BIRLA INSTITUTE OF TECHNOLOGY
MESRA – 835215, RANCHI, INDIA

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Name: ……………………………………………. Roll No.: …………………………………………..
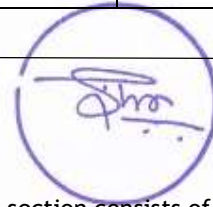
Branch: ……………………………………………. Signature of Invigilator: ……………………

Semester: IVth   Date: 27/04/2022 (MORNING)

Subject with Code: **MA203 NUMERICAL METHODS**

Marks Obtained	Section A (30)	Section B (20)	Total Marks (50)

INSTRUCTION TO CANDIDATE

1. The booklet (question paper cum answer sheet) consists of two sections. First section consists of MCQs of 30 marks. Candidates may mark the correct answer in the space provided / may also write answers in the answer sheet provided. The Second section of question paper consists of subjective questions of 20 marks. The candidates may write the answers for these questions in the answer sheets provided with the question booklet.

2. The booklet will be distributed to the candidates before 05 minutes of the examination. **Candidates should write their roll no. in each page of the booklet.**

3. Place the Student ID card, Registration Slip and No Dues Clearance (if applicable) on your desk. All the entries on the cover page must be filled at the specified space.

4. Carrying or using of mobile phone / any electronic gadgets (except regular scientific calculator)/chits are strictly prohibited inside the examination hall as it comes under the category of unfair means.

5. No candidate should be allowed to enter the examination hall later than 10 minutes after the commencement of examination. Candidates are not allowed to go out of the examination hall/room during the first 30 minutes and last 10 minutes of the examination.

6. Write on both side of the leaf and use pens with same ink.

7. The medium of examination is English. Answer book written in language other than English is liable to be rejected.

8. All attached sheets such as graph papers, drawing sheets etc. should be properly folded to the size of the answer book and tagged with the answer book by the candidate at least 05 minutes before the end of examination.

9. The door of examination hall will be closed 10 minutes before the end of examination. Do not leave the examination hall until the invigilators instruct you to do so.

10. Always maintain the highest level of integrity. Remember you are a BITian.

11. Candidates need to **submit the question paper cum answer sheets before leaving the examination hall**.

CLASS:BTECH   SEMESTER : IV
BRANCH:ECE/EEE/IT/
CSE   SESSION :SP/22

SUBJECT: MA203,NUMERICAL TECHNIQUES

TIME:2 HOURS   FULL MARKS:
                                                                                              50

INSTRUCTIONS:
1. The question paper contains Group A of 15 MCQ questions each of 2 marks and total of 30 marks.
2. Candidates may attempt from Group B any 5 questions from 10 questions of maximum of 20 marks.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Students can use their calculators for calculations.
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SECTION A

Q1. Number of iterations necessary to solve $x^3 + 4x^2 - 1 = 0$ with accuracy 10^{-3} ; a = 1 & b = 2

  (a) 10 (b) 5 (c) 6 (d) None

Q2. While solving the equation $x^2 - 3x + 1 = 0$ using Newton-Raphson Method with the initial guess of a root as 1, the value of the root after one iteration is

  (a) 1.5 (b) 1 (c) 0.5 (d) 0

Q3.Consider system of equations 27x+6y-z=85,x+y+54z=110,6x+15y+2z=72,taking initial guess as (0,0,0),the first iteration after solving problem by Gauss Seidel method is
   a. x=3.148,y=4.8 z=2.037   b. x=3.14,y=3.54,z=1.913   c. x=0,y=0,z=0 d. None

Q4.The root of the equation x^3-5x-7=0 between 2 and 3 by regula falsi method after 1 iteration only is
   (a) 2.5   (b) 2.6428 (c)2.7473   (d) None

Q5.While applying Gauss Elimination to solve the equations x+4y-z=-5;x+y-6z=-12; 3x-y-z=4,the value of only z is
    a.2.0845   b.2.0000   c. 1.6479 d.None

Q6. In LU decomposition to solve the equations 3x+2y+7z=4,2x+3y+z=5,3x+4y+z=7,the value of L(l_{21},l_{31},l_{32}) while solving the problem is
   (a) (2/3,1,6/5)   b.(6/5,1,2/3) c.(1,2/3,6/5) d. None.

