

D 130251

(Pages : 3)

Name.....

Reg. No.....

**FIFTH SEMESTER (CBCSS—U.G.) DEGREE EXAMINATION
NOVEMBER 2025**

Physics/Applied Physics

PHY 5B 06/APH 5B 06—COMPUTATIONAL PHYSICS

(2019 Syllabus)

Time : Two Hours

Maximum : 60 Marks

*The symbols used in this question paper have their usual meanings.***Section A (Short Answer Type)***Answer **all** questions in two **or** three sentences.**Each correct answer carries a maximum 2 marks.*

1. Write a python program to input a number and print it.
2. Differentiate *int* variable and *float* variable in python. How one type of variable is changed to the other ?
3. How do you add single line and multiple line comments in python ?
4. What are lists and tuples in python ?
5. Write down Taylor series expansion for a function $f(x)$ around x_0 .
6. Differentiate analytical and numerical solutions ?
7. Write the output of the following in python.
 - (a) `7 / 2`.
 - (b) `7 // 2`.
8. How do you create a two dimensional array using Numpy ? Give an example.

Turn over

9. Write the output of the following commands

```
b = "Hello"
print(b[2:5])
print(b[::-1])
```

10. Write a program, using a function to read angle in radian and convert it into degrees.
11. Write a program to create an array [1, 6, 11, 16.....46] using Numpy.
12. How do you label axes and choose line styles in plots using Matplotlib.

(Ceiling - 20)

Section B (Paragraph / Problem Type)

Answer all questions in a paragraph of about **half a page to one page**, each correct answer carries a maximum of 5 marks.

13. Write a program to count the number of vowels in a string read from input.
14. Using bisection method to find the real root of the equation $x^2 - 6x + 1 = 0$ between 0 and 1.
15. Evaluate $f(15)$, given the following table of values using Newton's forward difference interpolation.

X	:	10	20	30	40	50
$y = f(x)$:	46	66	81	93	101

16. Write a python program to read a decimal number and convert it into binary.
17. Write a program to solve $y' = -\sin(x)$, given $y(0) = 1$. Add code to plot the solution.
18. Evaluate $1 = \int_0^1 \frac{1}{1+x} dx$ using the Trapezoidal rule taking step size $h = 0.125$. Write the algorithm for the method.
19. Write a program to graphically simulate the projectile motion.

(Ceiling - 30)

Section C (Essay Type)

Essays - Answer in about two pages, any one question.

The question carries 10 marks.

20. Explain Least square curve fitting method and obtain the equations for fitting straight lines. Fit a straight line to the following data.

x	:	0.5	1.0	1.5	2.0	2.5	3.0
y	:	15	17	19	14	10	7

21. Given $\frac{dy}{dx} = x^2 - y$, $y(0) = 1$. find $y(0.1)$ correct to 3 decimal places using Euler method and Runge Kutta method. Write programs for both the methods.

(1 × 10 = 10 marks)

D 110234

(Pages : 2)

Name.....

Reg. No.....

**FIFTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2024**

Physics/Applied Physics

PHY 5B 06/APH 5B 06—COMPUTATIONAL PHYSICS

(2019 Admission onwards)

Time : Two Hours

Maximum : 60 Marks

*The symbols used in this question paper have their usual meanings.***Section A (Short Answer Type)***Answer all questions in two or three sentences.
Each correct answer carries a maximum 2 marks.*

1. What is an algorithm ? Write an algorithm to read two numbers and print their sum.
2. What are the different data types in python ?
3. How to add comments in python. What is the importance of comments in programming ?
4. What is a tuple ? How is it different from 'list'.
5. Write down Newton-Raphson formula.
6. What is the significance of computers in numerical simulations ?
7. Write down the output of the following :
 - (a) $3.4/3$.
 - (b) $3.4 \% 3$.
8. How do you create a two dimensional array using Numpy ? Give an example.
9. Write the output of the following commands
 - (a) `print("hello", "world", sep="---")`.
 - (b) `x=2; x+=2; print(x)`.
10. Write a program, using a function to read a velocity in kilometers per hour and print it in meters per second.

Turn over

11. Write a program to create a one dimensional array of numbers from 0 to 9 using numpy.
 12. Write down the commands for labeling axes and choosing line styles in plots using Matplotlib.
- (Ceiling - 20)

Section B (Paragraph / Problem Type)

(Answer **all** questions in a paragraph of about **half a page to one page**, each correct answer carries a maximum of 5 marks).

