] 12 [ ] 7 [ ] 15 [ ] 1

12. What is returned by the following function?

```
def slice_exercise( ):
    alist = [3, 67, "cat", [56, 57, "dog"], [ ], 3.14, False]
    print(alist[2:4])
```

[ ] [[ ], 3.14, False] [ ] ["cat", [56, 57, "dog"]]
[ ] [[56, 57, "dog"], [ ], 3.14, False] [ ] [27, "cat"]

13. What is the purpose of Matplotlib's pyplot module?

[ ] To create data visualizations [ ] To manage data storage
[ ] To manipulate data frames [ ] To install third-party packages

14. The scipy.optimize package provides different commonly used optimization ____.

[ ] Dataflow Diagram [ ] Flowchart
[ ] Algorithms [ ] Numerical Values

15. What will be the output of the following Python code?

```
my_tuple = (1, 2, 3, 4)
my_tuple.append( (5, 6, 7) )
print len(my_tuple)
```

[ ] 1 [ ] 2 [ ] 5 [ ] Error

16. Which statement is used to exit a loop prematurely in Python?

[ ] continue [ ] break [ ] pass [ ] stop

17. What will be the output of the following Python code?

```
numbers = [1, 2, 3, 4, 5, 6,7,8,9]
sum = 0
for num in numbers:
        if num % 2 == 0:
                sum += num
        elif num == 3:
                continue
print(sum)
```

[ ] 20 [ ] 40 [ ] 10 [ ] 7

18. What is the result of the following code snippet?

```
string = "Python Programming"
result = string.replace('p','Q')
print(result)
```

[ ] Qython Qrogramming [ ] Python Programming
[ ] python programming" [ ] Error

19. How is a function declared in Python?

[ ] def function function_name():
[ ] declare function function_name():
[ ] def function_name():
[ ] declare function_name():

20. Which one of the following is **INCORRECT**?

[ ] The variables used inside function are called local variables.
[ ] The local variables of a particular function can be used inside other functions, but these cannot be used in global space
[ ] The variables used outside function are called global variables
[ ] In order to change the value of global variable inside function, keyword global is used.

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28 NOV 2023

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Semester : II
F. M. : 40

SECTION "B"
[6Q. × 4 = 24 marks]

Attempt *ANY SIX* questions.

1. Differentiate between a flowchart and an algorithm in the context of problem-solving and programming. Explain when it's appropriate to use a flowchart and when an algorithm is more suitable. Provide an example of a simple algorithm and represent it as a flowchart.

2. Discuss the concept of operator precedence in Python. Provide an example where operator precedence affects the result of an arithmetic expression.

3. Create a Python program that prompts the user to enter values for variables a, b, and c. Use these values to solve a quadratic equation $ax^2 + bx + c=0$.Handle cases where the discriminant is negative, zero, or positive separately, and print the roots accordingly.

4. Explain the concept of key-value pairs in dictionaries. How does the dict function create dictionaries, and how can you add or remove items from a dictionary?

5. Create a Python program that takes five students' scores from five subjects as input and uses an if-else statement to determine their grades. Assume an A for scores above 90, B for scores between 80 and 89, C for scores between 70 and 79, and F for scores below 70.

6. Explain the rules and conventions for naming variables in Python. Provide examples of valid and invalid variable names, and discuss why adhering to naming conventions is important in programming.

7. What is a string in Python, and how is it represented? Discuss any three common string functions in Python.

SECTION "C"
[2 Q. × 8 = 16 Marks]

Attempt *ANY TWO* questions.

8. Explain the four categories of user defined functions and provide at leat one example of each category. Differentiate between global and local variables in Python. How does variable scope affect their accessibility within functions? Provide examples to demonstrate the scope of variables.

