Roll No. .....

MSCMAT-12 (M.Sc. Mathematics)

Second Year Examination-2015

MAT-508

Numericlal Analysis

Time : 3 Hours **Maximum Marks :** 60

Note : The Question paper is divided into three section A, B and C. Attempt Questions of each section according to given instruction.

Section - A

(Long Answer Type Questions)

Note : Answer any two questions. All questions carries equal marks. (2×15=30)

1. Solve the equation

   $2x = \cos x + 3$

2. Find all roots of the polynomial equation

   $x^3 + x^2 + 3x + 4 = 0$ correct to four place of decimals using Graeffe's root squaring method.

3. Solve the given system of equations using cholesrey method

$$\begin{bmatrix} 7 & -2 & 4 \\ 2 & 1 & 5 \\ 3 & -1 & 6 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 13 \\ 6 \\ 10 \end{bmatrix}$$

4. Use Runge–Kutta fourth order method to solve $\frac{dy}{dx} = xy$ for x = 1.4 Initially x = 1, y = 2 (take h = 0.2)

Section - B

(Short Answer Type Questions)

Note : Answer any four (04) questions. Each question carries equal marks. (4×5=20)

1. Find cube roots of 9 using Newton - Raphson method.
2. Find all the eigen values of the matrix

$$\begin{bmatrix} 2 & -1 & -1 \\ 1 & 0 & -1 \\ -1 & 1 & 2 \end{bmatrix}$$

3. Fit a straight line to the following data.

x	1	3	5	7	8	9
y	4	7	9	11	15	17

4. Use Picard's method to compute y(t) given by $\frac{dy}{dt} = y + t$ with boundary conditions y = 1 when t = 0.
5. Solve numerically the equation

$\frac{dy}{dx} = x + y$ with the initial conditions

$x_0 = 0, y_0 = 1$

by Milne's method from

x = 0.20 to 0.30.

6. Solve the BVP

$\frac{K\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial x}$, $0 < x < t$, $t > 0$ with boundary conditions

$u_x(o, t) = o$, $\cup(L, l) = a$ and Initial condition

$u(x, 0) = u_0$

7. Express

$T_o(x) - 2T_1(x) + 3T_2(x)$ as a polynomical in x.

8. Calculate the value of $\log_e^2$ by finding $\int_0^1 \frac{2x}{1+x^2} dx$ using Simpson's rule by dividing the interval into four equal parts.

Section - C

(Objective Type Questions)

Note : Section 'C' contains ten (10) objective-type questions of ½ mark each. All the questions of this section are compulsory. (10×1=10)

1. Simpson's One Third rule

$\int_{x_0}^{x_{0+nh}} ydx =$ ..... .

2. If i–1 is a root of an equation having real coefficent then another root must be ..... .

3. The eigen value of the matrix

$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is ..... .

Choose the correct alternative :

4. The matrix A is singular. Then
   (a) $\lambda = 0$ cannot be an eigen volume of A.
   (b) $\lambda = 1$ is an eigen value of A.
   (c) $\lambda = 0$ is an eigen value of A.
   (d) $\lambda = 0$ and 1 are eigen value of A.

5. Roots of $x^3 - x^2 - 3 = 0$ lies between
   (a) (0, 1) (b) (1, 2)
   (c) (–1, 0) (d) none of above

6. $T_n(x)$ is equal to cos nθ then x is
   (a) sinθ (b) cosθ
   (c) tanθ (d) None of above

7. Picard's method is used for
   (a) Solution of matrix (b) Solution of differential
   (c) Roots of equations (d) None of above

8. Bisection method is used for
   (a) to find roots of equations
   (b) to find solution of differential equations
   (c) to find definite Intequal
   (d) None of above

Fill in the blanks :

9. $\nabla f(x) =$ ..... .

10. $\bar{E}^1 f(x) =$ ..... .