

C 40206

(Pages : 3)

Name.....

Reg. No.....

SIXTH SEMESTER U.G. DEGREE EXAMINATION, MARCH 2023

(CUCBCSS-UG)

Physics

PHY 6B 13 (E1)—COMPUTATIONAL PHYSICS

(2017—2018 Admissions)

Time : Three Hours

Maximum Marks : 80

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

1. A program in high level language is called _____.
 2. The operational modes of python are _____ and file mode.
 3. In python >>> is known as _____.
 4. The string concatenation operator in python is :
(a) + ; (b) - ; (c) * ; (d) **.
 5. In difference table $\Delta^2 y_1 =$ _____.
 6. In python the result of $24 \% 6$ is _____.
 7. When step size increases, round of error _____.
 8. Simpson's rule is accurate only if the number of element is _____.
 9. The Mathematical symbol for the floor division is :
(a) / ; (b) // ; (c) % ; (d)**.
 10. The element that controls the accuracy of numerical method is _____.
- (10 × 1 = 10 marks)

Section B (Short Answer)*Answer all questions in one or two sentences.**Each question carries 2 marks.*

11. What is an algorithm ?
12. What is a function ?
13. What is truncation error ?
14. What is a set ?
15. What is the difference between print a, b and print $a, '\backslash n', b$?

Turn over

16. What is mean by numerical method in solving a scientific problem ?
 17. Give the difference between $x = y$ and $x = = y$.

(7 × 2 = 14 marks)

Section C

*Answer any five questions in a paragraph of about half a page to one page.
 Each question carries 4 marks.*

18. Explain the advantage of python over other language.
 19. Discuss numerical differentiation. Write general formula for the same.
 20. Explain the difference between local variable and global variable.
 21. Differentiate mutable and immutable data types.
 22. Discuss advantages of numerical methods over analytical methods.
 23. Discuss trapezoidal rule for numerical integration.
 24. Discuss input and output statements associated with python language.

(5 × 4 = 20 marks)

Section D

*(Problems - Write relevant formulas. All important steps carry separate marks.)
 Answer any four questions.
 Each question carries 4 marks.*

25. Write a python program to track out the motion of a projectile considering the variation of gravity and air drag.
 26. Using Newton--Raphson method, find the root of $f(x) = x^2 - 3x + 2$.
 27. Write a program to print all even numbers upto 30, suffixed by a * if the number is a multiple of 6. Use conditional statement if ... else.
 28. $\frac{dy}{dx} = 3x^2 + 1$ is with an initial value $y = 2$ when $x = 1$. Solve it for $x = 2$ with a step size 0.25.
 29. Using Simpson's 1/3 rule with a step size 0.1, find $\int_1^2 \frac{x^3 + 2x}{x^2 + 2x} dx$.
 30. From the following table estimate the area bounded by the curve and the x -axis from $x = 0$ to $x = 1$.

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

31. Write a program to evaluate $\cos()$ series $\cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$ for n terms.

(4 × 4 = 16 marks)

Section E (Essays)

*Answer any **two** questions in about **two** pages.
Each question carries 10 marks.*

32. Write a program to find the solution of a quadratic equation, with ladder if for different cases.
33. Explain the method of making user defined with examples. Write a program to find factorial of a given number using user defined function.
34. 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

35. Discuss Euler's method to identify position and velocity of a freely falling body. A body is falling freely from a height under gravity. Find the velocity and position at the end of 1 second. Tabulate the values of an interval of 0.25 seconds.

(2 × 10 = 20 marks)

C 20227

(Pages : 3)

Name.....

Reg. No.....

SIXTH SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION, MARCH 2022

Physics/Applied Physics

PHY 6B 13 (E1)—COMPUTATIONAL PHYSICS

(2014 to 2018 Admissions)

Time : Three Hours

Maximum : 80 Marks

*The symbols used in the question paper have their usual meanings.***Section A***Answer in a word or a phrase.**Answer all questions.**Each question carries 1 mark.*

1. Name any *two* input/output functions in Python.
2. What are strings ?
3. What is meant by curve fitting ?
4. What do you mean by interpolation ?
5. What is the difference between the *two* statements $i = i + 1$ and $i == i + 1$?

Write True or False :

6. Curve fitting by graphical method depends on the choice of points on the line.
7. The process of finding the value of a function outside the given range of arguments is called interpolation.
8. The operators ' Δ ' and ' ∇ ' are linear.
9. The logical NOT operator returns true if the operand is false.
10. Dictionary is a type of data structure.

