QP CODE: 25020823

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Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE / MERCY CHANCE EXAMINATIONS, FEBRUARY 2025

Sixth Semester

CHOICE BASED CORE COURSE - MM6CBT03 - NUMERICAL ANALYSIS

Common for B.Sc Mathematics Model I & B.Sc Mathematics Model II Computer Science

2017 Admission Onwards

30FF4709

Time: 3 Hours Max. Marks : 80

Part A

*Answer any **ten** questions.*

*Each question carries **2** marks.*

1. Give the algorithm for bisection method.
2. Give the graphical representation of regula-falsi method.
3. What is generalized Newton's formula?
4. Explain Ramanujan's method to find a smallest root of the equation $f(x) = 0$.
5. What is polynomial interpolation?
6. What are higher order backward differences?
7. Derive the iterative formula for n^{th} shift operator.
8. What are the sufficient conditions for the existence of Fourier transform?
9. Show that for W_N defined in DFT, $W_{\frac{n}{2}} = W_N^2$.
10. Given the values of x and y as (0,2), (2,2), (4,-1), find $\frac{dy}{dx}$ at x=2.
11. A curve $y = f(x)$ passes through the following points :

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
$f(x)$	2	2.4	2.7	2.8	3.0	2.6	2.1

Estimate the area bounded by the curve $y = f(x)$, the $x$axis and the lines $x = 1$ and $x = 4$ by suitable method

12. Evaluate the $\int_0^1 ydx$ by weddles rule for numerical integration

x	0	1/6	2/6	3/6	4/6	5/6	1
y	1	0.8571	0.75	0.6667	0.6	0.5454	0.5

(10×2=20)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. Explain Aitken's Δ^2-process.

14. Prove that Newton-Raphson method has quadratic convergence.

15. Derive the formula for second, third and forth forward differences.

16. Write Newton's forward difference interpolation formula and backward difference interpolation formula.

17. The table below gives the values of tan x for $0.10 \leq x \leq 0.30$. Find tan 0.40.

x	0.10	0.15	0.20	0.25	0.30
y	0.1003	0.1511	0.2027	0.2553	0.3093

18. Using Matrix, find DFT of the sequence $f_k = \{1, 2, 3, 4\}$.

19. Derive the general formula for numerical integration for using Newtons forward difference formula.

20. Evaluate $I = \int_3^7 x^2 log x dx$ using Simpsons 1/3 rule with $h = 1$.

21. Write the the general formula for Numerical Integration and derive Simpsons 3/8 -rule.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **15** marks.*

22. (i) Use the iterative method to find a real root ,correct to three decimal places,of the equation $2x - 3 = cosx$ lying in the interval $[\frac{3}{2}, \frac{\pi}{2}]$.

(ii) Use iterative method find a real root of the equation $x^3 = 1 - x^2$ on the interval [0,1] with an accuracy of 10^{-4}.

23. Using the method of separation of symbols show that

a) $\Delta^n u_{x-n} = u_x - nu_{x-1} + \frac{n(n-1)}{2} u_{x-2} + \ldots + (-1)^n u_{x-n}$.

b) $e^x(u_0 + x\Delta u_0 + \frac{x^2}{2!}\Delta^2 u_0 + \ldots) = u_0 + u_1 x + u_2 \frac{x^2}{2!} + \ldots$

24. Find the Fourier Series for the function defined by $f(x) = \begin{cases} x, & \text{if} -1 < x \leq 0. \\ x+2, & \text{if} 0 < x \leq 1. \end{cases}$

25. From the following values of x and y obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.6$, correct to four decimal places and estimate the errors in the values of $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at the same point.

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0493	7.3891	9.0250

(2×15=30)