SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2019

(CUCBCSS)

Physics

PHY 6B 13 (EI)—COMPUTATIONAL PHYSICS

Time : Three Hours   Maximum : 80 Marks

Section A (Answer in a word or phrase)

Answer all questions.
Each question carries 1 mark.

1. Originator of free software movement ————.

2. Human readable form of programme is known as ————.

3. Conversion of high level language to machine language is done by ————.

4. In python the result of 4.4 // 2 is ————.

   (a) 2.   (b) 2.0.

   (c) 2.2.   (d) 0.4.

5. The type system of python is ————.

6. The index of the first element of a list is ————.

   (a) 0.   (b) 1.

   (c) 2.   (d) – 1.

7. When step size increases truncation error ————.

   (a) Decreases.   (b) Increases.

   (c) Remains the same.   (d) None.

8. The angle of projection to get maximum range for a projectile is ————.

9. Extracting a part from string is known as ————.

10. The first order R-K method is known as ————.

$(10 \times 1 = 10$ marks)

Section B (Answer in a short paragraph-three or four sentences)

Answer all questions.
Each question carries 2 marks.

11. What is an assembler ?

12. What is high level language ?

13. Given s = '012345', write python code to remove first and last two elements.

14. What is iterative construct ?

15. Explain the term 'curve fitting'.

16. What is meant by list is mutable ?

17. Give the difference between input() and raw_input () functions.

(7 × 2 = 14 marks)

Section C (Answer in a paragraph of about half a page to one page)

Answer any five questions.
Each question carries 4 marks.

18. Explain the concept of discretization.

19. Discuss Numerical differentiation. Write general formula for the same.

20. Distinguish between compiler and interpreter.

21. Give some advantages of numerical methods over analytical methods.

22. Explain the Euler's method.

23. Discuss dynamic type system associated with python language.

24. Write note on modify loops using break and continue.

(5 × 4 = 20 marks)

Section D (Problems - write relevant formulas. All important step carries separate marks)

Answer any four questions.
Each question carries 4 marks.

25. By Newton-Ramphson method find the solution of $\sin(x) - 2x + 1 = 0$.

26. Write a program to find e^x by solving the series $e^x = 1 + \dfrac{x^2}{2!} + \dfrac{3}{3!} + \cdots$ upto n terms.

27. $\dfrac{dy}{dx} = 3x^2 + 1$ is with an initial value $y = 2$ when $x = 1$. Solve it for $x = 2$ with a step size 0.25.

28. Find sin 35 and cos 45 by Taylor series expansion.

29. A body is projected with velocity of 10 m/s at an angle $60°$. Tabulate the position and velocity for the first 0.6 seconds with an interval of 0.2 seconds.

30. Write a python program to track out the motion of a projectile considering the variation of gravity and air drag.

31. Estimate $\dfrac{dy}{dx}$ at $x = 0.26$ from the following table :

x :	0.25	0.26	0.27	0.28	0.29
y :	0.2474	0.2571	0.2667	0.2764	0.2860

$(4 \times 4 = 16 \text{ marks})$

Section E (Essays - Answer in about two pages)

Answer any **two** *questions.*
Each question carries 10 marks.

32. Write python programs :

    (a) To obtain multiplication table upto 15 of a given number (use input from keyboard, while loop for iteration and formatted printing).

    (b) Program to write multiplication table of 9 (use file input/output method).

33. Discuss freely falling body in viscous medium. A gently placed metallic ball of radius 0.05 m. and mass 1 kg. is moving down in caster oil of coefficient of viscosity 0.7 PaS. Estimate the position and velocity after 0.5 seconds under the influence of viscous force. Use the step size of 0.25 s.

34. What is interpolation ? Discuss various types of finite difference operator. Construct a forward difference table for the following data :

X	:	0.25	0.26	0.27	0.28	0.29
Y	:	0.2474	0.2571	0.2667	0.2764	0.2860

35. A satellite is dropped with an initial x-velocity of 7.97×10^3 m/s. and y-velocity of 6.972×10^3 m/s. in earth's orbit at a co-ordinate $(6 \times 10^6, 8 \times 10^6)$ with respect to earth. Trace out the position at every minute for the next 3 times.

$(2 \times 10 = 20 \text{ marks})$