K23U 0515

Reg. No. : .....

Name : .....

VI Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/ Improvement) Examination, April 2023
(2019 and 2020 Admissions)
CORE COURSE IN MATHEMATICS
6B12MAT : Numerical Methods, Fourier Series and Partial Differential Equations

Time : 3 Hours

Max. Marks : 48

PART – A

Answer **any 4** questions. **Each** question carries **one** mark.

1. Forward difference operator $\Delta f(x_i) =$ _____
2. Using Picard's method, obtain a solution up to the second approximation to the equation $\frac{dy}{dx} = 2y - x$ such that $y(0) = 1$.
3. Define odd function and give an example.
4. Define a periodic function and find the period of $\cos\pi x$.
5. Write the Laplacian equation in Polar coordinates.

PART – B

Answer **any 8** questions. **Each** question carries **two** marks.

6. Find the Lagrange interpolation polynomial for the following data :

x	1	2	4
f(x)	1	7	61

7. Find the second divided difference of $f(x) = \frac{1}{x}$, using points x_0, x_1, x_3.
8. Show that $\mu = \sqrt{\left(1 + \frac{1}{4}\delta^2\right)}$.

P.T.O.

9. Obtain the approximate value of $y(1.2)$ for the initial value problem $y' = -2xy^2$, $y(1) = 1$ using Taylor series second order with step size $h = 0.1$.
10. Using Euler method, find $y(0.02)$, $y' = 2y$ with $y(0) = 1$ and $h = 0.01$.
11. Using Heun's method, find $y(0.2)$, $y' = x^2 + y^2$ with $y(0) = 1$ and $h = 0.1$.
12. State Euler formula for Fourier coefficients.
13. Find the Fourier series of $f(x) = x, -L < x < L, f(x + 2L) = f(x)$.
14. Verify that the function $u = x^2 + t^2$ is a solution of wave equation with suitable c.
15. Solve $u_{xx} - u = 0$.
16. Determine the type and normal form of the PDE $u_{xx} - 16u_{yy} = 0$.

PART – C

Answer **any four** questions. **Each** question carries **four** marks.

17. Find $\ln(9.2)$ with $n = 3$, using Lagrange interpolation formula with the given table :

x	9.0	9.5	10	11.0
ln x	2.19722	2.25129	2.30259	2.39790

18. Using divided differences interpolation, find f(x) as a polynomial if

x	– 3	– 2	– 1	1	2	3
f(x)	18	12	8	6	8	12

19. Construct Newton's Backward Interpolation, table and Interpolating polynomial for the data :

x	– 4	– 2	0	2	4	6
f(x)	– 139	– 21	1	23	141	451

20. Using Picard's method, obtain a solution up to the fourth approximation to the equation $\frac{dy}{dx} = y + x$ such that $y(0) = 1$.