

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

CLASS: BTECH  
BRANCH: PROD/MECH/CHEM.ENGG./ CEE/BT/CIVIL

SEMESTER : III  
SESSION : MO/19

TIME: 3 HOURS

SUBJECT: MA203 NUMERICAL METHODS

FULL MARKS: 50

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
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. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

- Q.1(a) Discuss the convergence in Regula Falsi Method. [5]  
Q.1(b) How accurately should the time of vibration of a pendulum be measured in order that the computed value of  $g$  is correct to 0.01%. [5]

- Q.2(a) Solve the following system of equations by the Gauss-Jordan method: [5]  
 $10x+y+z=12$ ;  $2x+10y+z=13$ ;  $x+y+5z=7$ .  
Q.2(b) Using power method to evaluate eigen values and eigen vectors of the matrix [5]

$$A = \begin{pmatrix} 5 & 10 \\ 2 & 6 \end{pmatrix}$$

- Q.3(a) Q3a. Find the missing values in the following table: [5]

X	1	3	5	7	9	11
Y	2	?	27	64	?	216

- Q.3(b) Use Newton's divided difference interpolation formula to find  $f(12)$  from the given data: [5]

x	11	13	14	18	19	21
f(x)	1342	2210	2758	5850	6878	9282

- Q.4(a) Estimate the length of the arc of the curve  $3y=x^3$  from (0,0) to (1,1/3) using Simpson's  $1/3^{rd}$  rule by taking  $h=0.125$ . [5]  
Q.4(b) Tabulate the function  $f(x)=5x^4-3x^3+10x-6$  at  $x_0=-0.50$ ,  $x_1=1.00$  and  $x_2=2.00$ . Compute its first and second derivative as accurately as possible. [5]

- Q.5(a) Solve by Euler's Method  $\frac{dy}{dx} = \frac{x-y}{x}$ ,  $y(0)=1$  over  $[0,3]$  using  $h=$ . [5]  
Q.5(b) Find  $y(1.1)$  using the Runge-Kutta method of the fourth order, given that  $\frac{dy}{dx}=y^2+xy$ ,  $y(1)=1$  and  $h=0.1$ . [5]

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