(10 × 1 = 10 marks)

Turn over

Section B

Answer in two or three sentences each.

Answer all questions.

Each question carries 2 marks.

11. What is tuple in Python ?
12. What do you mean by the principle of least squares ?
13. Discuss the fall of a body in a viscous medium.
14. What are the properties of dictionary keys in python ?
15. Distinguish between compilers and interpreters.
16. What are finite differences ?
17. What are the advantages of python in comparison with other programming languages ?

(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. Write a note on operators and expressions in python.
19. Explain the principle of least squares.
20. Explain the Newton-Raphson method for solving algebraic equations.
21. What is the significance of indentation in python ?
22. How does a function return a value ?
23. Derive the Trapezoidal rule from the general quadrature formula.
24. How do you create a text file using python ?

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

x	...	1	2	3	4	5
y	...	14	27	40	55	68

26. Evaluate $\int_0^{10} \frac{dx}{1+x^2}$ using Simpson's 3/8 rule.
27. Using Taylor's series method, solve $\frac{dy}{dx} = x^2 - y$, $y(0) = 1$, at $x = 0.1$.
28. Write a program to find the factorial of a number, using python.
29. Using python, write a program to print the Fibonacci series.
30. Given $y' = x^2 - y$, $y(0) = 1$. Find $y(0.1)$ using Runge-Kutta method of second order.
31. Write a python program to add two numbers.

(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 list functions and set functions in python.
33. Describe with examples, the conditional statements and iterative statements in python.
34. Derive Newton's forward difference interpolation formula.
35. Derive the general quadrature formula and from that, obtain Simpson's 1/3 rule.

(2 × 10 = 20 marks)

C 1267

(Pages : 3)

Name.....

Reg. No.....

**SIXTH SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION
MARCH 2021**

Physics/Applied Physics

PHY 6B 13 (E1)—COMPUTATIONAL PHYSICS

Time : Three Hours

Maximum : 80 Marks

The symbols used in the question paper have their usual meanings.

Section A (Answer in a word or a phrase)

Answer all questions.

Each question carries 1 mark.

1. What is dictionary in python ?
2. What are arguments ?
3. What is an interpolating function ?
4. What is nabla operator ?
5. What are forward differences ?

Write True or False.

6. Curve fitting by method of group averages gives a unique curve of fit.
7. Finite differences deal with the variations in a function when the finite variable changes continuously in a given interval.
8. The process of computing the integral of a single variable function is called quadrature.
9. The '+' operator concatenates two strings in python.
10. The improved Euler's method is the Runge-Kutta method of first order.

(10 × 1 = 10 marks)

Section B (Answer in two or three sentences each)

Answer at least six questions.

Each question carries 2 marks.

All questions can be attended.

Overall Ceiling 12.

11. What is the significance of indentation in Python ?
12. What are the properties of the operator 'Δ' in forward differences ?

Turn over

13. Compare the analytical and numerical methods of computation.
14. What are conditional statements ?
15. Explain the use of 'for' loop in python with an example.
16. What are the circumstances in which we employ the Gregory-Newton forward, backward and central difference interpolation formulae ?
17. Explain how functions can return values.

(6 × 2 = 12 marks)

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

Answer at least four questions.

Each question carries 5 marks.

All questions can be attended.

Overall Ceiling 20.

18. Explain how a straight line fit can be obtained using the principle of least squares.
19. Discuss the Runge-Kutta method of second order.
20. Simulate the free fall motion of a ball using Euler method.
21. How do you define and call a function in python ?
22. How do you use the 'enumerate' function in python ?
23. Derive the Trapezoidal rule from the general quadrature formula.
24. List the file modes in python with their descriptions.

(4 × 5 = 20 marks)

Section D (Problems - Write all relevant formulas)

Answer at least three questions.

Each question carries 6 marks.

All questions can be attended.

Overall Ceiling 18.

25. Fit a parabola $y = ax^2 + bx + c$ in least square sense to the data :

x : 10 12 15 23 20

y : 14 17 23 25 21

26. Evaluate $\int_0^{10} \frac{dx}{1+x^2}$ using Simpson's 1/3 rule.

27. Solve $\sin x = 1 + x^3$ using Newton-Raphson method.
28. Write a program to check if a number is odd or even, using python.
29. Using python, write a program to find the largest among three numbers.
30. Using Runge-Kutta method of fourth order, solve for $y(0.1)$, given that $y' = xy + y^2$, $y(0) = 1$.
31. Write a python program to print all the prime numbers in an interval.

