2/91

1204E169

Candidate's Seat No :_____

M.Sc. Sem.-4 Examination

508

Physics

April-2025

Time : 2-30 Hours] **[Max. Marks : 70**

Q.1 (A) Deliberate four possible solution conditions of a system of linear simultaneous equations. Discuss each of them with an illustration. [07]

(B) Using Jacobi's method, find all the eigen values and the eigen vectors of the matrix. [07]

$$A = \begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}.$$

OR

Q.1 (A) Apply Gauss elimination method to solve the equations [07]
$x + 4y - z = -5$, $x + y - 6z = -12$ and $3x - y - z = 4$.

(B) Explain the Newton-Raphson method's benefits and drawbacks for resolving non-linear simultaneous equations. [07]

Q.2 (A) The following values of x and y are supposed to follow the law $y = ax^2 + b\log_{10}x$. Find graphically the most probable values of the constants a and b. [07]

x	2.85	3.88	4.66	5.69	6.65	7.77	8.67
y	16.7	26.4	35.1	47.5	60.6	77.5	93.4

(B) Explain the group averages method. Put its limitations in writing. [07]

OR

Q.2 (A) An experiment give the following values: [07]

v (ft/min)	350	400	500	600
t (min)	61	26	7	2.6

It is known that v and t are connected by the relation $v = at^b$. Find the best possible values of a and b.

(B) Explain method of moments. Using such method fit a straight line $y = a + bx$ to the following data. [07]

x	1	2	3	4
y	16	19	23	26

Q.3 (A) What are the characteristics of modular programming? Write a program demonstrating modular programming that calls at-least four functions. Write the advantages of modular programming. Also show the output of the program. [07]

(B) Write programs that demonstrate the use of [07]
(i) Functions with no arguments but return a value,
(ii) Functions that return multiple values.
Also show the output of the programs.

OR

Q.3 (A) Using the arrays as structure members, write a program to calculate the subject-wise and student-wise total, in three subjects for three students. Also show the output of the program. [07]

(P.T.O)

(B) Write a program to illustrate the use of indirection operator * pointing memory locations s, d and m to variables sum, difference and multiplication of two integers. Also show the output of the program. [07]

Q.4 (A) Develop 'C' program for solving differential equation using 4th order Runge-Kutta formulae given below with following conditions. Find y(0.2), if $y' = x + y$, y(0) = 1. [07]

(B) How would you decide the two initial values that are required for using the bisection method? Create a 'C' program for solving following nonlinear equation using the bisection method : $x^2 + x - 2 = 0$. [07]

OR

Q.4 (A) Write the basic concept of Simpson's 1/3 method for numerical integration. Write a program to integrate the following : $I = \int_a^b e^x dx$. Get limit values from user. [07]

(B) Discuss Monte Carlo Method with suitable example. [07]

Q.5 Answer in brief **Any Seven** questions from the following: (Each question is of **two** mark). [14]

(i) Differentiate direct and interactive method of solving simultaneous linear equation.

(ii) A matrix in which $a_{ij} = 0$ for $i \neq j$ is named _____.

(iii) The Gauss-Seidal iteration only converges when the coefficient matrix is diagonally dominant. (TRUE or FALSE)

(iv) Alter $y = ax^b + c$ in linear form.

(v) What is the linear form of $y = \frac{x}{ax+b}$?

(vi) In $y = a + bx$, $\Sigma x = 50$, $\Sigma y = 80$, $\Sigma xy = 1030$, $\Sigma x^2 = 750$ and n = 10 then estimate a and b.

(vii) What is the basic difference between Pass by Value and Pass by Pointers in C-programs?

(viii) In the function header **float quadratic (int a, int b, int c)**, **float** is called _____, **quadratic** is called _____ and **int a, int b, int c** represents _____, respectively.

A. function type, function name, and formal parameter list.
B. formal parameter list, function type, and function name.
C. function type, and function name, and formal parameter list.
function type, function name, and function statement.

(ix) The operator _____ immediately preceding a variable returns the address of the variable associated with it.

A. & B. * C. // D. #

(x) In the context of solution of a polynomial f(x) based on bisection method considering 'a' and 'b' are initial values if (f(a) * f(b) = 0), what does it mean?

(xi) While evaluating a definite integral by Trapezoidal rule, the accuracy can be increases by taking _____.

(xii) Consider the equation x2 - 4 = 0. Based on Newton-Raphson method for solution of the polynomial, if the initial guess value of x is 5, what will be next value of x?

***** PAPER ENDS *****