

**U.G. 6th Semester Examination - 2020****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: 1×10=10
- i) Write down the number of significant figures in the following numbers:  
3.05, 0.0290
  - ii) What do you mean by rounding off errors?
  - iii) Establish  $E \equiv 1 + \Delta$ , symbols have their usual significance.
  - iv) Obtain the linear interpolation formula using two points  $(x_1, y_1)$  and  $(x_2, y_2)$ .

- v) State the condition of convergence of Newton-Raphson method.
- vi) Define degree of precision of an interpolating quadrature formula.
- vii) State Lipschitz condition for the existence of a unique solution of an ordinary differential equation of first order and first degree.
- viii) Given  $f(0)=1$ ,  $f(1)=1$ ,  $f(2)=4$  then find  $\int_0^2 f(x) dx$  by Trapezoidal Rule.
- ix) Define order of convergence of an iterative method for finding root of an equation.
- x) Write down the binary equivalent of the decimal number  $(29)_{10}$ .
- xi) What is RAM?
- xii) What is the maximum length allowed in defining a variable in C?
- xiii) Library function `pow ( )` belongs to which header file?
- xiv) Write the keyword used to define floating point numbers.

xv) What should be the output of the following program:

```
# include <studio.h>

int main ()
{
int a=10/3;
printf("%d", a);
}
```

v) What do you mean by 'Interpreter' and 'Compiler'?

vi) Use 2's complement method to compute the difference

$$(1101.01)_2 - (1010.11)_2$$

vii) Write a program to read three values a, b, c from keyboard.

viii) What will be the value of x when the following segment is executed?

```
int x=10, y=15;
x=(x<y) ? (y+x):(y-x);
```

2. Answer any **five** questions:  $2 \times 5 = 10$

i) Find the absolute and relative error in computation of  $f(x) = 3 \sin x - 2x^2 - 9$  for  $x=0$  when the error in x is 0.003.

ii) By constructing the difference table, find the sixth term of the series 8, 12, 19, 29, 42.

iii) What is the condition for the convergence of Gauss-Seidel iterative method for the solution of a system of simultaneous equations?

iv) The root of an equation  $f(x)=0$  lies between 1 and 3. How many number of iterations are necessary in determining the root with a tolerance level  $\epsilon \sim 10^{-4}$  by bisection method.

3. Answer any **two** questions:  $5 \times 2 = 10$

i) Write down the Lagrange's interpolation formula and therefrom deduce closed type Newton-Cotes' quadrature formula in the form

$$I = (b-a) \sum_{r=0}^n K_r^{(n)} y_r \quad \text{for the integral}$$

$$I = \int_a^b f(x) dx, \quad \text{where } K_r^{(n)} \text{ being Cotes'}$$

co-efficients and  $y_r = f(x_r)$ . 5

ii) Prove that  $f(x_k, x_{k+1}, \dots, x_{k+n}) = \frac{\Delta^n f(x_k)}{n!h^n}$

when the argument values are equispaced with spacing  $h$  and  $\Delta$  is a forward difference operator. 5

iii) a) Explain the term 'Software' and 'Hardware'.

b) Write the syntax of nested if ... else statement. 2+3

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

i) a) Write down the iterative scheme of the Regula-Falsi method and discuss its convergence. Why does the method call 'linear interpolation method'?

b) Derive an expression of the error involved in approximating a function by an interpolating polynomial when the functional values are known at  $(n+1)$  distinct points. (5+1)+4=10

ii) a) Describe the Gauss-Seidel iteration method in solving a system of  $n$ -linear algebraic equations in  $n$ -unknowns. Comment on the convergence of the method.

b) Prove that the Simpson's 1/3rd rule of integration can be expressed as an area underlying a parabola  $y=ax^2+bx+c$  bounded by the  $x$ -axis and a line passing through the points  $(-h, y_0), (0, y_1), (h, y_2)$ .

$$5+5=10$$

iii) a) State the rules of using for-loop in C. Draw a flow-chart for showing the looping action of for-loop.

b) Write a program to test whether a given number is prime or not. (2+3)+5=10

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