

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

Term-End Examination

June, 2011

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

Time : 3 hours

Maximum Marks : 70

Note : Attempt any five questions. All questions carry equal marks. Use of calculator is permitted.

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

by iteration.
- (b) Find a root of the equation
$$2 \sin x - x = 0$$

by using Newton - Raphson method.
2. (a) Write 23.49, -302.867, 0.000527532, and 7+7
-25700 in floating-point form, rounded to
four significant digits.
- (b) Using Newton - Raphson method, compute
 $\sqrt[3]{7}$.

3. (a) Solve the following equation's by Cholesky's 7+7
method :

$$4x_1 + 2x_2 + 14x_3 = 14$$

$$2x_1 + 17x_2 - 5x_3 = -101$$

$$14x_1 - 5x_2 + 83x_3 = 155$$

- (b) Solve the following equations by using
Gauss - Seidal iteration method ;

$$5x_1 + x_2 + 2x_3 = 19$$

$$x_1 + 4x_2 - 2x_3 = -2$$

$$2x_1 + 3x_2 + 8x_3 = 39$$

4. (a) Evaluate the following integrals using 7+7
Simpson's $\frac{1}{3}$ rule (take step size $h = \frac{1}{2}$)

$$\int_0^2 \frac{dx}{x^2 + 2x + 10}$$

- (b) Find the Lagrange interpolating polynomial
that fits the following data.

x	0	1	2
$f(x)$	2	1	12

Also Compute $f(1.5)$.

5. (a) Find a root of the equation using the 7+7
bisection method correct to three decimal
places :

$$x^3 - x - 11 = 0$$

which lies between 2 and 3.

- (b) Using Runge-Kutta method of order 4, find $y(0.2)$ for the equation

$$\frac{dy}{dx} = \frac{y - x}{y + x},$$

$$y(0) = 1. \text{ Take } h = 0.2$$

6. (a) Write a FORTRAN program to compute the sum of the following series **7+7**

$$S = x + \frac{x^2}{2} + \frac{x^3}{3} + \dots + \frac{x^n}{n}.$$

- (b) Write a FORTRAN program to calculate and print the roots of a quadratic equation

$$ax^2 + bx + c = 0.$$

7. (a) Write a FORTRAN program for Temperature- conversion that gives the option of converting Fahrenheit to Celsius or Celsius to Fahrenheit and depending upon user's choice carries out the conversion. **7+7**

- (b) Write a FORTRAN program and print the values of $f(x)$ given by

$$f(x) = \frac{x^2 + 1.5x + 5}{x - 3}$$

for $x = -10$ to 10

x should take values $-10, -8, -6, \dots, 6, 8, 10$.

8. (a) Given three numbers A, B and C, write a FORTRAN program to write their values in descending order. 7+7

(b) Two one - dimensional arrays C and D have 25 elements each . Write a FORTRAN program to compute and print the following quantities :

$$(i) \quad B = \sum_{i=1}^{25} (C_i - D_i)^2$$

$$(ii) \quad P = \sum_{i=1}^{25} C_i D_i$$
