

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

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Name.....

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**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)