2024
M.Sc.
Fourth Semester
CORE – 11
PHYSICS
Course Code: MPHC 4.11
(Computational Physics)

Total Mark: 70 *Pass Mark: 28*
Time: 3 hours

Answer five *questions, taking* one *from each unit.*

UNIT–I

1. (a) One of the entry in the following table is incorrect and y is a cubic polynomial in x.
Use difference table to locate and correct the error. 7

x	0	1	2	3	4	5	6	7
y	25	21	18	18	27	45	76	123

(b) Find the root of the equation $x^3 - 2x - 5 = 0$, using bisection method, correct up to three decimal place. 7

2. (a) Find the root of the equation $x^4 - x - 10 = 0$, using Newton-Raphson method correct up to 3 decimal place. 7

(b) Find the missing term in following table using difference table. 7

x	2	3	4	5	6
y	45	49.2	54.1	__	67.4

UNIT–II

3. (a) Convert the following equations into matrix form
$x - 4y - z = -5$
$x + y - 6y = -12$
$3x - y - z = 4$
(i) Carry out partial pivoting and
(ii) Apply Gauss elimination method to find the value of x, y and z
3+5=8

(b) Solve the following equations using Jacobi's method (five iterations).

$4x + 2z = 4$

$5y + 2z = 3$

$5x + 4y + 10z = 2$ 6

4. (a) Find the eigen value and eigen vector of the following matrix. 6

$$A = \begin{bmatrix} 1 & -2 \\ -5 & 4 \end{bmatrix}$$

(b) Using Gauss-Seidel method, solve the following equation

$20x + y - 2z = 17$; $3x + 20y - z = -18$; $2x - 3y + 20z = 25$ 8

UNIT–III

5. (a) Using Sterling's formula, estimate the value of tan 16° 8

θ	:	0	5	10	15	20	25	30
tan θ	:	0	0.0875	0.1763	0.2679	0.3640	0.4663	0.5779

(b) By the method of least square, find the straight line that best fits the following data: 6

x	:	1	2	3	4	5
y	:	14	27	40	55	66

6. (a) The table gives the distance (x) of the visible horizon for the given height (y) above the Earth's surface :

x :	100	150	200	250	300	350	400
y :	10.63	13.03	15.04	16.81	18.42	19.90	21. 27

Using Newton interpolation formula, find the value of y when x is 160. 7

(b) Find the polynomial $f(x)$ by using Lagrange's formula and hence find $f(3)$ for the following: 5+2=7

x	:	0	1	2	5
$f(x)$	:	2	3	12	147

UNIT–IV

7. (a) Find $y'(0)$ and $y''(0)$ from the following table : 7

x :	0	1	2	3	4	5
y :	4	8	15	7	6	2

(b) Evaluate $\int_0^6 \frac{1}{1+x^2} dx$ by using taking $h = 1$ 7

(i) Trapezoidal rule

(ii) Simpson's 1/3 rule

8. (a) Using three point Gaussian quadture formula evaluate $\int_0^1 \frac{1}{1+x} dx$. 7

(b) From the table below, for what value of x, y is minimum? Also find the value of y. 7

x :	3	4	5	6	7	8
y :	0.205	0.240	0.259	0.262	0.250	0.224

UNIT–V

9. (a) Solve $\frac{dy}{dx} = 3x + y/2$; with $y(0) = 1$ and $h = 0.1$; find $y(0.1)$ using R-K 2nd order method. 7

(b) Evaluate $y(0.1)$ correct up to four decimal places using Taylor's series method, if $\frac{dy}{dx} = x^2 + y^2; y(0) = 1$. 7

10. Evaluate the function $u(x, y)$ satisfying the Laplace equation $\nabla^2 u = 0$ at the pivotal points of the figure shown below: 14