

**B.Tech. Civil (Construction Management) /
B.Tech. Civil (Water Resources Engineering)**

Term-End Examination

June, 2019

**ET-302 (A) : COMPUTER PROGRAMMING AND
NUMERICAL ANALYSIS**

Time : 3 hours

Maximum Marks : 70

- Note :**
- (i) *Attempt any five questions.*
 - (ii) *All questions carry equal marks.*
 - (iii) *Use of scientific calculator is permitted.*

1. (a) If $y = 4 \cos x - 6x$, find the relative error and percentage error in y at $x = 1$ given $\Delta x = 0.005$. 7+7
- (b) Solve the following linear equations by Gauss-Seidel iterative method.

$$\begin{aligned} 8x - 3y + 2z &= 20 \\ 4x + 11y - z &= 33 \\ 6x + 3y + 12z &= 36 \end{aligned}$$
2. (a) Solve the following linear equations by Gauss Elimination method. 7+7

$$\begin{aligned} 3x + 4y - z &= 8 \\ -2x + y + z &= 3 \\ x + 2y - z &= 2 \end{aligned}$$
- (b) Solve the following linear equations by Jacobi's iteration method.

$$\begin{aligned} 10x + 2y + z &= 9 \\ 2x + 20y - 2z &= -44 \\ -2x + 3y + 10z &= 22 \end{aligned}$$

3. (a) Find a real root of the equation $x^3 - 2x - 5 = 0$ 7+7

by using Bisection Method, correct to three decimal places.

- (b) Find a real root of the equation $x^3 - 5x + 3 = 0$

correct to three decimal places by using Newton's Raphson's method.

4. (a) Find a real root of the equation $x^3 + x - 1 = 0$ 7+7

correct to three decimal places by the Regula - Falsi method.

- (b) Using Runge - Kutta method of fourth order find y at $x = 1.2$ given that

$$2 \frac{dy}{dx} = 2x^3 + y ; \text{ and } y(1) = 2.$$

5. (a) Given the values : 7+7

x	0	2	3	6
$f(x)$	-4	2	14	158

Using Lagrange's formula for interpolation, find the value of $f(4)$.

- (b) The following table gives corresponding values of x and y . From the difference table, express y as a function of x , using Newton's forward interpolation.

x	0	1	2	3	4
y	3	6	11	18	27

Also compute the value of y for $x = 2.5$

6. (a) Write a FORTRAN program to calculate and print the roots of a quadratic equation $ax^2 + bx + c = 0$. 7+7
- (b) Write a FORTRAN program to calculate the factorial n (i.e. n!).
7. (a) Write a FORTRAN program to calculate the surface area of sphere and volume of sphere and also print the values. 7+7
- (b) Given three numbers A, B, and C. Write a program in FORTRAN to arrange the values of the three numbers in an ascending order.
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