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FMCE407**4th Semester Regular Examination– 2016-17****Math-IV****BRANCH(S): M.Sc.I(AP)****Time: 3 Hour****Max marks: 70****Q Code : Z911**

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)**

- Define error propagation and discuss the different types of error associated with numerical methods.
- Define rate of convergence of an iterative process.
- What is a diagonally dominant matrix?
- What is the disadvantage of Lagrange's Interpolation?
- Write the error in Simpson's $1/3^{\text{rd}}$ method of numerical integration.
- What do you mean by Partial Pivoting?
- Write the iterative formula of Euler's Method for solving the initial value problem $y' = f(x, y)$ with $y(x_0) = y_0$.
- What are the advantages of Runge-Kutta Methods?
- Explain Crout-Decomposition.
- Explain Method of Least Squares.

Q2 a) Find the positive root of $e^x - 3x - \sin x = 0$ using Newton –Raphson method. **[5]****b)** Find the root of $f(x) = x^3 + x^2 - 3x - 5 = 0$ using regula-falsi method **[5]**bput question papers visit <http://www.bputonline.com>**Q3 a)** Find the interpolating polynomial of the following data using Newton Divide Difference method **[5]**

x	3	5	6	9	11
f(x)	5	7	9	12	17

Also find $f(7)$.

- b) Find the Inverse of the following matrix using LU decomposition [5]

method.
$$\begin{bmatrix} 1 & 2 & 6 \\ 2 & 5 & 15 \\ 6 & 15 & 46 \end{bmatrix}$$

- Q4 a) Solve the following system of equations using Gauss-Seidel method, [5]

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$$\begin{aligned} 2x + y + z &= 7 \\ x + 3y + z &= 10 \\ x + y + 4z &= 15 \end{aligned}$$

- b) Using Simpson's 1/3 rule, evaluate $\int_1^5 xe^x dx$ taking $h = 0.5$ [5]

- Q5 a) Using Gauss-quadrature Two point Formula, evaluate $\int_{-1}^1 \frac{x^2}{\sqrt{1-x^2}} dx$ [5]

- b) Apply Runge-Kutta 4th order method to solve $y' = \frac{1}{x+y}$, $y(0.1) = 1$ at $x = 0.2$ with $h = 0.1$ [5]

- Q6 Given $\frac{dy}{dx} + \frac{y}{x} = \frac{y}{x^2}$, $y(1) = 1$, Evaluate $y(1.3)$ by Euler's Modified Method. [10]

- Q7 a) Evaluate $\int_0^1 e^{-x^2} dx$ by dividing the range into 4 equal parts using Trapezoidal rule. [5]

- b) Solve $\frac{dy}{dx} = 1 - y$, $y(0) = 0$ using Euler's Method. Find y at $x = 0.1$ and $x = 0.2$. Compare the result with the exact solution. [5]

- Q8 a) Using Lagrange's interpolation formula to fit a polynomial to the data [5]

x	0	1	3	4
y	-12	0	6	12

Find the value of y when $x = 2$.

- b) Solve the following equations using relaxation method [5]

$$5x - y - z = 3$$

$$-x + 10y - 2z = 7$$

$$-x - y + 10z = 8$$

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