STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted during the academic year 2011–12 & thereafter)

SUBJECT CODE : 11MT/ME/NA53

B. Sc. DEGREE EXAMINATION, NOVEMBER 2016
BRANCH I - MATHEMATICS
FIFTH SEMESTER

COURSE : MAJOR – ELECTIVE
PAPER : NUMERICAL ANALYSIS
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION – A **(10X2=20)**
ANSWER ALL THE QUESTIONS

1. Write the formula to find the value of $\overline{8}$ using Newton-Raphson method.
2. Show that $\mu^2 = 1 + \frac{1}{4}\delta^2$.
3. Find the missing value if $y = f(x)$ is a polynomial of degree two

x	2	3	4	5	6	7
y	7	12	19	?	39	52

4. State Gauss backward formula for interpolation.
5. Write the formula for first derivative corresponding to Newton's backward formula by setting $x = x_n$.
6. Write the error in using the trapezoidal formula.
7. State the general problem of numerical integration.
8. Given $\frac{dy}{dx} = x + y$, $y(0) = 0$. Compute $y(0 \cdot 4)$ using Euler's method. (Choose $h = 0 \cdot 2$).
9. Given $\frac{dy}{dx} = 1 + xy$ and $y(0) = 1$. Obtain the Taylor's series for $y(x)$.
10. Use Picard's method to solve $\frac{dy}{dx} = x + y^2$ subject to the condition $y = 1$ when $x = 0$ (first approximation only).

SECTION – B **(5X8=40)**
ANSWER ANY FIVE QUESTIONS

11. Find a real root of the equation $x^3 - 2x - 5 = 0$ correct to three places of decimals using bisection method.
12. Derive Gauss forward formula for interpolation.
13. If $y(1) = -3, y(3) = 9, y(4) = 30$ and $y\ 6 = 132$, find the value of $y(2)$ using Lagrange's interpolation formula.
14. From the following table, find x, correct to two decimal places for which y is maximum and find this value of y.

X	$1 \cdot 2$	$1 \cdot 3$	$1 \cdot 4$	$1 \cdot 5$	$1 \cdot 6$
Y	$0 \cdot 9320$	$0 \cdot 9636$	$0 \cdot 9855$	$0 \cdot 9975$	$0 \cdot 9996$

15. Apply Simpson's one-third rule to evaluate $\int_2^{10} \frac{dx}{1+x}$ by dividing the range into 8 equal parts.
16. Find the value of π from $\int_0^1 \frac{dx}{1+x^2}$ by taking 4 equal parts.
17. Use modified Euler's method to determine the value of y when $x = \cdot 1$ given that $y(0) = 1$ and $y' = x^2 + y$ (Take $h = 0 \cdot 05$).

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SECTION – C **(2X20=40)**

ANSWER ANY TWO QUESTIONS

18. Derive Stirling's formula for interpolation and use it to find u_{32} from $u_{20} = 14 \cdot 035$, $u_{25} = 13 \cdot 674$, $u_{30} = 13 \cdot 257$, $u_{35} = 12 \cdot 734$, $u_{40} = 12 \cdot 089$.

19. i) Solve the following system using Gauss method

$$2x + y + z = 10$$
$$3x + 2y + 3z = 18$$
$$x + 4y + 9z = 16$$

ii) From the table of values of x and y obtain $\frac{dy}{dx}$ for $x = 1.2$

x	1·2	1·4	1·6	1·8	2·0
y	3·3201	4·0552	4·9530	6·0496	7·3891

20. i) Apply Simpson's three - eighth rule to evaluate $\int_0^{\pi/2} \sqrt{sinx}\,dx$ (Take h = $\frac{\pi}{12}$) .

ii) Using Runge-Kutta method solve $\frac{dy}{dx} = y - x$ for $x = \cdot 1$ where $y(0) = 2$ (Take $h = \cdot 1$)