LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc.DEGREE EXAMINATION – **MATHEMATICS**

FIFTHSEMESTER – APRIL 2018

MT 5409- NUMERICAL METHODS

Date: 08-05-2018   Dept. No.   Max. : 100 Marks
Time: 09:00-12:00

SECTION-A

Answer **ALL** questions: (10 x 2 = 20)

1. Write Newton's formula to find a root of $f(x) = 0$.
2. State the condition for convergence in Newton Raphson method
3. Find D for the system of equations $x + 3y + 8z = 4, x + 4y + 3z = -2$ and $x + 3y + 4z = 1$.
4. Distinguish between Simpson's 1/3 rule and Simpson's 3/8 rule
5. Find an iterative formula to find $\sqrt{N}$, where N is a positive number.
6. Write Gauss Forward Interpolation formula.
7. Define Numerical Differentiation.
8. Write the derivatives using Newton's backward difference formula.
9. Why Trapezoidal rule is said to have least accurate?
10. Write Bessel's formula.

SECTION-B

Answer any **FIVE** questions: (5 x 8 = 40)

11. Solve the system of equations $10x + y + z = 12$, $2x + 10y + z = 13$ and $x + y + 5z = 7$ using Cramer's rule.
12. Solve the system of equations $3x + y - z = 3$, $2x - 8y + z = -5$ and $x - 2y + 9z = 8$ using Gauss elimination method.
13. Find a real root of the equation $cosx = 3x - 1$ correct to seven decimal places by the method of successive approximation.
14. Solve $x^3 + 2x^2 + 10x - 20 = 0$ by Newton – Raphson method.
15. Find a cubic polynomial which takes the following set of values (0,1), (1, 2), (2,1) and (3, 10).
16. Use Stirling's formula to find y_{35} given that $y_{10} = 600$, $y_{20} = 512$, $y_{30} = 439$, $y_{40} = 346$, $y_{50} = 243$.
17. Apply Bessel's formula to obtain y_{25} given that $y_{20} = 2854$, $y_{24} = 3162$, $y_{28} = 3544$, $y_{32} = 3992$.
18. Using Taylor's method, solve $\frac{dy}{dx} = 1 + xy$ with $y_0 = 2$ and $h = 0.1$. Find $y(0.1)$.

SECTION-C

Answer any **TWO** questions   (2 x 20 = 40)

19. (a)By Regula Falsi method find the root of $xe^x = 3$ correct to three decimal places.
    (b)Using Gauss Elimination method solve the equations $28x + 4y - z = 32$,

$x + 3y + 10z = 24$ and $2x + 17y + 4z = 35$. 　　　　　　　　　　(10 + 10)

20. (a)Find a root of the equation $x^3 - x - 11 = 0$ correct to four decimals using bisection method.
   (b)The following data gives the melting point of an alloy of zinc and lead, θ is the temperature and x isthe percentage of lead. Using Newton's Interpolation formula find θ (i) when $x = 48$ (ii) θ when $x = 84$. 　　　　　　　　　　(10 + 10)

x	40	50	60	70	80	90
θ	184	204	226	250	176	304

21. (a)Evaluate $\int_0^{10} \frac{dx}{1+x^2}$ using (i)Trapezoidal rule (ii) Simpson's $\frac{1}{3}$ rule (iii) Simpson's $\frac{3}{8}$ rule.

   (b)Solve $\frac{dy}{dx} = 1 - y$, $y(0) = 0$ using Euler's method. Find y at $x = 0.1$ and $x = 0.2$. Compare the results with the exact solution. 　　　　　　　　　　(10 + 10)

22. (a)Given $y' = x^2 - y$, $y(0) = 1$, find $y(0.1), y(0.2)$ using Runge-Kutta methods of third order and fourth order.
   (b)Using Gauss – Seidel method solve the equations $2x + y + z = 4$, $x + 2y + z = 4$ and $x + y + 2z = 4$. 　　　　　　　　　　(10 + 10)

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