(3 × 6 = 18 marks)

Section E (Essays - Answer in about two pages each)

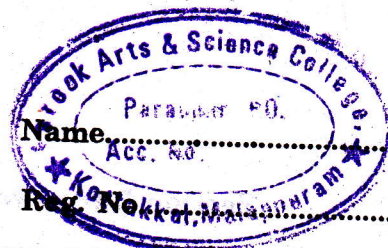
*Answer any two questions.
Each question carries 10 marks.*

32. What are built-in and user defined functions? Explain the definition, call, indentation, arguments and return values of functions in python.
33. Describe with examples, the conditional statements and iterative statements in python.
34. Discuss the evaluation of derivatives using Newton's forward difference formula.
35. Derive the general quadrature formula and from that, obtain Simpson's 3/8 rule.

(2 × 10 = 20 marks)

C 60058

(Pages : 4)



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 × 1 = 10 marks)

Turn over

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 $e^x = 1 + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$ upto n terms.
27. $\frac{dy}{dx} = 3x^2 + 1$ is with an initial value $y = 2$ when $x = 1$. Solve it for $x = 2$ with a step size 0.25.
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 $\frac{dy}{dx}$ 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

(4 × 4 = 16 marks)

Section E (Essays - Answer in about two pages)

Answer any two questions.

Each question carries 10 marks.

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

Turn over

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 (6×10^6 , 8×10^6) with respect to earth. Trace out the position at every minute for the next 3 times.

(2 × 10 = 20 marks)

D 40052

(Pages : 3)

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 $\int_1^2 \frac{x^3 + 2x}{x^2 + 2x} dx$
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 $\sqrt[3]{7}$.

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)

C 21579

(Pages : 3)

Name.....

Reg. No.....

**SIXTH SEMESTER B.Sc. DEGREE (SUPPLEMENTARY/IMPROVEMENT)
EXAMINATION, MARCH 2017**

(UG-CCSS)

Physics

PH 6B 19 (E01)—COMPUTATIONAL PHYSICS

(2013 Admissions)

Time : Three Hours

Maximum : 30 Weightage

Section A

Answer all questions.

(12 Objective type questions, in bunches of four questions.

Each bunch carries a weightage of 1.

- I. 1. A program in high level language is called _____.
2. The type system of python is _____.
3. Python source code must be with an extension :
- (a) .pn. (b) .py.
(c) .pt. (d) .ppt.
4. In python the result of $7//2$ is _____.
- (a) 1. (b) 1.0
(c) 3. (d) 3.0
- II. 5. The repetition operator in python is :
- (a) +. (b) -.
(c) *. (d) **.
6. To solve a scientific problem, we have analytical method and _____.
7. When step size increases, round of error _____.
- (a) decreases. (b) increases.
(c) remains same. (d) None.
8. Splitting of continuous quantity to small discrete quantity is called _____.
- III. 9. Simpson's rule is accurate only if, the number of elements is _____.
10. The only one special character allowed in the identifier/variable name is _____.
11. _____ is the built in function in python used to terminate the entire program at any stage.
12. The angle of projection to get maximum range for a projectile is _____.

(3 × 1 = 3 weightage)

Turn over

Section B (Short Answer Type Questions)

Answer all questions.

Each question carries 1 weightage.

13. What is high level language ?
14. What is an assignment operator in python ?
15. What are the various data types used in python ?
16. What is the output of $3*x$ if $x = \text{'hello'}$?
17. What is the difference between `print a, b` and `print a, '\n', b` ?
18. What is the meaning of variables/identifiers are case sensitive ?
19. What is a set ?
20. Give the syntax of `if ... elif ... else` (ladder if) statement.
21. What is the need of optimization of step size ?

(9 × 1 = 9 weightage)

Section C (Descriptive Type Questions)

Answer any five questions.

Each question carries 2 weightage.

22. Distinguish between compiler and interpreter.
23. Explain the difference between local variable and global variable.
24. Write a program to print all even numbers upto 30, suffixed by a^* if the number is a multiple of 6. Use conditional statement `if ... else`.
25. Write note on modify loops using `break` and `continue`.
26. Write a program to evaluate $\cos()$ series $\cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6} + \dots$ for n terms.
27. Give some advantages of numerical methods over analytical methods.
28. Discuss numerical integration. Write general formula for numerical integration.

(5 × 2 = 10 weightage)

Section D (Essay Type Questions)

Answer any two questions.

Each question carries 4 weightage.

29. 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).

