

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 2015
BRANCH I - MATHEMATICS
FIFTH SEMESTER

COURSE : MAJOR – ELECTIVE
PAPER : NUMERICAL ANALYSIS
TIME : 3 HOURS

MAX. MARKS : 100

SECTION – A
ANSWER ALL THE QUESTIONS

(10X2=20)

1. Show that a root of $x^3 - 6x - 13 = 0$ lies between 3 and 4.
2. Write a sufficient condition for Gauss–seidel methods to converge.
3. P.T $\Delta^3 y_2 = \nabla^3 y_5$.
4. State Gauss forward formula for interpolation.
5. Define numerical differentiation.
6. State Newton's formula to find $\frac{dy}{dx}$ at $x = x_0$ using the forward difference operator.
7. State Simpson's - $\frac{3^{th}}{8}$ Rule.
8. Give the general quadrature formula for define integrals.
9. Write down Euler algorithm to solve the differential equation $\frac{dy}{dx} = f(x, y)$.
10. Write the Runge-Kutta algorithm of second order for solving $y' = f(x, y), y(x_0) = y_0$.

SECTION – B
ANSWER ANY FIVE QUESTIONS

(5X8=40)

11. Find by Newton-Raphson method the real root of $3x - \cos x - 1 = 0$.
12. Solve by Gauss-Seidel method:
 $10x - 5y - 2z = 3, 4x - 10y + 3z = -3, x + 6y + 10z = -3$
13. Estimate the production for 1964 and 1966 from the following data:
Year : 1961 1962 1963 1964 1965 1966 1967
Production : 200 220 260 - 350 - 430
14. Using Lagrange's interpolation formula, find $y(10)$ from the following table.
 $x : 5 \quad 6 \quad 9 \quad 11$
 $y : 12 \quad 13 \quad 14 \quad 16$

15. Find the value of x for which y is minimum and find the minimum value from the table.

$$x : 0.60 \quad 0.65 \quad 0.70 \quad 0.75$$

$$y : 0.6221 \quad 0.6155 \quad 0.6138 \quad 0.6170$$

16. Evaluate $\int_0^{16} \frac{dx}{1+x^2}$ by (i) Trapezoidal rule

(ii) Simpson's $\frac{1}{3}$ rules.

17. Using Taylor's series method .find the correct to four decimal places, the value of $y(0.1)$

$$\text{given } \frac{dy}{dx} = x^2 + y^2, \quad y(0) = 1.$$

SECTION – C
ANSWER ANY TWO QUESTIONS

(2X20=40)

18. (a) Find the positive root of $x^3 - x = 1$. Correct to four decimal places by bisection method.

(b) Solve by Gauss-Elimination method $3x + 4y + 5z = 18$, $2x - y + 8z = 13$,
 $5x - 2y + 7z = 20$.

19. (a) Find the values of y at $x = 21$ from the following data:

$$x : 20 \quad 23 \quad 26 \quad 29$$

$$y : 0.3420 \quad 0.3907 \quad 0.4384 \quad 0.4848$$

(b) Find the first two derivatives of $(x)^{\frac{1}{3}}$ at $x = 56$ given the table below:

$$X : 50 \quad 51 \quad 52 \quad 53 \quad 54 \quad 55 \quad 56$$

$$Y = (x)^{\frac{1}{3}} : 3.6840 \quad 3.7084 \quad 3.7325 \quad 3.7563 \quad 3.7798 \quad 3.8030 \quad 3.8259$$

20. (a) Evaluate $\int_{-3}^3 x^4 dx$ by using (i) Trapezoidal rule

(ii) Simpson's $\frac{1}{3}$ rules.

(b) Apply the 4th order R.K method to find $y(0.2)$ given that

$$y' = x + y, \quad y(0) = 1, \quad (h = 0.1) .$$

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