9.

a. Name and describe at least three key modules in SciPy and their applications. Explain how each module contributes to solving scientific and engineering problems. [4]

b. Create a Python program that uses a for loop to print the squares of numbers from 1 to 10. Also check whether the squared numbers are divisible by 5 or not? Explain the mechanism of your program. [4]

10. Write a **single python program** based on the following specification.

a. Create a list and store 10 integer values. [2]
b. Create a function that calculates the sum of all even numbers in a list. [3]
c. Create a function that calculates the product of all odd numbers in the list. [3]

KATHMANDU UNIVERSITY
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26 NOV 2023

Level : B.E./B.Sc./B.Tech.
Year : I
Time : 2 hrs. 30 mins.

Course : PHYS 101
Semester : I
F. M. : 40

SECTION "B"
[5Q. × 3 = 15 marks]

1. What is meant by reduced mass? Show that the reduced mass of hydrogen atom is nearly equal to mass of electron.

2. A wire is fixed at one end and is subjected to increasing load at the other end. Draw a curve between stress and strain. With the help of the stress versus strain curve, explain the terms elastic limit and breaking stress.

OR

State Brewster's law and prove the relation $\mu = \tan i_p$, where μ is refractive index of transparent reflecting medium and i_p is the polarizing angle.

3. Write short notes on population inversion and pumping process for producing laser.

OR

State Wien's displacement law. Show that Planck's radiation law reduces to Rayleigh-Jean's law for high temperature and large wavelength.

4. A thin strip of material is bent into the shape of semicircle of radius R. Find it's centre of mass.

5. Calculate the minimum thickness of a soap-bubble film that results in constructive interference in the reflected light if the film is illuminated with light whose wavelength in free space is $\lambda = 600$ nm. The index of refraction of the soap film is 1.33. If the film is twice as thick then, does this situation produce constructive interference?

OR

A large storage tank, open at the top and filled with water, develops a small hole in its side at a point 16.0 m below the water level. The rate of flow from the leak is 2.50×10^{-3} m^3/min. Determine: (a) the speed at which the water leaves the hole. (b) the diameter of the hole.

SECTION "C"
[5Q × 5 = 25 Marks]

6. Derive Newton's second law for the variable mass system and hence prove the relation $M_f = M_0 e^{-\frac{v_f}{v_{rel}}}$ for rocket, where symbols have their usual meaning.

OR

What is damped harmonic oscillator? Set up the differential equation of damped harmonic oscillator and solve it then analyze the solution for different damping conditions.

7. Describe the formation of circular Newton's rings and hence show that the rings are not equally spaced. Also discuss how Newton's rings are used to calculate the wavelength of sodium light and to calculate the refractive index of transparent liquid.

OR

What do you mean by diffraction of light? Describe the Fraunhofer single slit diffraction. Also plot the intensity distribution curve.

8. State and prove the theorem of parallel axes for moment of inertia. Determine the moment of inertia of a circular disc (a) about a diameter, and (b) about a tangent.

9. What do mean by laminar flow of fluid? Obtain the Poiseulle's formula for a viscous fluid flowing through a capillary tube of radius R.

10. An ideal spring S can be compressed 1.0 m by a force of 100 N. This same spring is placed at the bottom of a frictionless inclined plane which makes an angle of $\theta = 30^0$ with horizontal as shown in Figure C-1. A 10-kg mass M is released from rest at the top of the incline and is brought to rest momentarily after compressing the spring 2.0 m.
(a) Through what distance does the mass slide before coming to rest?
(b) What is the speed of the mass just before it reaches the spring?

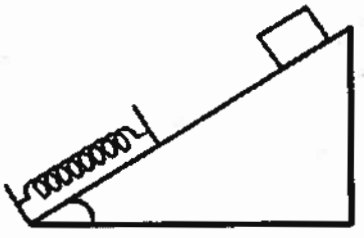

Figure C-1

OR

Consider an oxygen molecule(O_2) rotating in the xy plane about z-axis. The axis passes through the centre of the molecule, perpendicular to its length. The mass of each oxygen atom is 2.66×10^{-26}kg and at room temperature the average separation between the two atoms is $d = 1.21\times10^{-10}$m (the atoms are treated as point masses) (a) Calculate the moment of inertia of the molecule about the z-axis. (b) If the angular speed of the molecule about the z axis is 4.60×10^{-12}rad/s, what is its rotational kinetic energy?