30. 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 :

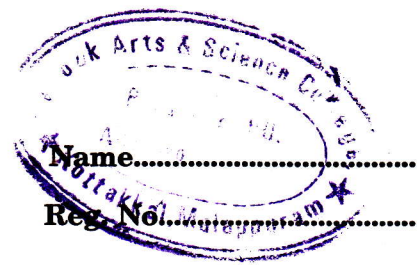
X :	1	2	4	5	6	8	9
Y :	2	5	7	10	12	15	19

31. Discuss Euler's method for projectile motion. A body is projected with a velocity of 10 m/s at an angle of 60° . Tabulate the position and velocity for the first 0.6 seconds with an interval of 0.2 seconds.

(2 × 4 = 8 weightage)

C 21577

(Pages : 3)



**SIXTH SEMESTER B.Sc. DEGREE (SUPPLEMENTARY/IMPROVEMENT)
EXAMINATION, MARCH 2017**

(UG-CCSS)

Physics

PH 6B 19—COMPUTATIONAL PHYSICS

(2009—2012 Admissions)

Time : Three Hours

Maximum : 30 Weightage

Part A

Answer all questions.

Each questions carries ¼ weightage.

1. A microprocessor is a complete CPU on a single chip :
 - (a) True.
 - (b) False.
 - (c) Partially true.
 - (d) Cannot be determined.
2. The fastest memory is :
 - (a) Hard disk.
 - (b) Virtual memory.
 - (c) Cache memory.
 - (d) Magnetic tape.
3. Which of the following statement is true ?
 - (a) Python 3 is a newer version, but it is backward compatible with python 2.
 - (b) Python 3 is a new version, but it is not backward compatible with python 2.
 - (c) both (a) and (b).
 - (d) None of the above.
4. Which of the following is immutable in Python ?
 - (a) String.
 - (b) List.
 - (c) Dictionary.
 - (d) None of the above.
5. Which of the following method is the only method in Python that both modifies the list and return a value ?
 - (a) Insert.
 - (b) Pop.
 - (c) Append.
 - (d) Count.
6. In Python programme output is >>>show(), then its out put is :
 - (a) Text.
 - (b) Number.
 - (c) Graphic.
 - (d) None of the above.

Turn over

7. Whenever Trapezoidal rule is applicable, Simpson 1/3 rd rule can also be applied :
- (a) True. (b) False.
(c) Partially true. (d) Cannot be determined.
8. Which of the following programme no variable or argument declaration are necessary ?
- (a) C. (b) C++.
(c) FORTRAN. (d) Python.
9. The interval in which a real root of the equation $x^3 - 2x - 5 = 0$ lies is :
- (a) 1, 2. (b) 2, 3.
(c) 3, 4. (d) 4, 5.
10. The equation $\Delta^2 u_{n+1} + \frac{1}{2} \Delta^2 u_n = 0$ is of order :
- (a) 1. (b) 2.
(c) 3. (d) 4.
11. Runge-Kutta method is a self starting method :
- (a) True. (b) False.
(c) Partially true. (d) None of the above.
12. Taylors series method will be useful to give some ——— of Milne's method.
- (a) Starting values. (b) Final values.
(c) Both (a) and (b). (d) None of the above.

(12 × ¼ = 3 weightage)

Part B

Answer all nine questions.

Each question carries 1 weightage.

13. Name the various data types used in Python language.
14. Discuss about precedence rule of operators in python.
15. What are the uses of tuples ?
16. Explain why program written in Python are much shorter than program in C or C++.
17. With suitable example, explain how python manipulate strings.
18. Give a brief introduction of numerical methods.
19. What are the dictionary functions ?
20. Explain the principle Curve fitting.
21. What is Euler method ?

(9 × 1 = 9 weightage)

Part C*Answer any five questions.**Each question carries 2 weightage.*

22. Write a Python program to simulate two dimensional projectile motion of a body moving under gravity.
23. With suitable example explain 'del' statement in Python.
24. With suitable example in python explain the main operation on a dictionary.
25. List and explain the properties of difference operator.
26. Explain the second order Runge-Kutta method to solve a differential equation.
27. Using Simpson one-third rule, find the value of the integral $\int_0^1 \frac{dx}{1+x}$ correct to third decimal place.
Take $h = 0.25$
28. Find the numerical solution of the differential equation $\frac{dy}{dx} = x + y$ from $x = 0$ to $x = 0.2$ by Euler's method.

