

B.E.(ELECTRICAL ENGINEERING) 2ND YEAR 2ND SEMESTER EXAM. 2024

BASICS OF NUMERICAL METHODS AND PROGRAMMING

Time: Three Hours

Full Marks: 100

(50 marks for each part)

Use a separate Answer-script for each Part

PART-I

Answer Any three questions (Q.No. 5 carries 18 marks)

Q.1. A) Explain the Newton-Raphson method to find out a real root of a transcendental equation and with suitable geometrical interpretation.

B) Determine the real root of the equation $f(x) = x^3 - 2x - 5 = 0$ in the interval [2, 3] by Bisection method. Perform at least six iterations.

8+8=16

Q.2. A) Solve the following simultaneous equations by Gauss-Seidel method. Assume the initial values of all the variables are equal to zero. Perform at least five iterations:

$$\begin{aligned} 10x_1 - 2x_2 - x_3 - x_4 &= 3 \\ -2x_1 + 10x_2 - x_3 - x_4 &= 15 \\ -x_1 - x_2 + 10x_3 - 2x_4 &= 27 \\ -x_1 - x_2 - 2x_3 + 10x_4 &= -9 \end{aligned}$$

B) Write down the steps of the Gauss elimination method to solve a system of linear equations.

10+6=16

Q.3. A) Construct a difference table with the following data and hence estimate the value of $f(0.25)$ using Newton's difference interpolation method.

x	0.1	0.3	0.5	0.7	0.9
y	0.11052	0.40496	0.82436	1.40963	2.21364

B) Write down the mathematical expression of the Lagrange interpolating polynomial for three data points – [a, f(a)], [b, f(b)] and [c, f(c)].

12+4=16

Q.4. A) Explain the basic theory of the Least Squares Error method to obtain best fit curve for a given set of data.

B) Determine the values of the coefficients 'a' and 'b' to fit the equation $y = ax + b$ with the following tabulated data by the Least Squares Error method -

x	0.5	1.5	2.0	2.5	3.0
y	5.5	2.5	1.0	-0.5	-2.0

8+8=16

Q.5. A) Derive the expression of the Trapezoid rule of Numerical integration from the general expression of Newton's forward difference interpolating polynomial.

B) Compute the following by the Simpson's 1/3rd rule of numerical integration. Consider $h=0.5$ -

$$\int_0^3 e^{-x} x^5 dx$$

10+8=18

[Turn over

**BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) SECOND
YEAR SECOND SEMESTER - 2024**

SUBJECT: BASICS OF NUMERICAL METHODS AND PROGRAMMING

Time: Three Hours

Full Marks: 100
(50 Marks for each part)

Use a separate Answer-Script for each part
Two marks are reserved for neat and well-organized answers

Question No.	Part-II	Marks
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Answer any three questions

- | | | | |
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| 1. | (a) | Explain the following operator in C with examples:
i. Conditional operators.
ii. Modulo division operator.
iii. Type Casting. | 9 |
| | (b) | With the help of a small program explain why 'switch' statement is normally associated with 'break' statement. | 7 |
| 2. | (a) | Explain the difference between 'entry' and 'exit' controlled loops in C programming language. Give examples of each of them. | 8 |
| | (b) | Write a C program to calculate the G.C.D and L.C.M of two given numbers. | 8 |
| 3. | (a) | Write a C program to print the first 20 members of Fibonacci series. | 6 |
| | (b) | Write a C program to print first 25 terms of the series: x, x^2, x^3, x^4, \dots , where x is to be considered as input. The developed program must be able to compute the sum up to first 25 terms of the series. | 6 |
| | (c) | Explain the difference between <i>break</i> and <i>exit()</i> in C programming language. | 4 |
| 4. | (a) | A positive integer is entered through keyboard. Write a C program using recursion to print the digits of the number in reverse order. | 9 |
| | (b) | Explain with C program how more than one values of a variable can be returned from the called function to the calling function. | 7 |
| 5. | (a) | With a suitable example, discuss how structure in C can be used to store the multiple information. | 7 |
| | (b) | Discuss the following library function used in C programming language.
(i) <code>strlen()</code> (ii) <code>strcpy()</code> (iii) <code>strcmp()</code> | 9 |