SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2013

(CCSS)

Physics

PH6 B19—COMPUTATIONAL PHYSICS

Time : Three Hours   Maximum : 30 Weightage

Section A

Answer all **twelve** *questions.*

1. Which among the following is NOT true about Python ?

    (a) Python is a high-level language.

    (b) Python is a compiler based language.

    (c) Python is an interpreted language.

    (d) Python is a portable language.

2. Which among the following is a valid Python variable name ?

    (a) yield@xy.   (b) del.

    (c) yield.   (d) del_123.

3. If the following Python code is used to convert temperature in the Celsius scale (C) to temperature in the Fahrenheit scale (F), what will be the output ?

    $> > > C = 100$

    $> > > F = 9/5*C+32$

    $> > > print F$

    (a) 100.   (b) 212.

    (c) 132.   (d) 32.

4. If we run the following Python code :

    x = 1

    while x < = 5:

    print x * 8

    x = x + 1

    the output list will not contain the number :

    (a) 5.   (b) 8.

    (c) 32.   (d) 40.

5. The Python program to display a message

    Hello, World

    on screen is ———.

6. Python has ——— number of keywords.

7. The Python expression for the equation $A = 10 \log_{10}\left(\dfrac{P_o}{P_i}\right)$ is ———.

8. The result of the Python statement $>>> 9 * 1 ** 3$ is equal to ———.

9. What is the result of the Python statement $>>> \text{print type}(5 + 8j)$?

10. If the step size in Euler method is h, then the global error is proportional to ———.

11. Write the output if we run the Python statement $>>> \text{range}(10)$.

12. What will be the step size if we use the Simpson's rule to integrate a function between limits a and b for n number of steps ?

$(12 \times \frac{1}{4} = 3$ weightage$)$

Section B

Answer **all** *nine questions.*

13. Mention any *four* properties of the Python language.

14. Draw the schematic diagram of execution of a Python program.

15. What is meant by a syntax error ? Give an example.

16. Give the rules of precedence of operations in Python.

17. Write the syntax for a function call.

18. What will be the output of the program ?

    $>>> a = 4.0$

    $>>> x = 3.0$

    $>>> y = (x + a/x) / 2$

    $>>> \text{print } y.$

19. What is a dictionary in Python ? Give an example.

20. What is a tuple ? How does it differ from a list ?

21. How can you write data to a file ? Give the Python statement to write some data as a 'text' file.

$(9 \times 1 = 9$ weightage$)$

Section C

Answer any **five** *from seven questions.*

22. A ball is dropped from a tower of height h with initial velocity zero. Write a program that asks the user to enter the time in seconds when the ball hits the ground and then calculates and prints the height of the tower, ignoring air resistance.

23. Briefly explain the Euler method to solve a differential equation.

24. By the method of least squares, find the straight line that best the following data :

x	1	2	3	4	5
y	23	29	17	37	41

25. Write a Python program to simulate two dimensional projectile motion of a body moving under gravity. Use Euler's method.

26. How do we create a list in Python ? Generate a list of number of your choice and show how to add another number to the list, find the total number of numbers in the list and replace one number in the list with another number.

27. Write a python program for solving the equation $x^3 + 2x^2 + 10x - 20 = 0$.

28. Suppose the position of a point in two-dimensional space is given to us in polar coordinates (r, θ). Write a Python program to ask the user to enter the values r and θ (in degrees) and to convert them to Cartesian coordinates $x = r \cos \theta$, $y = r \sin \theta$.

$(5 \times 2 = 10$ weightage)

Section D

Answer any **two** *from three questions.*

29. (a) Explain control structures in Python with suitable examples.

    (b) Elucidate the difference between *if .....else* and *if .....elif* statements. Write a program to find a given number is *even* or *odd*.

30. (a) Discuss the bisection (half interval) method for solving a transcendental equations.

    (b) Write a Python program for solving the equation $xe^x = 3$ correct to three decimals using bisection method.

Turn over

31. (a) Explain the Trapezoidal rule of integration with the help of suitable diagrams. What is the significance of the size of the interval in the integration ?

(b) Explain the second order Runge-Kutta method for solving a second order differential equation.

(2 × 4 = 8 weightage)