 $(5 \times 2 = 10 \text{ weightage})$ **Part D***Answer any two questions.**Each question carries 4 weightage.*

29. (a) Explain in detail, what are the rules for local and global variables in Python.
(b) Write a python program for solving the equation $xe^x = 3$ correct to three decimals using bisection method.
30. Write a program to obtain the numerical solution for a two-body problem in the central force field. Use the Euler method and save data into file format.
31. Find the least square $y = a + bx$ for the data given below :

x	:	-4	-2	0	2	4
y	:	1.2	2.8	6.2	7.8	13.2

 $(2 \times 4 = 8 \text{ weightage})$

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 $e^x = 1 + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$ 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)

C 1757

(Pages : 3)

Name.....

Reg. No.....

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH/APRIL 2016

(UG—CCSS)

Core Course—Physics

PH 6B 19—COMPUTATIONAL PHYSICS

(2009—2012 Admissions)

Time : Three Hours

Maximum : 30 Weightage

Section A

Answer all questions.

Each question carries $\frac{1}{4}$ weightage.

1. A comment in Python starts with _____ character.

- (a) #. (b) \$.
(c) *. (d) ^.

2. What is the output of the following statement is executed

```
>>>chr(ord('A'))
```

- (a) A. (b) B.
(c) a. (d) Error.

3. The output of the python code :

```
a = 1
```

```
a, b = a + 1, a + 1
```

```
print a
```

```
print b
```

- (a) 1,1. (b) 2,2.
(c) 3,3. (d) 4,4.

4. The output of `>>>2**3` is :

- (a) 6. (b) 2.3.
(c) 8. (d) None of the above.

5. In Python strings strings can be expressed in :

- (a) Single quotes. (b) Double quotes.
(c) Both (a) and (b). (d) None of the above.

Turn over

6. In Python output of a programme is `>>> print x` then x is :
- (a) Number. (b) Text.
(c) Fig. (d) Both (a) and (b).
7. Which of the following programme no variable or argument declaration are necessary ?
- (a) C. (b) C++.
(c) FORTRAN. (d) Python.
8. The order of convergence in Newton-Raphson method is :
- (a) First. (b) Second.
(c) Third. (d) Fourth.
9. Out of the method of false position and Newton Raphson method , the rate of convergence is faster for :
- (a) False position method.
(b) Newton Raphson method.
(c) Both method have the same rate of convergence.
(d) None of the above.
10. The n^{th} divided difference of a polynomial of degree n is :
- (a) Zero. (b) A constant.
(c) A variable. (d) None of the above.
11. The order of error in Trapezoidal rule and Simpson 1/3 rule is _____ and respectively _____.
- (a) One and three. (b) Second and fourth.
(c) Three and fifth. (d) None of the above.
12. Which of the following method is the only method that both modifies the list and return a value in Python ?
- (a) String. (b) List.
(c) Dictionary. (d) None of the above.

(12 × ¼ = 3 weightage)

Section B

Answer all **nine** questions.

13. What is a string ? How it differs from tuple ?
14. Explain the reason why python is widely used by scientific community.

15. What are the advantages of Python in comparison with other languages ?
16. What is quadrature in numerical integration ?
17. Write a Python program using pickling example.
18. Discuss the criteria for ending the iteration.
19. Briefly explain the use of range () function in Python.
20. What is the principle of curve fitting ?
21. List the advantages of numerical methods from analytical methods.

(9 × 1 = 9 weightage)

Section C

Answer any five questions.

22. With suitable Python program show that interconversion between list and tuples is possible using list () and tuple () function.
23. Discuss various operators in Python.
24. Write a Python program for solving the equation $x e^x = 3$ correct to three decimals using bisection method.
25. Find the root of the equation $3x = \cos x + 1$ between 0 and 1 with $x_0 = 0.6$ by Newton Raphson method.
26. With suitable example in python explain the main operation on a dictionary.
27. Discuss the technique for linear square fitting.
28. Discuss the merits of difference table.

(5 × 2 =10 weightage)

Section D

Answer any two questions.

29. What are standing waves ? Write a Python program to simulate it.
30. Write a python program to simulate motion of a body moving under an attractive inverse square law.
31. Explain the second order Runge-Kutta method for solving a differential equation.