Q7. If the 4th order Divided difference of f(x) = $\alpha x^4 + 5x^3 + 3x + 2$, $\alpha \in$ R at the points 0.1, 0.2, 0.3, 0.4, 0.5 is 5, then α is
   a.2 b. 3   c. 4 d.5

Q8.Consider A as a $(1+\Delta)(1-\nabla)=1$ and consider B as $\Delta + \nabla = \frac{\Delta}{\nabla} + \frac{\nabla}{\Delta}$, which statement is False

    a. A   b. B   c. Both A and B d. None

Q9. Use Trapezoidal rule to evaluate $\int_0^1 x^3$ dx considering five subintervals.

    a) 0.25   b)0.24 c) 0.26   d) 0.22

Q10.Using Newton's forward interpolation find value of f(0.5) from the following data sets

x	0	1	2
f(x)	1	0	1

    a.0.75 b. 0.25 c. 0.5 d.None

Q11.The value of $\int_0^6 \frac{dx}{1+x^2}$ (h=1) by using Simpson's 1/3 rule is

    a.1.4108 b.1.3662 c.1.3571 d.None

Q12.The value of dy/dx at x=0 for the following data set is

X	0	5	10
Y	0	3	14

    a. .2 b -0.2 c. 0.5 d.none

Q13. Solve the equation $\frac{dy}{dx} = 1 - y$ with the initial condition x = 0, y = 0 using Euler's algorithm and tabulate the solutions at x = 0.1, h=0.1

    a. 0.1 b. 0.001 c. 0.0001 d. none

Q14.Solve the differential equation y'=y-x, y(0)=1.5 , using Runge Kutta fourth order method Compute the value of k_2 at x=0.2

    a. 0.3 b.0.310 c.0.3110 d. None

Q15.The ordinary differential equation is solved by

    a.Bisection Method b.Gauss Seidel method c.Euler's method d.Simpson's 1/3 rule

SECTION B

Q1.   Find the value of 1/23 by the Newton Raphson method. The result must be correct to 2 decimal places and 3 iterations only.

Q2.   Find a real positive root (between 2 and 3) of $x^3 - 3x - 5 = 0$ correct to two decimal place using secant method.Solve for 3 iterations only.

Q3. Solve the following equation using Gauss Elimination method

$$3x+2y+7z=4; \qquad 2x+3y+z=5; \qquad 3x+4y+z=7$$

Q4. Apply Gauss- Seidal method upto 3 iterations and intial guess as (0,0,0) to solve the equations

$$3x+20y-z=-18; \qquad 2x-3y+20z=25; \qquad 20x+y-2z=17$$

Q5.The population of a certain city is given below for various years at equal intervals except for one year which is to be estimated.

Year	1951	1961	1971	1981	1991
Population 45 (in lakhs)		43	?	52	55

Q6.Find the polynomial (Newton's divided difference) satisfying the following data

X	0	1	4	5	7
Y	8	11	68	123	323

Also compute y(2)

Q7.Evaluate $\int_0^1 e^{-x^2}$ by deriving the range into four equal parts by using Simpson's 1/3 rule .

Q8. Find dy/dx at x=0 from the following data:-

x: 0   2   4   6   8

y: 7   13   43   145   367

Q9.Compute y, from the differential equation, $\frac{dy}{dx}=x-y, y(0)=1$ for x=0.1(0.1)0.4, using Euler's method.

Q10.Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = \frac{y^2-x^2}{y^2+x^2}$ with y(0)=1 at x=0.2.