**ADVANCED NUMERICAL ANALYSIS**

**QUESTION BANK**

1. Define Multipoint Iteration Function.

2. Define asymptotic error.

3. Define Spectral Radius.

4. Define Rate of Convergence.

5. Write down the formula for Hermite Interpolating Polynomial.

6. Define Lagrange Bivariate Interpolating Polynomial.

7. Define Extrapolation Method.

8. Explain Numerical Integration.

9.What is a canonical representation of the differential equation.

10. Define Lipschitz Constant.

11.What is the rate of convergence for Newton Raphson Method.

12. State Intermediate Value Theorem.

13. Define Pivotal Element.

14. Define Hilbert norm.

15. Define Truncation error.

16. Define Aitken’s Linear Interpolating polynomial.

17. Write down the formula for Numerical Differentiation of order p.

18. Prove that E = e hD.

19. Define Lipschitz constant.

20. Define Optimal.

21Find the interval in which the smallest positive root of the equation -x-4=0

22.Write thenewton’s Raphson method formula

23Find the inverse of the matrix

24.Define vector norm.

25.Write the Piecewise Hermite Interpolation formula.

26.Write the formulae for the least square polynomial approximation of degree one and two.

27.Write the quadratic interpolation formula for non uiform nodal points

28.Define extrapolation method

29.Define the term increment function, implicit,explicit of single step method.

30.Define the predictor ,corrector method.

31Find the real root of the equation x sin x + cos x = 0 using Regula Falsi meth

32.Perform two iterations of Muller’s method to find the root of the equation x3 – x2 – x - 1 = 0.

33. Solve the system of equation by Gauss Jordan Elimination Method

10x + y +z = 12, 2x +10 y +z = 13, x + y+5z = 7.

34. The following system of equations 3x+2y=4.5, 2x+3y-z=5, -y+2z=-0.5. Set up the SOR iteration scheme for the solution.

35.Using Sin(0.1) = 0.09983, Sin(0.2) = 0.19867. Find Sin (0.15) by Lagrange’s Interpolation. Obtain a bound on the truncation error.

36. Explain Piecewise Linear Interpolation.

37. Find the Jacobian matrix for the system of equation f1(x,y) = x2 + y2 - x = 0, f2(x,y) = x2 - y2 - y = 0 at the point (1,1).

38. Evaluate the Integral I = using Gauss Legendre 3 point formula.

39. Explain Euler Method.

40 Solve u 1 = -2tu2, u(0)=1 with h = 0.2 on the interval [0,0.4] using the Backward Euler Method.

41. (a). Use synthetic division and perform two iterations by Birge-Vieta method to find the smallest positive root of the equation x4 -3x3 +3x2 -3x +2 = 0

42. Find the smallest positive root of the equation tan x + tan hx = 0 by Bisection Method.

43. State and Prove a necessary and sufficient condition for convergence of an iteration method.

44. State and Prove Gerschgorin Theorem.

45. Using sin(0.1) = 0.09983 & sin (0.2) = 0.19867, find an approximate value of sin (0.15) by Lagrange Interpolation. Obtain a bound on the truncation error.

46. Derive Hermite Interpolating Polynomial.

47. Given the following values of f(x) = log x, find the approximate value of f1(2.0) & f11 (2.0) , using the methods based on linear & quadratic interpolation.

|  |  |  |  |
| --- | --- | --- | --- |
| i | 0 | 1 | 2 |
| xi | 2.0 | 2.2 | 2.6 |
| fi | 0.69315 | 0.78846 | 0.95551 |

48. Derive Gauss Legendre Integration Method.

49. Derive Runge Kutta Method.

50. Solve the initial value problem u1 = -2tu2 , u(0) = 1 with h = 0.2 on the interval

[0, 0.4]. Use the fourth order classical Runge Kutta method.

51. Find all the roots of the equation x4 - x3 +3x2 + x - 4 = 0 using the Graeffe’s root squaring method.

52. Find the largest eigenvalue in modulus & the corresponding eigen vector of the matrix A = using the Power method.

53. Derive Cubic Spline Interpolation.

54. Evaluate the integral I = using Gauss-Legendre three point formula.

55. Given the initial value problem u1 = t2 + u2 , u(0) = 0 determine the first three non-zero terms in the Taylor series for u(t).

56. Derive rate of convergence for the Secant Method

57. Determine the largest eigen value and corresponding eigen vector of the matrix

A = using Power method correct to 3 decimal places.

58. Using the following table of values

|  |  |  |
| --- | --- | --- |
| **x** | **f(x)** | **f 1(x)** |
| -1 | 1 | -5 |
| 0 | 1 | 1 |
| 1 | 3 | 7 |

Estimate the value of f(-0.5) & f(0.5) using Piecewise Cubic Hermite Interpolation.

59. Explain Methods based on finite difference.

66. Explain Mid Point Method.