T – 6387

Reg. No. : ....

Name : ....

Second Semester M.Sc. Degree Examination, September 2024

Physics/Physics with specialization in Space Physics/Physics with specialization in Nano Science

PHSP 523/PHNS 523/PH 223 : COMPUTER SCIENCE AND NUMERICAL TECHNIQUES

(2020 Admission Onwards)

Time : 3 Hours

Max. Marks : 75

SECTION – A

Answer any **five** questions. **Each** question carries **3** marks.

1. Write a short note on computer memory.

2. In Python, you have to store several fundamental constants in an array. What is the advantage of using tuples over lists for this purpose?

3. What is one use of the accumulator in the 8085 microprocessor? How can data be copied from a memory location into the accumulator?

4. Briefly discuss built-in functions in C++ with an example.

5. Write a C++ program demonstrating the declaration of a global variable. Can functions from multiple files access this variable?

6. What are classes in C++?

7. Provide an approach to reduce error during interpolation.

8. Write down the equation for change in angular momentum $\frac{dL}{dt} = \tau(t)$ using the backward difference scheme.

(5 × 3 = 15 Marks)

P.T.O.

SECTION – B

Answer any **three** questions. **Each** question carries **15** marks.

9. (a) Provide the functional pin diagram of the 8085 microprocessor and discuss the function of any four pins. **7**

(b) Briefly explain data transfer and arithmetic instructions in the 8085 microprocessor. Provide the syntax and explanation for any five such instructions. **8**

OR

10. (a) Write a Python program to create a list of the first 100 natural numbers and then find the sum of these numbers. **7**

(b) Write a Python function to multiply two square matrices stored as lists. **8**

11. (a) Write a short note on file handling in C++ with examples. **7**

(b) Write a C++ program for reading the heights of people from a group from a file. Print the heights after ranking them in descending order. **8**

OR

12. (a) Discuss briefly arrays and storage classes in C++ with one example each. **6**

(b) Write a C++ program to create a class "mobile-phone" with attributes "brand" and "price". Also, write a method to print the brand and price of the phone. Then, create an object "phone1" and set the above attributes to the object. Use the method to print the brand and price of "phone1". **9**

13. (a) Compute the integral $\int_{2}^{2.4} e^x$ using the Trapezoidal rule using the step size 0.2. **7**

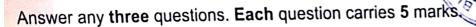(b) Demonstrate that the accuracy of the above result improves if a smaller step size (say 0.1) is chosen. **8**

OR

14. (a) Compare the Euler's and Runge-Kutta methods for finding the numerical solutions to differential equations. **6**

(b) Given $\dfrac{dy}{dx} = -2y$ the initial condition $y(0) = 1$, find $y(0.3)$, using the Euler's method and a step size of 0.1. Compare with the exact solution $y(x) = e^{-2x}$. **9**

(3 × 15 = 45 Marks)

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SECTION – C

Answer any **three** questions. **Each** question carries **5 marks**.

15. In the 8085 microprocessor, the accumulator initially contains the 8-bit value 0011 1011 (hexadecimal 3Bh). Write an assembly language code to load register B with the 8-bit value 1001 0011 (hexadecimal 93h) and then perform a logical AND operation between the contents of the accumulator and register B. What will the resulting value be in the accumulator after the operation?

16. Write a Python program to read numbers from a file and sum up the first ten numbers. Assume that there are more than ten numbers in the file.

17. Write a C++ program that allows the user to enter a number between 1 and 7 and uses a switch statement to print the corresponding day of the week.

18. Write a program in C++ for finding the largest of 3 numbers.

19. The table tabulates exp(x) as a function of x. Using the Lagrange second-order interpolation formula, compute exp(1. 3).

x	exp(x)
0.00	1.00
0.40	1.49
0.80	2.23
1.20	3.32
1.60	4.95
2.00	7.39

20. Find the solution to the system of linear equations using the Gauss-Jordan method.

$$7x + y = 17$$
$$3x - y = 3$$

(3 × 5 = 15 Marks)

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