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ET-302(A)

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

Term-End Examination

00281

June, 2015

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) Explain the various data types available in FORTRAN. 7

(b) Draw a flow chart to read 10 integers and find out whether they are distinct or not. 7

2. (a) Write a program to read the elements of array A which is of size 10 and having integers only. Locate the position of the largest number, print its value and the corresponding element. 7

(b) What is a file ? Explain the various types of files used for storage. 7

3. (a) Write the sufficient condition for convergence of an iterative method for $f(x) = 0$, written as $x = g(x)$. 7

(b) Write down the procedure to find the numerically smallest eigenvalue of a matrix by power method. 7

4. (a) Use the Newton-Raphson method to find a root of the equation $\cos x = xe^x$. 7

(b) Solve by using the Gauss-Seidel method : 7

$$10x + 2y + z = 9$$

$$2x + 20y - 2z = -44$$

$$-2x + 3y + 10z = 22$$

5. (a) Compute the first derivative for the following table at $x = 0{\cdot}75$. Use $h = 0{\cdot}05$. 7

x	0·5	0·7	0·9	1·1	1·3	1·5
y	1·48	1·64	1·78	1·89	1·96	1·00

(b) Using Runge-Kutta method of order 4, compute $y(0{\cdot}2)$ from the equation

$$10 \frac{dy}{dx} = x^2 + y^2$$

$$y(0) = 1.$$

Take $h = 0{\cdot}1$. 7

6. (a) Use Romberg integration to evaluate

$$\int_0^{\pi/2} \frac{\cos x}{\sqrt{1+\sin x}}\, dx$$

Take $h = \frac{\pi}{4}, \frac{\pi}{8}, \frac{\pi}{16}$ successively and compare the result with the one obtained by trapezoidal rule. 7

(b) Find the inverse of the matrix

$$A = \begin{bmatrix} 3 & 1 & 2 \\ 2 & -3 & -1 \\ 1 & -2 & 1 \end{bmatrix}.$$

Name the method used. Is the inverse unique ? 7

7. (a) Use Lagrange's interpolation formula to find y, when x = 5, from the following table : 7

x	0	1	3	8
y	1	3	13	123

(b) Using Muller's method, find a root of the following equation : 7

$$x^3 - 3x - 5 = 0$$

8. Explain the following : $4 \times 3\frac{1}{2} = 14$

(a) Difference between formatted Write/Read and unformatted Write/Read statements

(b) Convergence of Newton-Raphson method

(c) Application of eigenvalues and eigenvectors

(d) Taylor's theorem and Intermediate value theorem