No. of Printed Pages : 4

ET-302(A)

00985

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

Term-End Examination

June, 2012

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.*

1. (a) If $A = \begin{bmatrix} 1 & 2 \\ 2 & 3 \\ 4 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \end{bmatrix}$ write a program to find product of A and B. **7+7**

(b) Given an array of numbers draw a flow chart and a program to locate the position of the largest number. Print its value and the corresponding rank position.

2. (a) Explain different types of file structures. How these files are created and used ? **7+7**

(b) Suppose you are given three sides of a triangle A, B, C. The area of the triangle is given by

$$\text{Area} = \sqrt{S\,(S-A)\,(S-B)\,(S-C)}$$

Where $S = (A+B+C)/2$

However when all the sides are equal, that is triangle is equilateral, its area can be computed as $\sqrt{3\,(A^2)/4}$ where A is a side.

Write a program which tests whether triangle is equilateral and then compute the area accordinaly.

3. (a) Write the Syntax of : 7+7

(i) 'Do' statement

(ii) 'If then else' statement

(iii) Open file and close file

(iv) 'Continue' statement

(b) Explain with examples the difference between :

(i) Function and subroutine

(ii) STOP and END statements

(iii) real variable and integer variable

(iv) Constant and variable

4. (a) Find the real root of the equation $x \log_{10} x = 1.2$ by Bisection method correct to four decimal places. **7+7**

(b) Evaluate $\sqrt{12}$ to four decimal places by Newton Raphson method.

5. (a) Use Lagrange's interpolation formula to fit a polynomial to the data : **7+7**

x :	-1	0	2	3
$f(x)$:	-8	3	1	12

Hence or otherwise find the value of f (1)

(b) Solve the following system by the LU factorization method :

$$2x + 3y + z = 9$$

$$x + 2y + 3z = 6$$

$$3x + y + 2z = 8$$

6. (a) Use Gauss-Seidel iterative method to solve the following system of simultaneous equations **7+7**

$$9x + 4y + z = -17$$

$$x - 2y - 6z = 14$$

$$x + 6y = 4$$

perform four iterations

(b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$, using :

(i) Simpson's $\frac{1}{3}$ rule taking $h = \frac{1}{4}$

(ii) Simpson's $\frac{3}{8}$ rule taking $h = \frac{1}{6}$

Hence compute and approximate value of π in each case.

7. (a) Given $\frac{dy}{dx} = y - x$, $y(0) = 2$ 7+7

Find $y(0.1)$ and $y(0.2)$ correct to four decimal places.

(b) Define operators Δ, E and ∇. Prove the relations :

(i) $\nabla = 1 - E^{-1}$

(ii) $E = e^{hD}$

(iii) $\Delta = E\nabla$

8. (a) Using Taylor's expansion for sin x about $x = 0$, find the approximate value of *Sin* 10° with errors less than 10^{-7}. 7+7

(b) Find the smallest eigen value in magnitude and the corresponding eigen vector of the matrix

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$