PG/IS/PHY/PH - 1103/09

2008

PHYSICS

PAPER—PH - 1103 (A+B)

Full Marks : 40

Time : 2 hours

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

GROUP—A

[*Marks* : 20]

(*Computer Programming*)

Answer **Q.No.1** and any *one* from the rest

1. Answer any *five* bits : 2 x 5

(*a*) What are the major criteria of an algorithm ?

(*b*) Define Cache memory.

(*c*) What is machine language? What are the advantages of this language?

(*d*) What is the difference between impact and non-impact type printer?

(*e*) Why compiler is better than interpreter?

(*f*) Define 'arithmetic-if' and 'logical-if' in FORTRAN.

(*g*) Write the following algebraic expressions in equivalent FORTRAN expression :

(*i*) $a = x^{1/3} + \log | x + y | + \frac{x}{y}$

(*ii*) $b = e^{x} + y^{5} + \sin^{-1} x.$

(*h*) Draw a flowchart to find the value of $n!$.

2. Write a program in FORTRAN to find the 2nd lowest number for the set of integer numbers using an array. 10

3. Write a program in FORTRAN to find the sum of all prime numbers between 1 to 50. 10

GROUP—B

[*Marks*: 20]

(*Numerical Analysis*)

Answer **Q.No.1** and any *one* from the rest

1. Answer any *five* questions : 2×5

(*a*) Define the terms "significant figure" and "absolute error".

(*b*) Define differences of a function $f(x)$.

(*c*) Round the number $x = 2{\cdot}2514$ to three significant figures and find the absolute error.

(*d*) When $f(x) = ax^2 + bx + c$, a, b, c being constant show that $\Delta^3 f(x) = 0$.

(*e*) Explain reasons for calling Newton-Raphson method a better method than the method of ordinary iteration.

(*f*) Give the geometrical interpretation of the Regula-Falsi method.

(*g*) State the condition of convergence of the Gauss-Seidel method for numerical solution of a system of n linear equations with n unknowns.

(*h*) Show that the rate of convergence of Newton-Raphson method is quadratic.

2. (*a*) Find from the following table the value of y when $x = 1{\cdot}45$.

x	1·0	1·1	1·2	1·3	1·4	1·5
y	·24197	·21785	·19414	·17137	·14973	·12952

(*b*) Compute the integral

$$\int_0^1 \frac{dx}{1+x^2}$$

by Simpson's $\frac{1}{3}$ rule and then use it to compare the value of π.

(*c*) Given :

$$\frac{dy}{dx} = x^2 + y \text{ with } y(0) = 1,$$

determine $y(0{\cdot}02)$. 3 + 4 + 3

3. (*a*) Solve the following system of equations by the method of elimination :

$$\begin{aligned} x_1 + 2x_2 + x_3 &= 0 \\ 2x_1 + 2x_2 + 3x_3 &= 0 \\ -x_1 - 3x_2 &= 2. \end{aligned}$$

(*b*) Find the least square parabolic fit of the form $y = ax^2 + bx + c$ to the following data :

x	-3	-1	1	3
y	15	5	1	5

(*c*) Find the eigenvalues of the matrix :

$$A = \begin{bmatrix} 3 & 2 & 5 \\ 6 & -5 & 3 \\ -24 & 38 & 2 \end{bmatrix}.$$

$4 + 3 + 3$