STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI-600 086
(For candidates admitted during the academic year 2019–20 and thereafter)
SUBJECT CODE: 15MT/ME/NA55
B. Sc. DEGREE EXAMINATION, APRIL 2021
BRANCH I - MATHEMATICS
SIXTH SEMESTER

COURSE : MAJOR ELECTIVE
PAPER : NUMERICAL ANALYSIS
TIME : 90 MINUTES **MAX. MARKS: 50**

SECTION – A

Answer **ALL** questions **(3 × 2 = 6)**

1. Evaluate $(\Delta - \nabla)\, x^2$ taking the interval of differencing as h.
2. Write the formula for $\frac{dy}{dx}$ at $x = x_n$ using the backward difference operator.
3. Using the modified Euler's method, find $y(0.1)$ if $\frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$.

SECTION-B

Answer any **THREE** questions **(3×8 = 24)**

4. Find the smallest positive root of the equation $x^3 - 2x + 0.5 = 0$ by Newton Raphson method.
5. Find an expression for the following:
   (i) $\Delta\left[\frac{f(x)}{g(x)}\right]$ (ii) $\nabla^r f(x)$, for any positive integer r.
6. Find the value of $\log 2^{1/3}$ from $\int_0^1 \frac{x^2}{1+x^3}dx$ using Simpson's one-third rule with $h = 0.25$.
7. Solve the Poisson equation $u_{xx} + u_{yy} = -x^2y^2$ over the square region bounded by the lines $x = 0$, $y = 3$ given that $u = 10$ throughout the boundaries taking $h = 1$.

SECTION-C

Answer any **ONE** question **(1×20 = 20)**

8. Solve the system of equations using Gauss-Seidel iteration method:

$$4x + 2y + z = 14$$
$$x + 5y - z = 10$$
$$x + y + 8z = 20$$

9. a) Find the Taylor series solution of $y(0.1)$, given that $\frac{dy}{dx} + y^2 = e^x$; $y(0) = 1$. Compute using the first five terms.
   b) Find the maximum value of y from the following table:

x	9	10	11	12	13	14
y	1330	1340	1320	1250	1120	930

(8+ 12)

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