Seat No. : _____

# AG-125

**April-2015**

## M.Sc., Sem.-IV

## PHY-508 : Physics

## Numerical Techniques and C-programming

**Time : 3 Hours]** **[Max. Marks : 70**

**Instructions :** (i) Numbers to the right margin indicate full marks of the respective question.
(ii) Symbols and terminology have their traditional meaning.
(iii) Use scientific calculator, if required.

1. (a) Explain Jacobi iterative method for finding the solution of simultaneous equations. What are the limitations of this method ? **7**

**OR**

Solve the following set of simultaneous equations by Gauss-Seidal method :

$10w - 2x - y - z = 3$

$-2w + 10x - y - z = 15$

$-w - 2x - y - z = 27$

$-w - x - 2y + 10z = -9$

(b) What are the four possible solution conditions of a system of linear simultaneous equations ? Explain each of them with an illustration. **7**

**OR**

Solve the following set of equations by factorization method :

$3x + 2y + 7z = 4$

$2x + 3y + z = 5$

$3x + 4y + z = 7$

2. (a) Explain in detail the graphical method and laws reducible to the linear law to evaluate the unknown involved in the empirical relation. **7**

**OR**

Find a second degree parabola of best fit to the following data, using the method of least square : **7**

| $x$ | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 4.0 |
|---|---|---|---|---|---|---|
| y | 1.1 | 1.3 | 1.6 | 2.0 | 2.7 | 4.1 |

(b) For the following set of observations, fit the relation $y = ax^n$ to obtain a and n using method of group averages : **7**

| $x$ | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 |
|---|---|---|---|---|---|---|---|---|
| y | 1.06 | 1.33 | 1.52 | 1.68 | 1.81 | 1.91 | 2.01 | 2.11 |

**OR**

Describe how to find three known (a, b, c) of following relations :

(i) $y = a + bx + cx^2$

(ii) $y = a + bx^c$

3. (a) Explain with illustration, the concept of structures within structures in C-programming. **7**

**OR**

Write short note on I/O operations on files in C-programming.

(b) What do you understand by a union ? Explain how members of a union are accessed using a program code. In which applications union can be useful ? **7**

**OR**

A file named "DATA" contains a series of integer numbers. Code a program to read these numbers and then write all odd numbers to a file to be called "ODD" and all even numbers to a file to be called "EVEN".

4. (a) Describe Monte Carlo method for numerical integration and write a C-program of solving $y = \int_a^b f(x)\,dx$ using this method. **7**

**OR**

Write C-program to solve $Y = a_0 + a_1X + a_2X^2$ using Bisection method.

(b) Using Trepezoidal method, write a C-program to solve following integration. **7**

$$Y = \int_0^1 \frac{\sin x}{x}\,dx.$$

**OR**

Write a C-program to solve following three simultaneous equations using Gauss-Seidal method.

$a_{11}x_1 + a_{12}x_2 + a_{13}x_3 = b_1$

$a_{21}x_1 + a_{22}x_2 + a_{23}x_3 = b_2$

$a_{31}x_1 + a_{32}x_2 + a_{33}x_3 = b_3$

5. Answer the followings : (each of **one** marks) **14**

(i) Factorization of method is applicable only to

(a) m × n matrix (m≠n).

(b) every square matrix.

(c) every square matrix, provided all the principal minors of the matrix are non-singular.

(d) every square matrix, provided all the principal minors of the matrix are singular.

(ii) $A = \begin{bmatrix} 3 & 2 & 7 \\ 7 & 6 & 6 \\ 3 & 4 & 1 \end{bmatrix}$

The principal minors of the above matrix A are _____.

(a) 3, 4, 38 (b) 3, 6, 1 (c) 3, 6, 7 (d) 3, 2, 1

(iii) $A = \begin{bmatrix} 8 & 2 & 7 \\ 2 & 3 & 1 \\ 3 & 4 & 1 \end{bmatrix}$

The lower triangular matrix coefficient $l_{21}$ for the above matrix A is _____.

(a) 1/3 (b) 2 (c) 2/8 (d) 4

(iv) III-conditioning of a system is usually expected when _____.

(a) the determinant of the coefficient matrix is large.

(b) the determinant of the coefficient matrix is small.

(c) the small change in the coefficients of the equations results in a small change in the values of the unknowns.

(d) the determinant of the coefficient matrix is zero.

(v) Which one of the following method is the iterative method of solving the linear simultaneous equations ?

(a) Cramer's rule (b) Gauss elimination method

(c) Relaxation method (d) Doolittle method

(vi) Let $(x_1, y_1), (x_2, y_2), (x_3, y_3), \ldots\ldots (x_n, y_n)$ be the set of n observations such that

$x_2 - x_1 = x_3 - x_2 = \ldots\ldots = h$

Then the third moment is defined as _____.

(a) $h\Sigma x$ (b) $h\Sigma y$ (c) $h\Sigma xy$ (d) $h\Sigma x^2 y$

(vii) How many times below for loop will be executed ?
(assume program is correct)

```
#include<stdio.h>
int main()
{
int i=0;
for(;;)
    printf("%d",i);
return 0;
}
```

(a) infinite times (b) zero time

(c) one time (d) 100 times

(viii) What will be output of the following C-program ?

```
#include<stdio.h>
int main()
{
int i=4,x;
x=++i + ++i + ++i;
printf("%d",x);
return 0;
}
```

(a) 4 (b) 12 (c) 21 (d) 40

(ix) We can insert pre written code in a C-program by using _____.

(a) #read (b) #get (c) #include (d) #put

(x) What is correct order of precedence in C ?

(a) Addition, Division, Modulus

(b) Addition, Modulus, Division

(c) Multiplication, Substration, Modulus

(d) Modulus, Multiplication, Substration

(xi) What is the purpose of getc() ?

(a) read a character from STDIN (b) read a character from a file

(c) read all file (d) read file random

(xii) The getw() function is used to read a _____ from a file.

(a) character (b) integer value

(c) float value (d) word

(xiii) Which function returns the next character from stream, EOF if the end of file is reached, or if there is an error ?

(a) fgetc () (b) fgets () (c) fputc () (d) fwrite ()

(xiv) rand () function returns _____.

(a) float value (b) integer value

(c) any type (d) none of above