STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted during the academic year 2004 – 05 & thereafter)

SUBJECT CODE : MT/AC/NA33

B. Sc. DEGREE EXAMINATION, NOVEMBER 2008
BRANCH I - MATHEMATICS
THIRD SEMESTER

COURSE : ALLIED – CORE
PAPER : NUMERICAL ANALYSIS
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION – A (10 X 2 = 20)

ANSWER ALL THE QUESTIONS

1. Form a backward difference table for $f(x) = x - x^2,\ x = 0,1,2,3,4.$
2. Show that $\mu\delta = \frac{\Delta + \nabla}{2}$.
3. What is the condition for convergence of Gauss-Jacobi method of iteration?
4. State Lagrange's interpolation formula.
5. Find the cubic polynomial, which takes the following values $y(0) = 1,\ y(1) = 0,\ y(2) = 1,\ y(3) = 10$.
6. State Trapezoidal rule for numerical integration.
7. State any two drawbacks of Euler's method.
8. State Runge-Kutta formula (fourth order).
9. State Stirling's formula.
10. State the fundamental theorem of difference calculus.

SECTION – B (5 X 8 = 40)

ANSWER ANY FIVE QUESTIONS

11. Solve $x^3 - 9x + 1 = 0$ for a root between 2 and 4 using bisection method.
12. Use Stirling's formula to find y_{25} given $y_{20} = 512,\ y_{30} = 439,\ y_{40} = 346,\ y_{50} = 243$ where y_x represents the number of persons at age 'x' in life.
13. Find the polynomial which takes the following values.

x	0	1	2	3
f(x)	1	0	1	10

Hence or otherwise find f(4).

14. The table indicates the velocity 'v' of a body during the time 't' specified . Find the acceleration when t = 1.3

t	1.0	1.1	1.2	1.3	1.4
v	43.1	47.7	52.1	56.4	60.8

..2

15. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's $\frac{3}{8}^{th}$ rule by dividing the interval into 4 equal parts. Hence find the approx value of π.

16. Use Picards method to solve $\frac{dy}{dx} = 1 + xy$ with $x_0 = 2,\ y_0 = 0$ (use 3 approximations)

17. Estimate the production for 1964 and 1966.

Year	1961	1962	1963	1964	1965	1966	1967
Production	200	220	260	-	350	-	430

SECTION – C (2 X20 = 40)

ANSWER ANY TWO QUESTIONS

18. a) Solve the system of equations using Gauss-Seidel method.

$$10x + 2y + z = 9$$
$$x + 10y - z = -22$$
$$2x + 3y + 10z = 22$$

b) Derive Newton's Backward interpolation formula for equal arguments.

19. a) Use Euler's method with $h = 0.1$ to find the solution of the equation $\frac{dy}{dx} = x^2 + y^2$ with $y(0) = 0$ in the range $0 \le x \le 0.5$.

b) Use Lagrange's formula to prove

$$y_0 = \frac{1}{2}(y_1 + y_{-1}) - \frac{1}{8}\left[\frac{1}{2}(y_3 - y_1) - \frac{1}{2}(y_{-1} - y_{-3})\right]$$

20. a) Apply R-K fourth order method to find an 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 $x = 0$.

b) Using Trapezoidal rule evaluate $\int_0^3 \frac{dx}{1+x}$. Hence computer $\log_e 2$.