



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – MATHEMATICS

THIRD SEMESTER – APRIL 2016

MT 3965 - NUMERICAL ANALYSIS

Date: 03-05-2016
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

ANSWER ALL THE QUESTIONS:

(5 X 20 = 100)

1. (a) Explain Bisection Method.

(OR)

(b) Solve for a root of $x - \cos x = 0$ by Regula – Falsi method. **(5)**

(c) Find a real root $x^3 - 2x - 5 = 0$ between 2 and 3 correct to three decimal places by secant method.

(OR)

(d) Find a positive root of $x^3 - 5x + 3 = 0$ by Newton Raphson method. **(15)**

2. (a) If $y(x)$ represents the number of people living at age x in a life table, find $y(47)$ if $y(20) = 512, y(30) = 439, y(40) = 346, y(50) = 243$.

(OR)

(b) A third degree polynomial passes through the points $(0, -1), (1,1), (2,1)$ and $(3, -2)$. Using Newton's forwards formula, find the polynomial. Hence find the value at 1.5. **(5)**

(c) State and prove Gauss Forward formula for interpolation.

(OR)

(d) Given the following table

θ°	0	5	10	15	20	25	30
$\tan \theta^\circ$	0	0.0875	0.1763	0.2679	0.3640	0.4663	0.5774

Find the value of $\tan 16^\circ$ using Stirling's formula. **(15)**

3. (a) Dividing the range into 10 equal parts, find the approximate value of $\int_0^{\pi} \sin x dx$ by Trapezoidal rule.

(OR)

(b) Derive Simpson's $1/3$ rule. **(5)**

(c) (i) Derive the formula to find the derivative of a function given by a tabulated set of values using Newton's backward difference interpolation formula.

(ii) Find $f'(x)$ at $x = 0.4$ from the following table

x	0.1	0.2	0.3	0.4
$f(x)$	1.10517	1.22140	1.34986	1.49182

(8+7)

(OR)

(d) Find the maximum and minimum values of y from the following table

	-2	-1	0	1	2	3	4
max							
min	2	-0.25	0	-0.25	2	15.75	56

(15)

4. (a) What do you mean by “direct method” of solving a system of linear equations?

(OR)

(b) Solve by Gauss Jordan method $x + y + z = 9$; $2x - 3y + 4z = 13$; $3x + 4y + 5z = 40$.

(5)

(c) Solve the system of equations correct to three decimal places using Gauss Jacobi’s method: $x + 17y - 2z = 48$; $30x - 2y + 3z = 75$; $2x + 2y + 18z = 30$.

(OR)

(d) Solve the following equations by Gauss Seidel method

$$27x + 6y - z = 85; x + y + 54z = 110; 6x + 15y + 2z = 72.$$

(15)

5. (a) Apply Modified Euler Method to find $y(0.2)$ and $y(0.4)$ given $y = x^2 + y^2$; $y(0) = 1$ by taking $h = 0.2$.

(OR)

(b) Explain Picard’s method of successive approximation.

(5)

(c) Apply Runge Kutta method to find approximate value of y for $x = 0.2$ in steps of 0.1 if $\frac{dy}{dx} = x + y^2$ given that $y = 1$ when $x = 0$.

(OR)

(d) Using the finite difference method, find $y(0.25)$, $y(0.5)$ and $y(0.75)$ satisfying the differential equation $\frac{d^2y}{dx^2} + y = x$ subject to the boundary conditions $y(0) = 0$ and $y(1) = 2$.

(15)
