QP CODE: 21101243

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B.Sc DEGREE (CBCS) EXAMINATION, APRIL 2021

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

F868D8D4

Time: 3 Hours   Max. Marks : 80

Part A

*Answer any **ten** questions.*

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

1. Give the graphical representation of regula-falsi method.

2. State iteration method to find the root of an equation f(x) = 0.

3. Give graphical representation of Newton-Raphson method.

4. What is generalized Newton's formula?

5. What are called third forward differences?

6. How are forward fifference and backward difference operators related?

7. Prove that $E \equiv e^{hD}$.

8. Define Power density Spectrum of the Periodic spectrum of the periodic signal

9. Define Inverse Discrete Fourier Transform IDFT

10. Define Truncation and Rounding error in numerical Differentiation

11. Write General formula for Numerical Integration using Newtons forward difference formula.

12. Evaluate the integral $\int_0^{0.4} ydx$ from the following data using Boole's rule for numerical integration

x	0	0.1	0.2	0.3	0.4
0	0.37	0.68	0.93	1.12	1.25

Part B

*Answer any **six** questions.*

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

13. Using bisection method find a real root of the equation f(x) = x^3 - x - 1 = 0.

14. Explain Aitken's Δ^2-process.

15. Write a shortnote on errors in polynomial interpolation.

16. Prove that a) $\mu = \frac{E^{1/2}+E^{-1/2}}{2}$ b) $\mu = \sqrt{1 + \frac{\delta^2}{4}}$.

17. The table below gives the values of tan x for $0.10 \leq x \leq 0.30$. Find tan 0.50.

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

18. Derive the exponential form of the periodic function f(t) with period T > 0

19. The distance $(x\ cm)$ traversed by a particle at different times $(t\ seconds)$ are given below.

t	0	0.1	0.2	0.3	0.4	0.5	0.6
x	3.01	3.16	3.29	3.36	3.40	3.38	3.32

Find the velocity of the particle at $t = 0.3\ seconds$.

20. a) Write a shortnote on trapezoidal rule with step size h to evaluate the integral $I = \int_{x_0}^{x_n} y dx$.

Given vaules of x, y(x) as follows:

x	0	0.5	1	1.5	2
y(x)	0.399	0.352	0.242	0.129	0.054

Find an approximate value of $\int_0^2 y(x)dx$.

21. Evaluate $\int_0^1 sinx^2 dx$ by Simpsons 1/3 rule correct to four decimal places, taking 10 sub intervals.

Part C

*Answer any **two** questions.*

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

22. (i) Explain Ramanujan's method to find a smallest root of the equation $f(x) = 0$.
    (ii) Find the smallest root of the equation $f(x) = x^3 - 6x^2 + 11x - 6 = 0$ using Ramanujan's method.

23. a) Write a short note on Newton's forward difference formula.
    b) Using Newton's forwad difference formula, find the sum
    $S_n = 1^3 + 2^3 + 3^3 + \ldots + n^3$.

24. Find the Fourier transforms of
    i) $f(x) = 1$ if $|x| < 1$ and $f(x) = 0$ otherwise
    ii) $f(x) = e^{-ax}$ if $x > 0$ and $f(x) = 0$ if $x < 0$; where a > 0.

25. Derive Simpsons 3/8 rule. Using this rule evaluate $\int_0^1 \frac{1}{1+x}\,dx$ with $h = \frac{1}{6}$. Compare the results with exact values.

(2×15=30)