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C 21081 (Pages : 3) Name.....

Reg. No.....

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2017

(CUCBCSS—UG)

Physics

PHY 6B 13 (E1)—COMPUTATIONAL PHYSICS

Time : Three Hours Maximum : 80 Marks

Section A

Answer in a word **or** *a phrase.*
Answer **all** *questions.*
Each question carries 1 *mark.*

1. In python >>> is known as ————————.
2. In python the result! of 24 % 6 is ————————.
3. In difference table $\Delta^2 y_1$ = ————————.
4. The second order R-K method is known as ————————.
5. The index of the first element of a list is ————————.

Questions 6 to 10 : write True or False

6. When step size increases, round of error increases.
7. Simpson's rule is accurate only if the number of element is odd.
8. Least square approximation is a method for curve fitting.
9. Extracting a part from string is known as indexing.
10. The first order R-K method is known as Euler's method.

(10 × 1 = 10 marks)

Section B

Answer in two **or** *three sentences each.*
Answer **all** *questions.*
Each question carries 2 *marks*

11. Give the difference between $x = y$ and $x = = y$.
12. What is truncation error in numerical analysis ?
13. What is discretisation ?

Turn over

14. Give the syntax of the function range() in python.

15. Give the difference between input() and raw input () functions.

16. What is the need of optimization of step size ?

17. What is a tuple ?

(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 difference between local variable and global variable.

19. Discuss trapezoidal rule for numerical integration.

20. Explain the R-K method to solve first order differential equation.

21. Discuss dynamic type system associated with python language.

22. Write a python program to obtain multiplication table up to 15 of a given number.

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

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

(5 × 4 = 20 marks)

Section D

Problems—write ***all*** *relevant formulas,* ***all*** *important steps carry separate marks.*
Answer any **four** *questions.*
Each question carries 4 *marks.*

25. Using Newton-Raphson method, find the root of $f(x) = x^2 - 3x + 2$.

26. $\frac{dy}{dx} = 3x^2 + 1$ is with an initial value $y = 2$ when $x = 1$. Solve it for $x = 2$ with a step size 0.25. Use Euler's method.

27. From the following table estimate the area bounded by the curve and the x-axis from $x = 0$ to $x = 1$. Use trapezoidal rule.

X	...	0	0.2	0.4	0.6	0.8	1.0
Y	...	2.00	2.04	2.16	2.36	2.64	3.00

28. Write a python program to evaluate $e^x = 1 + \frac{x^2}{2!} + \frac{x^3}{3!} + \ldots\ldots$ for n terms.

29. $\frac{dy}{dx} = \frac{2y}{x}$ is with an initial value of $y(1) = 2$. Estimate $y(1.5)$ with a step size of 0.25, Use Heun's method.

30. Using Simpson's 1/3 rule with a step size 0.1, find $\int_1^2 \frac{x^3 + 2x}{x^2 + 2x} dx$.

31. A body is falling freely from a height under gravity. Find the velocity and position at the end of 1 second. Tabulate the values at an interval of 0.25 second.

(4 × 4 = 16 marks)

Section E

Essays—answer in about **two** *pages each.*
Answer any **two** *questions.*
Each question carries 10 *marks.*

32. Explain the method of making user-defined function with examples. Write a program to find factorial of a given number using user defined function.

33. Obtain Newton's forward difference interpolation formula. Construct a difference table and find the value of y corresponding to $x = 2.5$ from the following data :

X	...	1	2	3	4
Y	...	1	8	27	64

34. What is curve fitting ? Discuss the principle of least squares and straight line fitting. Find the equation of the best fit straight line for the following data points.

X	...	1	2	4	5	6	8	9
Y	...	2	5	7	10	12	15	19

35. 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

(2 × 10 = 20 marks)