S.Y. M.Sc. Part-II (Physics) Third Semester Old

MSC231010 - Elective Physics Paper-VIII
Numerical Methods & Programming

P. Pages : 3 **GUG/W/18/2313**

Time : Three Hours * 1 8 0 7 * Max. Marks : 80

Notes : 1. All questions are compulsory.
2. All questions carry equal marks.

1. Either

a) Using Newton's Raphson's method, solve the following system of non linear equation **10**

$x^2 + y = 11$

$y^2 + x = 07$

b) What is meant by absolute and relative error? **6**
if y = (0.31x + 2.73) / (x + 0.35)
Where the coefficients are rounded off. Find the absolute and relative error in y when $x = 0.5 \pm 0.1$.

OR

e) Find the quadratic factor of the polynomial given by $x^3 - 2x^2 + x - 2 = 0$ using Bairstow's method. **6**

f) Apply Ramanujan's method, obtain the first eight convergents of following equations **10**

i) $x + x^3 = 1$ and ii) $x + x^2 + x^3 = 1$

2. Either

a) Using Gaussian elimination method, solve the system of equations **8**

$2x + y + z = 10$

$3x + 2y + 3z = 18$

$x + 4y + 9z = 16$

b) Solve the system of equations using Jacobi's method upto three significant figure **8**

$83x - 11y - 4z = 95$

$7x + 52y + 13z = 104$

$3x + 8y + 29z = 71$

OR

e) Solve the following equations using Gauss-Seidal method to three decimal places **8**

$9x_1 + 2x_2 + 4x_3 = 20$

$x_1 + 10x_2 + 4x_3 = 6$

$2x_1 - 4x_2 + 10x_3 = -15$

f) Solve the following system of equation by LU decomposition method **8**

$$2x + 3y + z = 9$$
$$x + 2y + 3z = 6$$
$$3x + y + 2z = 8$$

3. Either

a) Describe the following basic steps involved in finite element method as **8**

i) Discretization of the region

ii) Variational formulation over the element e for the two point boundary value problem defined by

$$\frac{d}{dx}\left[a(x)\frac{dy}{dx}\right] = -f(x), \qquad 0 < x < 1$$

with the boundary conditions, y(0) = 0

$$\left[a(x)\frac{dy}{dx}\right]_{x=1} = 0$$

b) Obtain the Euler's modified formula. **8**

OR

e) Use the Runge-Kutta fourth order method to fix the value of y when x = 1 given that y = 1 when x = 0 and that $\frac{dy}{dx} = \frac{y - x}{y + x}$ **6**

f) Write a short notes on - **10**

i) Crank-Nicolson formula and

ii) ADI method.

4. Either

a) What are strings? Give any four standard Library string functions and explain them with suitable example. **8**

b) Write short note on registers and static variables. **8**

OR

e) Explain **8**

a) Automatic storage class

b) Register storage class

c) Static storage class

d) External storage class.

f) What are arrays? How are they useful in programmes? Explain the different types of array in brief. **8**

5. Answer all the following.

a) Describe the Graeffe's root squaring method for the numerical solution of polynomial equation. **4**

b) Evaluate the determinant **4**
   i) With the help of second row and
   ii) With the help of third column

$$\begin{vmatrix} 1 & 0 & 4 \\ 3 & 5 & -1 \\ 0 & 1 & 2 \end{vmatrix}$$

c) Explain the following basic terminology of differential equation. **4**
   i) Order of differential equation.
   ii) Degree of differential equation.

d) In function, what is mean by call by value and call by reference. Explain with suitable examples. **4**

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