

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: B TECH
BRANCH: BT/CE/ME/PIE/CEE

SEMESTER: III
SESSION: MO/2022

SUBJECT: MA203 NUMERICAL METHODS

TIME: 2 HOURS

FULL MARKS: 25

INSTRUCTIONS:

1. The total marks of the questions are 25.
2. Candidates attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

- Q1 (a) What is the accuracy of the following numbers? [2] CO1 BLO2
(i) 96.453 (ii) 0.002345 (iii) 4300.00 (iv) 88
- Q1 (b) Given $x = 0.1111 \times 10^4$ and $y = 0.1113 \times 10^4$. The relative error in the values of x and y is 0.05%. calculate the relative error in $z = x - y$. [3] CO1 BLCO4
- Q2 (a) Find a real root of the equation $f(x) = x^3 - 2x^2 + 3x - 1$ on the interval (0, 1) using bisection method with four iterations. [2] CO1 BLCO3
- Q2 (b) Using iteration method find the real root of the equation $x^3 = 1 - x^2$ on the interval [0,1] with an accuracy of 10^{-4} [3] CO1 BLCO4
- Q3 (a) Find the range of values of a such that Gauss-Jacobi's iteration method for the set of equations $x_1 + 2ax_2 = 7$, $ax_1 + x_2 = 3$ converges with any choice of initial approximation of the solution. [2] CO2 BLO3
- Q3 (b) Find an approximate value of $f(3.8)$ using given data. [3] CO3 BL03
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|------|-----|-----|-----|-----|
| x | 1 | 2 | 3 | 4 |
| f(x) | 1.6 | 2.2 | 3.1 | 4.3 |
- Q4 (a) Decompose the given coefficient matrix of the system of linear equations into Lower triangular matrix L and upper triangular matrix U. [2] CO2 BLO3
- $$\begin{aligned} x + 2y + 3z &= 14 \\ 2x + 5y + 2z &= 18 \\ 3x + y + 5z &= 20 \end{aligned}$$
- Q4 (b) Obtain the solution of the above system with the help of L-U triangular matrix obtained above. [3] CO2 BL03
- Q5 (a) Obtain the solution of the system of equations [2]
 $28x + 4y - z = 32, 2x + 17y + 4z = 35, x + 3y + 10z = 24$
with initial approximation $(x_0, y_0, z_0) = (0, 0, 0)$ correct to 4 decimal place using Gauss Seidel method. CO2 BLO3
- Q5 (b) What are the eigen value of the least magnitude and corresponding eigen vector (correct up to 2 decimal places) of matrix A obtained till third iteration [3] CO2 BL04
using Power method where $A = \begin{pmatrix} -2 & -3 \\ 6 & 7 \end{pmatrix}$