Manmohan Technical University

School of Engineering

Model Question Set

Subject: Numerical Methods (EG553SH)   Full Marks: 50

Year/Part: II/II   Pass Marks: 20

Time: 3:00 hours

Attempt all the questions

Group: A (10*1=10 marks)

Multiple choice questions

1. Number of significant digits in 3.80092 is :
    a. 4
    b. 5
    c. 6
    d. 7

2. Which of the following is the advantage of using the Gauss Jordan method?
    a) Additional Calculations
    b) No labour of back substitution
    c) More operations involved
    d) Elimination is easier

3. Matrix which does not have an inverse by solving it, is classified as which of the following?
    a) singular matrix
    b) non-singular matrix
    c) linear matrix
    d) unidentified matrix

Sample Question

4. What is the other name for factorization method?
   a) Muller's Method
   b) Decomposition Method
   c) Lin Bairstow Method
   d) Doolittle's Method

5. If the equation $y = ae^{bx}$ can be written in linear form $Y = A + BX$, what are Y, X, A, B?
   a) $Y = \log y$, $A = a$, $B = \log b$ and $X = x$
   b) $Y = y$, $A = a$, $B = \log b$ and $X = \log x$
   c) $Y = y$, $A = a$, $B = b$ and $X = x$
   d) $Y = \log y$, $A = \log a$, $B = b$ and $X = x$

6. The order of convergence of Bisection method is
   a. 0
   b. 1
   c. 1.61
   d. 2

7. $1 + \Delta =$
   a. E - 1
   b. $\frac{1}{E}$
   c. E
   d. ∇

8. If a root lies between x=a and x= b then:
   a. $f(a) \times f(b) = 0$
   b. $f(a) \times f(b) = $ positive
   c. $f(a) \times f(b) = $ negative
   d. None

9. Runge Kutta II order method is used to solve _____ equation
   a) Differential
   b) Integral
   c) Interpolating
   d) Linear

10. We wish to solve x2 - 2 = 0 by Newton Raphson technique. If initial guess is $x_0 = 1.0$, subsequent estimate of x (i.e. x_1) will be

a) 1.414
b) 1.5
c) 2.0
d) None

Group: B

Short Answer Questions

(Attempt any EIGHT questions only)   (8*2 = 16 marks)

11. Explain the importance of Numerical Methods in the field of Science and Engineering.

12. Use Trapezoidal rule to find $\int\limits_{0}^{3} \sin (2x) \, with \, h=0.5$.

13. Derive the iterative formula to find root of a function using Newton's Raphson Method

14. Use Gauss Siedel iterative method to solve following equations correct to two decimal places.

$$9x+3y=63$$
$$2x+7y=28$$

15. Solve the equation y' = 1- y, with the initial condition y(0)=0 using Eulers method.

16. What do you mean by Interpolation? What are different types of Interpolation Techniques.

Sample Question

17. Use Lagrange Interpolation formula to find f(2.5) from following data:

x	1	2	4	5
	1	1.414	1.732	2.00

18. Explain the difference between Ordinary and Partial Differential Equations.

19. Construct Forward Difference Table from following data:

X	0.1	0.2	0.3	0.4	0.5
Y	1.40	1.56	1.76	2.00	2.28

Group: C

Long Answer Questions

(Attempt any SIX questions only)   (6*4 = 24 marks)

20. Using the Cubic Spline interpolation technique, estimate the value of y(4) from the following data:

X	1	3	5	7
y	1.56	-0.43	-16.90	6.10

21. Derive an expression to evaluate first derivative from Newton's backward interpolation formula and evaluate $\frac{dy}{dx}$ at x = 8 from the following table.

X	0	2	4	6	8
y	0	-0.7553	-11.2151	34.2867	-8.3226

22. .Using Fourth-order Runge Kutta method, solve the following differentil equation for y at x=0.2 and r=0.4 : y''-xy'+y²=0, y(0)=1, y'(0)=0 .

23. Solve Poisson's equation $U_{xx} + U_{yy}$ = 243 $(x^3 +y^3)$ over the square domain $0 \leq x \leq 1$, $0 \leq y \leq 1$, with step size $h = \dfrac{1}{3}$ and U =100 on the boundary.

24. Find a positive root of the equation $x^2 \sin x - e^x +2 = 0$ using Bisection method correct to 3 decimal places.

25. Using L-U method solve, the following system of equations

$$2x+3y+z=1$$

$$6x-3y+4z=17$$

$$5x+7y+6z=10$$

26. Fit the following set of data to a curve of the form $y=ae^{bx}$.

X	2	3	4	5	6	7
Y	15.1	10.2	7.8	5.5	3.8	1.7

Sample Question