

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

Term-End Examination

00642

December, 2016

**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.

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1. (a) Write a program in FORTRAN to read two matrices X and Y. Both X and Y matrices are square matrices. Also make a program to check whether $X^{-1} = Y$ or not. 7
 - (b) Given four numbers A, B, C and D. Write a program in FORTRAN to arrange the values of the four numbers in an ascending order. 7
 2. (a) Explain the following control constructs with examples : 8
 - (i) IF
 - (ii) GO TO
 - (iii) DO
 - (iv) COMMON

- (b) Write a program in FORTRAN to calculate the area of a circle, the area of a triangle and the area of a rectangle. 6
3. (a) Using Newton-Raphson method, find out the real root of the equation $x \log_{10} x = 1.2$, correct to five decimal places. 7
- (b) Find the root of the equation $x e^x = \cos x$ using the Secant method, correct to four decimal places. 7
4. (a) Using Lagrange's interpolation formula, find the values of y when $x = 10$, from the following table : 7

x	5	6	9	11
y	12	13	14	16

- (b) Apply Gauss elimination method to solve the following equations : 7
- $$x + 4y - z = -5$$
- $$x + y - 6z = -12$$
- $$3x - y - z = 4$$
5. (a) Apply Crout's method to solve the following equations : 7
- $$3x + 2y + 7z = 4$$
- $$2x + 3y + z = 5$$
- $$3x + 4y + z = 7$$
- (b) Use Runge-Kutta fourth order method to find an approximate value of y when $x = 0.2$, given that $\frac{dy}{dx} = x + y$; $y = 1$ when $x = 0$. 7

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

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$$A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$$

- (b) Find the inverse of the matrix

$$A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix} \quad \text{by elementary row}$$

operations. Also find out the rank of the matrix.

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7. (a) From the following table, estimate the number of students who obtained marks between 40 and 45 :

7

<i>Marks</i>	<i>No. of Students</i>
30 - 40	31
40 - 50	42
50 - 60	51
60 - 70	35
70 - 80	31

- (b) The velocity v (km/minute) of a moped which starts from rest, is given at fixed intervals of time t (minutes) as follows :

t	v
2	10
4	18
6	25
8	29
10	32
12	20
14	11
16	5
18	2
20	0

Estimate approximately the distance covered in 20 minutes.

7

8. Explain the following : $4 \times 3 \frac{1}{2} = 14$
- (a) Taylor's theorem and Intermediate value theorem
 - (b) Global and Local variables
 - (c) Additional sequential file manipulation statements
 - (d) Graeffe's root squaring method