

D 40052

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Name.....

Reg. No.....

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH/APRIL 2018

(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. The string concatenation operator in python is \_\_\_\_\_.
2. The mathematical symbol for the floor division is \_\_\_\_\_.
3. In difference table  $\Delta^2 y_0 =$  \_\_\_\_\_.
4. The angle of projection to get maximum range for a projectile is \_\_\_\_\_.
5. Conversion of high level language to machine language is done by

*Questions six to ten : write True or False*

6. Simpson's rule is accurate only if the number of element is even.
7. Step size is the element that controls the accuracy of numerical method.
8. In python the result of floor division  $14.8 // 2$  is 7.4
9. Least square approximation is a method for integration.
10. When step size increases truncation error decreases.

(10 × 1 = 10 marks)

Section B

*(Answer in two or three sentences)*

*Answer all questions.*

*Each question carries 2 marks.*

11. What is an algorithm ?
12. What is mean by numerical method in solving a scientific problem ?
13. Explain the difference between  $5 \% 2$  and  $5.0 \% 2$ .
14. What is round of error in numerical analysis ?

Turn over

15. What is discretisation ?
16. Given  $s = '012345'$ , write python code to remove first and last two elements and print it.
17. Why the accuracy in Simpson's rule decreases, if we divide the function into odd number of subintervals.

(7 × 2 = 14 marks)

### Section C

(Answer any five paragraph of about half a page to one page)

Answer any five questions.

Each question carries 4 marks.

18. Discuss numerical differentiation. Write general formula for the same.
19. Discuss input and output statements associated with python language.
20. Differentiate user defined functions and built in functions associated with python language. Give examples.
21. Write note on modify loops using break and continue.
22. Explain the R-K method to solve first order differential equation.
23. Discuss the concept of discretisation.
24. Write a program to obtain multiplication table upto 15 of a given number.

(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 Simpson's 1/3 rule with a step size 0.1, find  $\int_1^3 \frac{x^3 + 2x}{x^2 + 2x} dx$
26. 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 seconds.
27. Write a python program to evaluate cos () series  $\cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$  for  $n$  terms.

28. Using Newton Raphson method find  $\sqrt[4]{7}$ .

29. Estimate  $\frac{dy}{dx}$  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

30.  $\frac{dy}{dx} = 3x^2 + 1$  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.

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

(4 × 4 = 16 marks)

### Section E

*(Essays-answer in about two pages)*

*Answer any two questions.*

*Each question carries 10 marks.*

32. 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

33. 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

34. 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 castor 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.

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

(2 × 10 = 20 marks)