13. Write a program to draw the position time graph for a freely falling object.
14. Find the real root of the equation $x^3 - x - 11 = 0$ by using the bisection method.
15. Apply Runge Kutta method to find an approximate value of $y(0.2) = 0$, given $y' = x + y$ and $y(0) = 1$.
16. Write a python program to read two 3×3 matrices and print the matrix product of them. Write a program using Numpy for the same.
17. Write a program to solve $y' = \cos(x)$, given $y(0) = 0$. Add code to plot the solution.
18. Evaluate $I = \int_0^6 \frac{1}{1+x} dx$ using Simpson's rule.
19. Write a program to graphically simulate the radioactive decay of an element where initial quantity and half life is given.

(Ceiling - 30)

Section C (Essay Type)

*Essays - Answer in about **two pages**, any one question.*

The question carries 10 marks.

20. Explain Newton's interpolation formula. The population of a town in the census is as given below. Estimate the population for the year 1965 using Newton's forward interpolation formula.

Year	:	1961	1971	1981	1991	2001
Population	:	46	66	81	93	101

21. Given $\frac{dy}{dx} = x^2 - y$, $y(0) = 1$, find $y(0.1)$ correct to 3 decimal places using Euler method and modified euler method. Write programs for both the methods.

(1 × 10 = 10 marks)

D 50690

(Pages : 2)

Name.....

Reg. No.....

**FIFTH SEMESTER (CBCSS-UG) DEGREE EXAMINATION
NOVEMBER 2023**

Physics/Applied Physics

PHY 5B 06/APH 5B 06—COMPUTATIONAL PHYSICS

(2019 Admission onwards)

Time : Two Hours

Maximum : 60 Marks

Section A (Short Answer Type)

*Answer all questions in two or three sentences,
each correct answer carries a maximum of 2 marks.*

1. Differentiate between compilers and interpreters.
2. What are modules ?
3. Define slicing operation in a list with one example.
4. Write a python program to calculate circumference of a circle.
5. Write the syntax of linspace function in numpy module.
6. What are vectorized functions ?
7. Write down Newton - Raphson formula.
8. Write down Forward difference table.
9. Discuss Modified Euler's method.
10. Discuss the significance of computer in numerical methods.
11. What are polar plots ?
12. Discuss the accuracy consideration in simulation.

(Ceiling 20)

Section B (Paragraph / Problem type)

*Answer all questions in a paragraph of about half a page to one page,
each correct answer carries a maximum of 5 marks.*

13. Find the real root of the equation $f(x) = x^3 - x - 1 = 0$ using bisection method.
14. Discuss Simpsons 1/3 rule.
15. Write a note on conditional execution in python.
16. Write a program to print the multiplication table of 8.

Turn over

17. Write down the functions used for finding cross and dot products in python. Write a program to demonstrate the dot and cross products.
18. Write a python program to simulate motion of a body dropped into a highly viscous medium.
19. Write a note on graphical simulation; take radioactive decay as an example.

(Ceiling 30)

Section C (Essay type)

*Answer in about two page, any **one** question,
The correct answer carries 10 marks.*

20. What do you mean by curve fitting ? Discuss Curve fitting procedure to fit a straight line through given data points.
21. Write an essay on operators used in python language. List the operators according to their precedence.

(1 × 10 =10 marks)

D 30584

(Pages : 2)

Name.....

Reg. No.....

**FIFTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2022**

Physics/Applied Physics

PHY 5B 06/APH 5B 06—COMPUTATIONAL PHYSICS

(2019 Admission onwards)

Time : Two Hours

Maximum : 60 Marks

Section A (Short Answer Type)

*Answer all questions in two or three sentences.
Each correct answer carries a maximum of 2 marks.*

1. Define functions in Python.
2. Differentiate between interactive mode and script mode used in Python.
3. Modify the expression $\text{print } 5 + 3 * 2$ to get the result of 16.
4. What is meant by indentation ?
5. Discuss any two functions to create arrays in Python.
6. Write a note on matplotlib module.
7. Write down Forward difference table.
8. Write down Newton's forward interpolation formula.
9. Write down Taylor series expansion of $\sin x$
10. Write a python program to plot $\cos x$ using `plot()`.
11. Discuss the accuracy consideration in simulation.
12. Write the significance of computer in numerical methods.

