

U.G. 6th Semester Examination - 2021**MATHEMATICS****Course Code : BMTMCCHT601****Course Title : Numerical Methods &
Computer Programming**

Full Marks : 40

Time : 2 Hours

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.**Notations and symbols have their usual meanings.*

1. Answer any **ten** questions: $1 \times 10 = 10$
- State the theorem on which polynomial interpolation is based.
 - What is 'variable' in C language?
 - State the limitations of using Newton-Raphson method.
 - What is 'main()' in C?
 - Define the term 'significant figure'.
 - What is full form of ANSI?

- Round off the following numbers to four significant figures: 0.0073945, 0.080039.
- What is a light pen?
- Write short note on 'for loop' in C.
- What is ALU?
- State duality principle in Boolean Algebra.
- What is the binary equivalent of the decimal number 10?
- What is the geometrical interpretation of trapezoidal rule?
- Define 'degree of precision' of a numerical integration formula.
- What is an array?

2. Answer any **five** questions: $2 \times 5 = 10$
- Explain the term: Software and Hardware.
 - State De-Morgan's laws of Boolean algebra and prove them.
 - If V_T is the true value, then find the number of significant figures in $V_T = 1.5923$ given its relative error as 0.1×10^{-3} .

- d) Write the differences between compiler and interpreter.
- e) Let $f(x) = 2x^2 + 3x + 5$ find $\Delta^3 f(x)$.
- f) Write two disadvantages of Newton-Raphson method for finding a real root of the equation $f(x) = 0$.
- g) What is the difference between $i++$ and $++i$?
- h) Deduce the Newtonian iterative formula for finding q^{th} root of a positive real number R .

3. Answer any **two** questions: 5×2=10

- a) i) Show that interpolating polynomial is unique.
- ii) Is Gauss-Seidel iteration method suitable for solving the system $x + y - z = 1$, $x - y - z = -1$, $x - y + z = 0$? Justify your answer. 3+2
- b) i) Explain the method of Regula-Falsi for computing a real root of equation $f(x) = 0$.
- ii) Perform subtraction of the following decimal numbers after converting them to binary numbers: $(19.5)_{10} - (12.75)_{10}$
3+2

- c) Discuss the “if-else if” and “switch” statements with the appropriate examples and also mention the distinction between these two structures in C. 2+2+1

4. Answer any **one** question: 10×1=10

- a) i) Explain 4th order Runge-Kutta method for the numerical solution of $\frac{dy}{dx} = f(x, y)$ with $y_0 = y(x_0)$. Can you identify the case when Runge-Kutta method of 4th order reduces to Simpson's 1/3rd rule? 3+2
- ii) Write an algorithm to find the first 50 Fibonacci numbers defined by:
 $F_1 = 0, F_2 = 1, F_n = F_{n-1} + F_{n-2}, n = 3, 4, \dots$
5
- b) i) Establish Newton-Cotes' quadrature formula for numerical integration $\int_a^b f(x) dx$ when the function $f(x)$ is known at $(n+1)$ equidistant points. If $H_i^{(n)}$ be the Cote's coefficient show that $\sum_{i=0}^n H_i^{(n)} = b - a$ and $H_i^{(n)} = H_{n-i}^{(n)}$, $i = 0, 1, \dots, n$. 4+1+1

- ii) Prove that for each pair of elements a and b in Boolean algebra:

$$a + ab = a \text{ and } a(a + b) = a ;$$

$$a + a(bc) = a + (ab)c \quad 4$$

- c) i) Draw the flowchart to find the value of

$$\int_a^b f(x) dx \text{ by Simpson's 1/3rd rule.}$$

- ii) Explain the propagation of error in a difference table. What is Noise level?
- iii) Write a program in C to find the maximum and minimum among a set of real numbers. 3+3+4
