

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

Term-End Examination

00071

December, 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 calculator is permitted.

1. (a) Draw a flow chart to read 15 numbers and find out its mean and variance. 7
- (b) Write a program to read two matrices A and B, both are square matrices, and check whether $A = B^{-1}$ or not. 7
2. (a) Write the arithmetic statement functions for the following in FORTRAN : 7
- (i)
$$\frac{x^2 - y^2}{|x - y|}$$
- (ii)
$$x^2 - y^2z - zx^2 - z^2y$$

(b) Explain the following control constructs with examples :

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- (i) IF
- (ii) DO
- (iii) CASE
- (iv) GOTO

3. (a) Use Lagrange's formula to compute the value of y , when $x = 5$, if the following values of x and y are given :

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x	1	2	3	4	7
y	2	4	8	16	128

(b) Using Newton-Raphson method, find out the root of the equation correct to three decimal places

$$x \sin x + \cos x = 0, \text{ which is near to } x = \pi.$$

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4. (a) Solve the following system of equations :

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$$x + y + z = 1$$

$$4x + 3y - z = 6$$

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

using Gauss-Jordan method with pivoting.

(b) Calculate the value of $\int_0^{\pi} \sin x \, dx$ by

Simpson's $\frac{1}{3}$ rule using 11 ordinates.

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

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$$\frac{dy}{dx} = \frac{y-x}{y+x}; y(0) = 1.$$

Take $h = 0.2$.

- (b) Find first and second derivative at 1.1 for the data

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x	1.00	1.2	1.4	1.6	1.8	2.00
y	0	0.1280	0.5440	1.2960	2.432	4.00

6. (a) Determine the eigenvalues and corresponding eigenvectors for the matrix A.

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$$A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}.$$

- (b) Find inverse of the matrix A

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$$A = \begin{bmatrix} 5 & 8 & 1 \\ 0 & 2 & 1 \\ 4 & 3 & -1 \end{bmatrix}$$

and hence solve $Ax = b$ when

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

7. (a) The following table gives the values of x and y . Use appropriate central difference formula to find the value of y when x is 38. 7

x :	30	35	40	45	50
y :	15.9	14.9	14.1	13.3	12.5

- (b) Prove that 7

(i) $\nabla E = E \nabla = \Delta = E - 1$

(ii) $e^x = \left(\frac{\Delta^2}{E} \right) e^x \cdot \frac{E e^x}{\Delta^2 e^x}$, interval of differencing being unity.

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

- (a) Lagrange's Mean Value Theorem
 - (b) Round off and Truncation errors
 - (c) Numerical Integration
 - (d) Global and Local Variables
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