(2 × 4 = 8 weightage)

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH/APRIL 2016

(UG—CCSS)

Physics

PH 6B 19 (E01)—COMPUTATIONAL PHYSICS

(2013 Admissions)

Time : Three Hours

Maximum : 30 Weightage

Section A (Objective Type Questions)*Answer all questions.**Each ¼ weightage.*

1. Who created the python programming language ?
2. Which operating system that python can run on ?
(a) Unix/ Linux. (b) Windows.
(c) Mac. (d) All the above.
3. Which of the following data types are not supported by python ?
(a) Numbers. (b) String.
(c) List. (d) Slice.
4. Which of the following function convert a string to an object in python ?
(a) repr(x). (b) eval(str).
(c) tuple(s). (d) list(s).
5. Which of the following data types is not supported by python ?
(a) Tuple. (b) Dictionary.
(c) Generics. (d) List.
6. Which of the following function convert a string to a long in python ?
(a) int (x[,base]). (b) long (x[,base]).
(c) float (x). (d) str (x).
7. What is the output of print str [0] if str = 'Hello Kerala !' ?
(a) Hello Kerala! (b) H.
(c) Ello Kerala! (d) None of the above.
8. Write the output of :
>> print 'Hello' + 'Hello'

Turn over

9. What does the following code do : `def a (b, c, d) : pass.`
- (a) Defines a list and initializes it.
 - (b) Defines a function which does nothing.
 - (c) Defines an empty class.
 - (d) Defines a function which passes its parameters through.
10. What gets printed if we type in python ?

```
>> print type(1/2)
```

- (a) <type 'int'>.
- (b) <type 'number'>.
- (c) <type 'float'>.
- (d) <type 'double'>.

11. What is the output of the following python program ?

```
>> A = [1, 2, 3, None, (), [],]
```

```
>> print len(a)
```

- (a) Syntax error.
- (b) 4.
- (c) 5.
- (d) 6.

12. What gets printed if we type in python ?

```
>> x = 4.5
```

```
>> y = 2
```

```
>> print x/y
```

- (a) 2.25.
- (b) 2.0.
- (c) 9.0.
- (d) 20.25.

(12 × ¼ = 3 weightage)

Section B (Short Answer Type Questions)

*Answer all questions.
Each 1 weightage.*

13. Write any five salient features of python.
14. How can we print "Hello, Calicut" using python ?
15. Write a python program to swap values of two variables where variables are x and y and having values 9 and 8 respectively.
16. Is python a case sensitive language ?
17. What are supported data types in Python ?
18. Write a python program which accept the radius of a circle from the user and compute the area.
19. Write the output of

```
>> x = 'Hello'
```

```
>> print x + x
```

20. Write a program in python to display the current date and time such as shown in sample: Current date and time:

2014-07-05 14 : 34 : 14

21. How can we get a python version that we are using with a program.

(9 × 1 = 9 weightage)

Section C (Short Essay/Paragraph Questions)

Answer any five questions.

Each 2 weightage.

22. Write a program in python to solve a quadratic equation where coefficients a , b and c are provided by the user.

23. Write a program in python to plot the Taylor series expansion of $\sin(x)$.

24. Write a program in python to solve the equation : $x^3 - 6x^2 + 11x - 6 = 0$.

25. Explain the different 'data structures' in python.

26. Write about two major 'control flow statements' in python with examples of usage.

27. Explain about 'modules' in python.

28. Write a program in python to check two integers to ensure one is even and other is odd.

(5 × 2 = 10 weightage)

Section D (Essay Questions)

Answer any two questions.

Each 4 weightage.

29. (a) What is the difference between a module and a package in Python ?

(b) Fit a straight line to the following data :

x	...	0.0	1.0	2.0	2.5	3.0
y	2.9	3.7	4.1	4.4	5.0

30. (a) Explain Trapezoidal rule.

(b) Write a program in python for computing $\int_0^{2\pi} \sin x dx$ using Trapezoidal rule.

31. (a) Explain the Newton-Raphson method.

(b) Find the smallest positive zero of $f(x) = x^4 - 6.4x^3 + 6.45x^2 + 20.538x - 31.752$ with a python program using Newton-Raphson method.

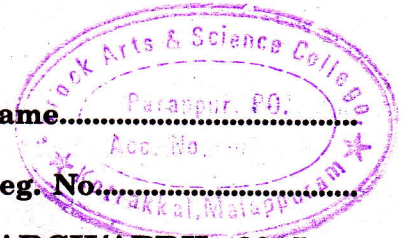
(2 × 4 = 8 weightage)

C 80036

(Pages : 4)

Name.....Parappur, P.O.

Reg. No.....



SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH/APRIL 2015

(U.G.—CCSS)

Core Course—Physics

PH 6B 19—COMPUTATIONAL PHYSICS

Time : Three Hours

Maximum : 30 Weightage

Section A

Answer all questions.