(Ceiling 20)

Section B (Paragraph / Problem Type)

*Answer all questions in a paragraph of about half a page to one page.
Each correct answer carries a maximum of 5 marks.*

13. Write a program to plot a circle using the `polar()` function.
14. Discuss second order Runge-Kutta method.

Turn over

15. Write a Python program to create a 3×3 matrix and find its inverse.
16. Write a program to convert Fahrenheit to Celcius.
17. Find the cubic polynomial which takes the following values
 $y(0) = 1, y(1) = 0, y(2) = 1$ and $y(3) = 10$. Obtain $y(4)$ using Newton's forward interpolation formula.
18. Write a note on graphical simulation ; take a horizontally thrown projectile as an example.
19. Write a Python program to simulate motion of a freely falling object.

(Ceiling 30)

Section C (Essay Type)

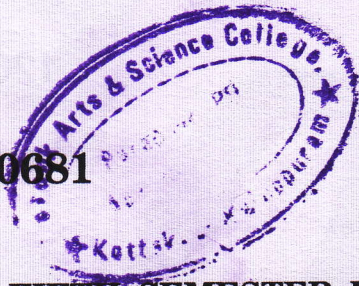
*Answer in about **two pages**, any **one** question.*

Each correct answer carries 10 marks.

20. Write an essay on different data types in Python.
21. Obtain Trapezoidal rule and Simpson's 1/3 rule for numerical integration.

(1 × 10 = 10 marks)

D 10681



(Pages : 2)

Name.....

Reg. No.....

12006

FIFTH SEMESTER U.G. DEGREE EXAMINATION, NOVEMBER 2021

(CBCSS—UG)

Physics/Applied Physics

PHY 5B 06/APH 5B 06—COMPUTATIONAL PHYSICS

(2019 Admissions)

Time : Two Hours

Maximum : 60 Marks

The symbols used in question paper have their usual meanings.

Section A (Short Answer Type)

*Answer at least **eight** questions.*

Each question carries 3 marks.

All questions can be attended.

Overall Ceiling 24.

1. Identify the functional differences of the Compiler and the Interpreter in the context of high-level computer languages.
2. Write an algorithm to check whether a given number is odd or even.
3. List the different datatypes in Python.
4. Write a Python program to print the multiplication table of 9 having 20 rows using *while* loop.
5. What is a *tuple* ? How it is different from *list* ?
6. Discuss about the functional differences of *break* and *continue* statements in Python.
7. Write a Python program to plot the function $y = \sin x$ within the region 0 to 2π .
8. Write a Python program to create a 3×2 matrix having random numbers ranging between 0 and 1 as elements.
9. Explain the least squares curve fitting procedures.
10. Construct a forward difference table for the following data :

x	:	0	1	2	3	4
y	:	1	3	9	27	81
11. How the subintervals width is associated with the error in Trapezoidal rule and Simpson's 1/3 rule for numerical integration ?
12. Discuss the advantages of numerical methods over analytical methods.

(8 × 3 = 24 marks)

Turn over

12006

Section B (Paragraph/Problem Type)

Answer at least five questions.

Each question carries 5 marks.

All questions can be attended.

Overall Ceiling 25.

13. Write a Python program to print the squares of the integer numbers within the range entered by the user.
14. Discuss about different built-in operations on *list* in Python with the help of examples.
15. Write a program to create two 3×3 matrices and add them.
16. The table below gives the temperature T (in $^{\circ}\text{C}$) and length l (in mm) of a heated rod. If $l = a_0 + a_1T$, find the best value for a_0 and a_1 :
- | | | | | | | | |
|------------------------------|---|-------|-------|-------|-------|-------|-------|
| T (in $^{\circ}\text{C}$) | : | 20 | 30 | 40 | 50 | 60 | 70 |
| l (in mm) | : | 800.3 | 800.4 | 800.6 | 800.7 | 800.9 | 801.0 |
17. Using Newtons forward interpolation formula obtain $y(2)$, given that, $y(1) = 24$, $y(3) = 120$, $y(5) = 336$, and $y(7) = 720$.
18. Explain the Bisection method for finding the solutions of algebraic equations.
19. Write a Python program to simulate the motion of a body dropped into a highly viscous medium.

(5 × 5 = 25 marks)

Section C (Essay Type)

Answer any one question.

The question carries 11 marks.

20. (a) Find $y(0.2)$ for $y' = (x - y)/2$, $y(0) = 1$, with step length 0.1 using Runge-Kutta method.
- (b) Write a Python program to simulate a two-dimensional projectile motion using Euler's method in a table.
21. (a) Explain the Newton-Raphson method to find the roots of a function.
- (b) Write a Python program to simulate a freely falling body using Euler's method in a table.

(1 × 11 = 11 marks)