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ET-302(A)

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

Term-End Examination

December, 2014

01309

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) Write the arithmetic statement functions for the following : 7

(i) $\frac{x^2 - y^2}{|x - y|}$

(ii) $x^2 - y^2z - zx^2 - z^2y$

(b) Find the value of the logical expression

. NOT . A . AND . B . OR . A . AND . NOT . B

when

(i) Both A and B have False value.

(ii) A has value True and B has value False. 7

2. (a) Explain with examples difference between unformatted WRITE/READ and formatted WRITE/READ statements. 7

(b) If A(1), A(2) ..... A(20)

and B(1), B(2) ..... B(20)

are two arrays of numbers and

C(I) = A(I) + B(I) where I = 1, ... 20,

write a program to read two arrays A and B, and print C. 7

3. (a) Use Runge's method to approximate y when x = 1·1 given that y = 1·2. when x = 1 and $\frac{dy}{dx} = 3x + y^2$. 7

(b) The following table gives the values of x and y. Use appropriate central difference formula to find the value of y when x is 3·8. 7

x :	3·0	3·5	4·0	4·5	5·0
y :	15·9	14·9	14·1	13·3	12·5

4. (a) Show that the square root of N = AB is given by $\sqrt{N} = \frac{S}{4} + \frac{N}{S}$, where S = A + B. 7

(b) Solve the following system of equations using Gauss-Seidel iterative method :

$$2x + 10y + z = 51$$

$$10x + y + 2z = 44$$

$$x + 2y + 10z = 61$$ 7

5. (a) Prove that

(i) $\Delta \log f(x) = \log\left(1 + \frac{\Delta f(x)}{f(x)}\right)$

(ii) $\Delta \sqrt{u_x} = \frac{\Delta u_x}{\sqrt{u_x} + \sqrt{u_{x+n}}}$ 7

(b) Find $f'(x)$ at $x = 0{\cdot}4$ from the following table of values given below : 7

x :	0·1	0·2	0·3	0·4
f(x) :	1·10517	1·22140	1·34986	1·49182

6. (a) Find the inverse of the matrix using LU decomposition

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

Also show that your answer is correct. 7

(b) Solve the system of equations

$x + y + z = 1$

$4x + 3y - z = 6$

$3x + 5y + 3z = 4$

using Gauss-Jordan method with pivoting. 7

7. (a) Show that if $\lambda_1, \lambda_2 \ldots \lambda_n$, are the eigenvalues of A, then $\frac{1}{\lambda_1}, \frac{1}{\lambda_2} \ldots \frac{1}{\lambda_n}$ are the eigenvalues of A^{-1}. *5*

(b) State the following :

(i) Rolle's theorem

(ii) Lagrange's mean value theorem

(iii) Taylor's theorem *3+3+3*

8. (a) Evaluate $I = \int_0^1 \frac{dx}{1+x}$ correct to three decimal places by Trapezoidal rule with h = 0·5, 0·25, 0·125. Use Romberg integration to get an accurate value for the definite integral. Hence find the value of log 2. *7*

(b) Calculate a bound for the truncation error in approximating e^{x^2} by

$$e^{x^2} = 1 + x^2 + \frac{x^4}{2!} + \frac{x^6}{3!} + \frac{x^8}{4!} \text{ for } x \in]-1, 1[\quad 7$$