Each question carries ¼ weightage.

1. _____ is the physical aspect of the computer that can be seen :
(a) Hardware. (b) Software.
(c) Operating system. (d) Application program.
2. _____ translate high level language to low level language.
(a) Assembler. (b) Compiler.
(c) CPU. (d) Operating system.
3. Python was created by _____.
4. _____ is interpreted.
(a) Python. (b) C++.
(c) C. (d) Java.
5. To start python from the command prompt, use the command :
(a) Execute python. (b) Run python.
(c) Python. (d) Go python.
6. The order of error in Runge Kutta method is :
(a) 2. (b) 3.
(c) 4. (d) 5.
7. Which of the following programme no variable or argument declaration are necessary ?
(a) C. (b) C++.
(c) FORTRAN. (d) Python.

Turn over

8. Simpsons $1/3^{\text{rd}}$ rule is :
- (a) First order. (b) Second order.
(c) Third Order. (d) Fourth order.
9. In the following python code
- ```
n = 1
print n++ :
```
- (a) Line 1 has error. (b) Line 2 has error.  
(c) Both line has error. (d) Both lines has no errors.
10. The absolute error in Bisection methods is :
- (a)  $\frac{1}{|b-a|}$ . (b)  $1/2^n$ .  
(c)  $|b-a|2^n$ . (d)  $\frac{|b-a|}{2^n}$ .
11. What is the order of error in the expression  $D^2 = h^{-2} (\delta^2 - \delta^4/12)$  ?
- (a)  $O(h^2)$ . (b)  $O(h^3)$ .  
(c)  $O(h^4)$ . (d)  $O(h^5)$ .
12. What is  $(1 + \Delta)^{-1}$  ?
- (a)  $1 - \nabla$ . (b)  $1 + \Delta$ .  
(c)  $1 + \nabla$ . (d) None of the above.

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

*Answer all nine questions.  
Each question carries a weightage 1.*

13. Write a programme in Python to print all the contents of a file.
14. Demonstrate the use of exception handling in Python.
15. Write a short python program to check whether the given no. is odd or even.

16. Explain how 'infinite looping' is achieved in python language.
17. Briefly explain the use of range ( ) function in Python.
18. Explain the different uses of tuples.
19. What is meant by curve fitting ?
20. List the advantages of numerical methods from analytical methods.
21. Find the root of the equation  $3x = \cos x + 1$  between 0 and 1  $x_0 = 0.6$  by Newton-Raphson method.  
(9 × 1 = 9 weightage)

### Section C

*Answer any five questions.*

*Each question carries weightage 2.*

22. Distinguish between looping through dictionaries and through a sequence.
23. With suitable example explain del statement in Python.
24. Name a module that is not included in python by default and declare it.
25. With suitable example in python explain the main operation on a dictionary.
26. Find the numerical approximate value of the integral  $\int_0^2 x^{1/3} dx$  using the trapezoidal rule with eight increments.
27. Using Simpson one-third rule, find the value of the integral  $\int_0^1 \frac{dx}{1+x}$  correct to third decimal place. Take  $h = 0.5$ .
28. Find the numerical solution of the differential equation  $\frac{dy}{dx} = x + y$  from  $x = 0$  to  $x = 0.2$  by Euler's method.

(5 × 2 = 10 weightage)

### Section D

*Answer any two questions.*

*Each question carries weightage 4.*

29. (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

30. Write a program to obtain the numerical solution for a two-body problem in the central force field. Use the Euler method and save data into file format.
31. Write a python program to simulate two dimensional projectile motion of a body moving under gravity. Use Euler's method.

(2 × 4 = 8)

C 60120

(Pages : 4)

Name.....

Reg. No.....

**SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2014**

(U.G.-CCSS)

Physics

PH 6B 19—COMPUTATIONAL PHYSICS

Time : Three Hours

Maximum : 30 Weightage

**Section A**

*Answer all twelve questions.*

1. Which among the following is not a numerical data type allowed in Python ?
  - (a) Long.
  - (b) Float.
  - (c) Double.
  - (d) Complex.
2. 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 = 150
```

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

```
>>> print F
```

- (a) 150.
  - (b) 262.
  - (c) 182.
  - (d) 32.
3. If we run the following Python code :

```
x = 1
```

```
while x <= 10 :
```

```
print x * 8
```

```
x = x + 1
```

the output list will *not* contain the number :

- (a) 10.
- (b) 8.
- (c) 72.
- (d) 96.

Turn over

4. The output of the Python code :

```
>>> x = 0
>>> print (x)
>>> x = x**2 - 2
>>> print (x)
```

will be :

- (a) 0. (b) -1.  
(c) 2. (d) -2.
5. What will be the output when we execute the following Python code ?

