Ref No.: Ex/CON/CSE/T/113/2019 (Old)

B.E. Construction Engineering 1st Year 1stSemester Examination, 2019 (Old)

Numerical Analysis & Computer Programming

Time – 3 hours **Full Marks - 100**

Answer any five questions

1. a. Write a function `mystrcat` that will simulate the functionality of the `strcat` function. *4*
   b. Write a program to find out and print the prime numbers in a range specified by the user. *8*
   c. What is a pointer? How pointers and arrays are related. *2+2*
   d. Write a program to copy the contents of a file into another file. *4*

2. a. Write 2 functions, one iterative and the other recursive, to find out the factorial of n. *6*
   b. Write a program to check whether a matrix input by the use is symmetric or not. *6*
   c. Write a program to sort an array of strings in alphabetical order. *8*

3. a. What is a structure (`struct`) in C and what is its usefulness? *3*
   b. Write a program to check whether an integer number is a palindrome or not. *8*
   c. Write a function to print the binary equivalent of a positive integer number. *5*
   d. Write a function to reverse a string without using a second string. *4*

4. a. Is there any difference between a string and a character array? Explain your answer. *2*
   b. What will be the output of the following segment of code? Explain the logic behind your answer.

```
int a[5]={9, 7, 5, 3, 1}, *p;
p=&a[1];
printf("%d\n", *p++);
printf("%d\n", *++p);
printf("%d\n", ++*p);
```

4

   c. What are the utilities of functions? Write the properties of a recursive function. *3+2*
   d. Discuss the Newton Raphson method for solving nonlinear functions together with its graphical interpretation. *5*
   e. Prove that any real $n*n$ square matrix has n real Eigenvalues and corresponding Eigenvectors. *4*

5. a. Solve the following set of linear simultaneous equations by the Gauss-Jordan elimination method.

$$3x + 2y - z = 4$$
$$-x + y + 2z = 7$$
$$2x - y + 3z = 9$$

8

b. Find the Eigenvalues and the corresponding Eigenvectors for the following square matrix. *8*

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

c. Given the following set of tabular values, find the derivative at $x = 0.05$. *4*

x	0.0	0.2	0.4	0.6	0.8
y	0.0	0.1823	0.3365	0.47	0.5879

6. a. Discuss the trapezoidal method for numerical integration. *4*

b. Find the root of the equation $x^3 - 39 = 0$ correct up to 3 decimal places (or show the first 5 iterations) using the following methods.

i. Bisection method.
ii. Regula Falsi method.
iii. Newton Raphson method, and
iv. Secant method. *4*4*

7. a. Define Eigenvalue and Eigenvector of a square matrix. *2*

b. Find the relationship between the following pairs of operators:

i. forward difference operator (Δ) and backward difference operator (∇)
ii. central-difference operator (δ) and shift operator (E).
iii. averaging operator (μ) and shift operator (E). *3*2*

c. Given the following table of values, find the values of y at x=0.15 and 0.75. *2*3*

x	0.0	0.2	0.4	0.6	0.8
y	0.0	0.1823	0.3365	0.47	0.5879

d. Evaluate the following integral by Trapezoidal method considering the error tolerance of 0.001. *6*

$$I = \int_0^{1.5} \frac{1}{x+1} dx$$