



M 26482

Reg. No. :

Name :

**I Semester M.A./M.Sc./M.Com. Degree (Reg./Sup./Imp.)
Examination, November 2014
(2013 and earlier Admn.)
PHYSICS**

PH 104 : Numerical Techniques and Computer Programming

Time : 3 Hours

Max. Marks : 50

- Instructions :** 1) Answer **any two** questions from Section A. **Each** question carries **10** marks.
2) Answer **any five** questions from Section B. **Each** question carries **3** marks.
3) Answer **any three** questions from Section C. **Each** question carries **5** marks.

SECTION – A

1. a) Obtain the Newtons forward difference interpolation formula. **5**
b) Explain the principle of least squares curve fitting. **5**
2. Derive the general formula for numerical integration and obtain the Simpson's $\frac{1}{3}$ rule.
3. a) Explain how arrays are handled in FORTRAN. **5**
b) Write down FORTRAN statements to read the elements of an $M \times N$ matrix. **5**
4. Explain how conditional and unconditional transfer of control is implemented in FORTRAN programs. Give examples. **(2×10=20)**

SECTION – B

5. Explain the bisection method for finding the root of transcendental and algebraic equations.
6. Show the construction of a forward difference table for tabulated functions.

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7. Explain the Euler's method for the solution of ordinary differential equations.
8. Explain the least squares curve fitting procedure for an exponential function of the form $y = ae^{bx}$.
9. Distinguish between logical IF statement and arithmetic IF statement in FORTRAN. Give examples.
10. What are library functions ? Explain any three library functions in FORTRAN.
11. What are the file operations in FORTRAN ? Write down the FORTRAN statements to create a new file named 'EMPLOY.DAT'.
12. What do you mean by constructors and destructors in C++ ? (5×3=15)

SECTION - C

13. Find the two roots of the equation $x^2 - 5x + 6 = 0$ using Newton-Raphson method. Start with $x_0 = 0.2$ and $x_0 = 4$ and carry out five iterations.
14. Find the Lagrange interpolation polynomial to fit the following data and find the value of $e^{1.5}$:

x	0	1	2	3
$e^x - 1$	0	1.7183	6.3891	19.0855
15. Find from the following table, the area bounded by the curve and x-axis from $x = 7.47$ to $x = 7.52$

x	7.47	7.48	7.49	7.50	7.51	7.52
$f(x)$	1.93	1.95	1.98	2.01	2.03	2.06
16. Write a FORTRAN program to compute the cartesian coordinates to spherical coordinates using the relation

$$r = \sqrt{x^2 + y^2 + z^2} \quad \theta = \tan^{-1} \sqrt{\frac{x^2 + y^2}{z}} \quad \phi = \tan^{-1} \frac{y}{x}$$

17. Write a C++ function that returns the value of $\exp(-x^2/2)$, when x is supplied from the calling function. (3×5=15)