```
>>> x = 2
>>> x += 1
>>> x -= 4
>>> x * = -5
>>> x /= 5 :
```

- (a) 1. (b) -5.  
(c) 5. (d) 2.
6. In Euler method, if  $h$  is the step size, the global error is proportional to :

- (a)  $h$ . (b)  $h^2$ .  
(c)  $h^3$ . (d)  $h^4$ .

7. In the following Python code sequence, the output will be :

```
>>> x = 1
>>> y = 2
>>> print x, y :
```

- (a) 1. (b) 12.  
(c) 2. (d) Error.
8. Identify the statement that is not allowed in Python :

- (a)  $x = a + b/c$ . (b)  $x = (a + b)/c$ .  
(c)  $x, y = y, x$ . (d)  $2 * x = y$ .

9. What is *math* in the following Python code ?

```
>>> from math import log :
```

- (a) A function. (b) A variable.  
(c) A module. (d) A class.

10. 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 ?

11. Write an alternative expression for the Python statement : `>>> n * = 10.`

12. Write an example of multiple assignment.

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

### Section B

*Answer all nine questions.*

13. What are the sources of error in numerical computation ?

14. Show how the *while* statement can be used in Python ?

15. Write a python program to add an element 10 to a list  $x = [1, 2, 3]$  and to print that element.

16. Write the syntaxes for importing a module and sub module from Python library.

17. Explain the difference between list and tuple.

18. What will be result if the following Python code is executed ?

```
for n in range (1000) :
```

```
 if n% 100 == 0 :
```

```
 print 'Step', n.
```

19. Give the intention of using the Python command : list extend (L).

20. Give the command to reverse the elements of the list, in place.

21. How will you use the value of  $\pi$  from the Python module ?

( $9 \times 1 = 9$  weightage)

### Section C

*Answer any five from seven questions.*

22. A root of  $f(x) = x^3 - 10x^2 + 5 = 0$  lies close to  $x = 0.7$ . Write a Python program to compute this root with the Newton-Raphson method.

23. Illustrate how the *break* and *continue* statements can be used in Python ?

Turn over

24. Write a Python program to sum the series :

$$\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$$

25. Write a Python program to simulate *two* dimensional projectile motion of a body moving under gravity. Use Euler's method.
26. Write a Python program to integrate  $f(x) = x^3$  using Simpson's rule.
27. Write a Python program to find the solution of second order differential equation using Runge-Kutta method, taking the example of simple harmonic oscillator problem.
28. The following table given the values of density of saturated water vapour for various temperatures of saturated steam. Find by interpolation formula, the densities when the temperatures are 1500°C and 2250°C respectively :

|          |     |     |     |     |     |
|----------|-----|-----|-----|-----|-----|
| T (°C)   | 100 | 150 | 200 | 250 | 300 |
| p (g/cc) | 958 | 917 | 865 | 799 | 712 |

(5 × 2 = 10 weightage)

#### Section D

*Answer any two from three questions.*

29. (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) Write a Python program for solving the equation  $xe^x = 3$  correct to *three* decimals using bisection method.
30. Write a program to obtain the numerical solution for the motion of a body falling in a viscous medium.
31. Use the second-order Runge-Kutta method to integrate  $dy/dt = \sin y$ ,  $y(0) = 1$  from  $x = 0$  to 0.5 in steps of  $h = 0.1$ . Keep *four* decimal places in the computations.

(2 × 4 = 8 weightage)

C 40406

(Pages : 4)

Name.....

Reg. No.....

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.

- Which among the following is NOT true about Python ?
  - Python is a high-level language.
  - Python is a compiler based language.
  - Python is an interpreted language.
  - Python is a portable language.
- Which among the following is a valid Python variable name ?
  - yield@xy.
  - del.
  - yield.
  - del\_123.
- 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
```

  - 100.
  - 212.
  - 132.
  - 32.
- 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 :
  - 5.
  - 8.
  - 32.
  - 40.

Turn over

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  $A = 10 \log_{10} \left( \frac{P_o}{P_i} \right)$  is \_\_\_\_\_.
8. The result of the Python statement `>>> 9 * 1 ** 3` is equal to \_\_\_\_\_.
9. What is the result of the Python statement `>>> 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 `>>> 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
>>> 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 × 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)

D 40052

(Pages : 3)

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