



Seat No. : \_\_\_\_\_

**XZ-110**

**April-2013**

**M.Sc. Sem.-IV**

**508 – PHYSICS**

**(Numerical techniques and C-programming)**

**Time : 3 Hours]**

**[Max. Marks : 70**

- Instructions :** (1) Numbers to the right margin indicate full marks of the respective question.  
(2) Symbols and terminology have their traditional meaning.  
(3) Use scientific calculator, if required.

1. (a) Apply Factorization method to solve the following simultaneous linear equations : **7**

$$13x + 2y + 7z = 4$$

$$2x + 3y + z = 5$$

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

**OR**

Discuss, in detailed, the Jacobi's iterative method to obtain the solution of a system of linear simultaneous equations.

- (b) What are ill-conditioned equations ? Explain how to improve accuracy of an ill-conditioned system ? **7**

**OR**

Apply Relaxation method to solve the following simultaneous linear equations :

$$9x - 2y + z = 50$$

$$x + 5y - 3z = 18$$

$$-2x + 2y + 7z = 19$$

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**

Discuss the method of group averages.

- (b) Explain how one can obtain three constants (a, b and c) from the given set of data for the relations.

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

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

(iii)  $y = a + b \exp(cx)$

**OR**

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

<b>x</b>	1.0	1.5	2.0	2.5	3.0	4.0
<b>y</b>	1.1	1.3	1.6	2.0	2.7	4.1

3. (a) With proper examples, explain arrays within structures, structures within structure and size of the structures. 7

**OR**

What are the roles of the “function” in the C-programming ? How functions are used in the C-program ? Write the structure of the C-program which uses functions.

- (b) Write the concept and applications of Unions in C-programming. 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) What is meant by solution of an ordinary differential equation ? Write a C-program which is to be used to find out the value of  $y(4)$  for the equation

$$\frac{dy}{dx} = \frac{x^2 + 1}{y^2 + 1} \text{ with } y(1) = 1 \text{ using RK4 method.}$$

**OR**

Using Trepzoidal method, write a C-programme to solve following integration. 7

$$y = \int_0^1 \frac{\sin x}{x} dx$$

- (b) Write C-programme for solving the simultaneous algebraic equations by Gauss-Seidal method. 7

**OR**

Discuss the Newton Raphson method to integrate a function. Write a code in C language to integrate the following function within the specified limits :

$$y = \int_0^1 \frac{2x}{(2x + 1)^3} dx$$

5. Answer the following : 14

- (i) What is meant by a system of linear equations ?
- (ii) What are trivial and non-trivial solutions ?
- (iii) Give examples of homogeneous and non-homogeneous equations.

- (iv) What is geometric progression and arithmetic progression in the series ?
  - (v) What are the drawbacks of method of group averages ?
  - (vi) Obtain straight line fit equation for  $y = bx/[x(x + a)]$  where a and b are constants.
  - (vii) Obtain straight line fit equation for  $xy^a = b$  where a and b are constants.
  - (viii) What is fseek() function ?
  - (ix) Write a statement to move the file pointer 5 positions forward from the starting of the file.
  - (x) What are the necessities of header files in C-programming ?
  - (xi) What is the difference between getw( ) and gets( ) functions in C-programming ?
  - (xii) What is the difference between X++ and ++X in C-programming ?
  - (xiii) What is the main concept of Monte-Carlo method to solve integration, numerically ?
  - (xiv) How long integers are defined in C-programming ?
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