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

Term-End Examination

December, 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 scientific calculator is permitted.*

1. (a) Find a root of the equation   7+7

    $x^3 + x - 1 = 0$

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

    (b) Find a root of the equation

    $x - 2 \sin x = 0$

    by using the secant method, starting from

    $x_0 = 2, x_1 = 1.9$

2. (a) Solve the following equations by Gauss   7+7
    elimination method :

    $6x_2 + 13x_3 = 61$

    $6x_1 - 8x_3 = -38$

    $13x_1 - 8x_2 = 79$

(b) Solve the following equations, by Gauss - Seidal iteration :

$$10x_1 + x_2 + x_3 = 6$$

$$x_1 + 10x_2 + x_3 = 6$$

$$x_1 + x_2 + 10x_3 = 6 \cdot$$

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

$$4x_1 + 6x_2 + 8x_3 = 0$$

$$6x_1 + 34x_2 + 52x_3 = -160$$

$$8x_1 + 52x_2 + 129x_3 = -452$$

(b) Evaluate $\int_0^2 \frac{x^2}{1+x^3}$ using the Simpon's

$\frac{1}{3}$ rule with step size $h = \frac{1}{2}$

4. (a) For the data 7+7

x	1	1.1	1.2	1.3	1.4
$f(x)$	7.0	8.093	9.384	10.891	12.632

find an approximation of f (1.35) and f (1.25) by using Newton's backward difference formula.

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

x	-2	1	0	2
$f(x)$	3	-3	1	-1

Also compute f (1.5)

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

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

(b) Using Runga-Kutta method of order 4, find y (0.2) given that

$$\frac{dy}{dx} = 3x + \frac{y}{2} , y \ (0) = 1,$$

taking h = 0.1

6. (a) Write a FORTRAN program to find the sum 7+7 of the series

$S = 1 + x + x^2 + \ldots + x^n.$

(b) Write a FORTRAN program to calculate area of a circle, area of a triangle, surface area of a sphere, volume of a sphere upon user's choice.

7. (a) Write a FORTRAN program to find the 7+7 factorial N (i.e. $\lfloor N$).

   (b) Write a FORTRAN program to find the largest and smallest number out of a given list of 100 numbers.

8. (a) Using logical IF statements write a 7+7 FORTRAN program that calculates and prints.

$$f(x) = \begin{cases} 3x + 5x^3 & \text{for } 4.3 \leq x < 9.1 \\ 6x + 8x^2 & \text{for } 9.1 \leq x < 15.5 \end{cases}$$

   for x varying from 5.0 to 15.0 in steps of 0.5.

   (b) The Fermi - Dirac distribution for a normalised energy U is given by the Formula

$$\text{FDD} = \frac{1}{e^u - 1}$$

   Write a FORTRAN program that will prepare a table of this function for U varying from 1.0 to 10.0 in steps of 0.05.