Numerical Analysis and Computer Programming (MU-311)

B Tech (Mech. Engg.) V Semester

Max. Marks: 60 **Max. Time: 3 hrs**

Part A (10 x 2 = 20)

Answer all questions briefly

1. Explain briefly secant method for finding root of an equation.
2. What are various iterative methods for solution of simultaneous linear equations?
3. What is calculus of finite differences? How it differs with infinitesimal calculus?
4. Evaluate $\Delta(x^2/\cos 2x)$
5. What is difference between interpolation and extrapolation?
6. Explain the principle of least squares.
7. What is Weddle's rule?
8. Evaluate $\int_0^6 \frac{1}{1+x^2}\,dx$ by Simpson's 1/3 rule..
9. Describe briefly Runge Kutta's method.
10. What is elliptic partial differential equation?

Part B (4 x 10 = 40)

Answer any 4 questions out of 6 questions

2. (a) Find a root of the equation $x^3-x-11 = 0$, using bisection method correct to three decimal places. (5)
   (b) Using Newton-Raphson method, find a root of the equation $x^3-5x+3 = 0$ correct to three decimal places. (5)
3. Solve the following equations buy Gauss-Seidal method:

   $54x + y + z = 110;\ 2x + 15y + 6z = 72;\ -x + 6y + 27z = 85$ (10)

4. (a) Evaluate $\Delta^2\left(\frac{5x+12}{x^2+5x+16}\right)$ (5)

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(b) Find the cubic polynomial which takes the following values:

x:	0	1	2	3
$f(x)$:	1	2	1	10

Hence or otherwise calculate $f(4)$. (5)

5. (a) For the following values of x and y, find the first derivatives at x = 4

x :	1	2	4	8	10
y :	0	1	5	21	27

(5)

(b) Using three point Gaussian quadrature formula, evaluate $\int_0^1 \frac{1}{1+x}\,dx$ (5)

6. (a) Using simple Euler's method, solve for y at $x = 0.1$ from $dy/dx = x + y + xy$, $y(0) = 1$, taking step length as 0.025. (5)

(b) Using Runge-Kutta method of order 4, find $y(0.2)$, given that $dy/dx = 3x + y/2$, $y(0) = 1$ and taking $h = 0.1$. (5)

7. Solve the equation $u_{xx} + u_{yy} = 0$ for the square mesh with the boundary values shown below. (10)