Registration No : | | | | | | | | | | |

Total Number of Pages : 02

M.Sc.I
FMCE407

4th Semester Back Examination 2018-19
MATH-IV
BRANCH : M.Sc.I(AP)
Time : 3 Hours
Max Marks : 70
Q.CODE : F366

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions :** **(2 x 10)**

a) Determine the smaller root of the equation $x^2 - 400x + 1 = 0$ by using four digits arithmetic.

b) Obtain an interval which contains a root of the equation $f(x) = \cos x - xe^x = 0.$

c) What is the convergence criterion for Gauss Jacobi iteration method?

d) Perform two iterations of the Newton-Raphson method to find the smallest positive root of the equation $f(x) = x^3 - 5x + 1 = 0.$

e) Write the pitfalls of Newton Raphson's method.

f) Define interpolation and extrapolation.

g) What is Least Square Approximation?

h) Write the formula for Euler's Modified Method.

i) Find the approximate value of $I = \int_0^1 \frac{dx}{1+x}$ by using Simpson's $1/3$ rule.

j) Compare composite Simpson's $1/3$ rule and Simpson's $3/8$ rule.

Q2 a) Perform four iterations of the Newton-Raphson method to obtain the approximate value of $(17)^3$ starting with the initial approximation $x_0 = 2.$ **(5)**

b) Use Regular-Falsi methods to determine the root of the equation $\cos x - xe^x = 0$ correct up to 3 decimal places. **(5)**

Q3 a) Given that $f(0) = 1, f(1) = 3, f(3) = 55,$ find the unique polynomial of degree 2 or less, that fits the given data. Also, find the bound on error. **(5)**

b) Construct Newton's forward interpolating polynomial for the following data: **(5)**

x	4	6	8	10
y	1	3	8	16

Also, evaluate y for x = 5.

Q4 a) State and prove the existence and uniqueness theorem of Lagrange interpolating polynomial. **(5)**

b) Evaluate $\int_0^1 \frac{dx}{1+x}$ by using Gauss- Legendre 3-point rule. Also estimate the error. **(5)**

Q5 **a)** Use Simpson's $\frac{1}{3}$ rule to approximate the value of $\tan^{-1} 4$ by evaluating $\int_0^4 \frac{dx}{1+x^2}$. **(5)**

b) Solve: $y' = x + y$, $y(0) = 1$ by using Euler's method. **(5)**
Also, find the value of y at x = 0.1.

Q6 Discuss the condition for existence of inverse of a matrix and find the inverse **(10)**
of the matrix $\begin{bmatrix} 3 & 2 & 1 \\ 2 & 3 & 2 \\ 1 & 2 & 2 \end{bmatrix}$
by using **LU** decomposition method. Take $u_{11} = u_{22} = u_{33} = 1$.

Q7 Solve the system of equations $\begin{bmatrix} 4 & 1 & 1 \\ 1 & 5 & 2 \\ 1 & 2 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 2 \\ -6 \\ -4 \end{bmatrix}$ using the Gauss Jacobi **(10)**
and Gauss-Seidel iteration method. Take the initial approximation as $[0.5, \quad -0.5, \quad -0.5]$. Also, find the exact solution.

Q8 **Write short answer on any TWO :** **(5 x 2)**

a) LUDecomposition
b) Uniform Approximation
c) Gauss – Legendre Integration Method