LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIFTH SEMESTER – NOVEMBER 2017

MT 5409 - NUMERICAL METHODS

Date: 15-11-2017 Dept. No. Max. : 100 Marks
Time: 09:00-12:00

Part A: Answer all the questions and each question carries 2 marks. 10 X 2 = 20

1. Solve the following equations using Crammer's rule: $2x - y = 5$ and $3x + 2y = -3$.
2. Show that $\sqrt{12} = 3.4641$ using Newton-Raphson method.
3. Find the initial approximate root of $xe^x = 3$ when you try solve by any known method.
4. Given that f(0)= 8, f(1) = 68 and f(5) = 123. Using Newton's interpolation formula, find f(2).
5. Choosing suitable origin, construct the difference table for the following data:

   $y_{21} = 18.4708$; $y_{25} = 17.8144$; $y_{29} = 17.1070$; $y_{33} = 16.3432$ and $y_{37} = 15.5154$.
6. State the formulae for Euler's method and Modified Euler's method to solve ordinary differential equations.
7. What should one do to get a refined answer while using Trapezoidal rule.
8. When will you use Simpson's one by third and Simpson's three by eighth rule.
9. Using Bessel's formula find y_{25} given that $y_{20} = 2854$; $y_{24} = 3162$; $y_{28} = 3544$ and $y_{32} = 3992$.
10. A curve is drawn to pass through the points given by the following table. Estimate the area bounded by the curve, the x-axis and the lines x = 1 and x = 4.

x	1	1.5	2	2.5	3	3.5	4
y	2	2.4	2.7	2.8	3	2.6	2.1

Part B: Answer any FIVE questions and each question carries 8 marks. (5 x 8= 40)

11. Find the real root of the equation $x^3 - x^2 - 1 = 0$ correct upto 3 decimal places by using iteration method.
12. Show that the root of $xe^x = 3$ by regula falsi method is x = 1.049 approximately.
13. Find f(7.5) using a suitable method from the values given in the following table:

X	1	2	3	4	5	6	7	8
f(x)	1	8	27	64	125	216	343	512

14. Given $\log_{10} 654 = 2.8156$; $\log_{10} 658 = 2.8182$; $\log_{10} 659 = 2.8189$ and $\log_{10} 661 = 2.8202$. Find $\log_{10} 656$ using Lagrange's interpolation formula.

15. Given that the square root of the following numbers are 12500, 12510, 12520, 12530 are 111.803399, 111.848111, 111.892806 and 111.937483 respectively. Using any suitable formula show that square root of 12516 is 111.874930.

16. Using any central difference formula find y_{28} given that y_{20} = 49225; y_{25} = 48316, y_{30} = 47236; y_{35} = 45926 and y_{40} = 44306.

17. Given that $\frac{dy}{dx} = \log(x + y)$, with the initial condition that y= 1 when x = 0, find y for x = 0.2.

18. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's one by third rule.

Part C: Answer any TWO questions only. Each question carries 20 marks. (2x 20=40)

19. Find the root of the equation $x^3 - x - 11 = 0$ correct to 4 decimal places using bisection method.

20. 1) Solve the system of equations 3 x + y – z = 3; 2x – 8 y + z = - 5 and x – 2 y + 9 z = 8 using Gauss elimination method.

    2) Solve by Gauss - Seidel method, the following system of equations 27 x + 6 y – z = 85; 6 x +15 y + 2 z = 72 and x + y + 54 z = 110 (10+10)

21. From the following table, find the value of log 337.5 by Gauss, Stirling, Bessel and Everett formulae.

x	310	320	330	340	350	360
$\log_{10}$ x	2.4913617	2.5051500	2.5185139	2.5314789	2.5440680	2.5563025

22. Use Runge Kutta method to approximate y, when x = 0.1 and x = 0.2 given that x = 0 and y =1, and $\frac{dy}{dx} = x + y$.

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