Video Explanation (+theory) Link Here

Final Notes Here

Final Question Pattern (60 marks)

-1.5 hrs

CO1 - 12 marks (~15 mins)

Entirely Theoretical Qs with some math expression

Any one of the two questions.

1. a) i)

ii)

b) i)

ii)

CO2 - 18 marks (~25 mins)

Small Mathematical Question with significant marks

Any one of the two questions.

1. a) i)

ii)

iii)

b) i)

ii)

iii)

CO3 - 30 marks (~50 mins)

Large Mathematical Question
Any 2 of the 3 questions.

Orange marked not thoroughly discussed in classes.

Chapter 4:

1. **Interval Bisection Method**.
   - With both positive and/or negative intervals along with a specific number of iterations.
   - Without predefined intervals.
   - Total number of iteration given the interval and error bound

2. **Fixed Point Method.**
   - Find the roots *given a specific starting point*
   - Find original roots, lamba and nature of roots or rate of convergence (super linear convergence, linear convergence or divergence)

3. **Newton Raphson Method.**
   - Error bound given. Iteration until it is reached.
   - Specific number of iteration

- Find a fixed point expression which is super linear convergence

4. Aitken's Acceleration Method.

- With newton raphson method
- With error bound or specific number of iteration.

5. Secant Method.

Chapter 5:

1. Pivoting Problem
2. Gaussian Elimination. Must be with multiplier
3. LU decomposition. Must be with multipliers .

Chapter 6:

1. Orthonormal Matrix
2. Least square method
3. QR decomposition
4. Know how to calculate matrix multiplication for 4x2 * 2x4, 4x3 * 3x4, 3x2 * 2x3

Chapter 7: (Easy mark with minimal effort)

1. Trapezium Rule
2. Simpson Rule
3. Composite Newton Cotes Rule

4. Error and relative error
5. Actual Integral

THEORY

Chapter 4:

1. Suppose we have multiple roots within a given interval. Can we use interval bisection method? If not, what can be done so that we can use interval bisection methods to find the individual roots.
2. Let's say we want to find the roots with some error using interval bisection method. Now let's say we want to find the exact roots without any error, do we need MORE or LESS iterations.
3. If we are asked to find the roots using divergence g(x), can we find the roots?
4. Why do we get super linear convergence using Newton Raphson method? Show using a detailed proof.
5. What are the issues when working with turning points in Newton Raphson Method?
6. Explain how Newton Raphson tackles the problem related to turning points.
7. Why do we use Aitken's acceleration using Newton's Method instead of simple Newton's Method.
8. Let's say instead of using 2 times Newton Raphson followed by Aitken's Acceleration we use an alternative method. We use Newton Raphson 4 times followed by Aitken's Acceleration. Do we need more or less iterations and why?
9. Why do we use the Quasi Newton Method over Newton Method? What is the advantage?
10. What is the difference between the Quasi Newton Method and Secant Method?

Chapter 5:

1. What is the difference between Augmented Matrix (A) and simple A matrix in Gaussian Elimination. Why do we use Augmented Matrix (A) instead of simple matrix A in the process.
2. Do we need Augmented Matrix(A) for solving all linear Systems? If not, state the method that can be used.

3. What is a linear system?
4. When is a system not directly solvable by Gaussian or LU decomposition. Explain with a scenario.
5. Briefly explain what can be done to solve the issue that has been addressed in the previous question.
6. Given the equation, what is the issue here? What can be done to solve the issue and get the result of the linear system.

$$x + 2y - 3z = 2$$
$$2x + 5z = 4$$
$$3x + 1y + 11z = 15$$

7. Can we solve $x = A^{-1} b$. Show how.
8. Show the det L is always 1.
9. If det U is 13. Then what is det A. You must show what is the value of det L?

Chapter 6:

1. What is the difference between a linear system and an overdetermined System?
2. Can we use LU decomposition or gaussian to solve an overdetermined system?
3. What are the conditions needed for orthonormality ? Can we get an orthonormal basis if the basis is not orthogonal?
4. What are the methods for solving an overdetermined system?
5. Can we solve $x=A^{-1} b$ given we are working with an overdetermined system? Show how. If not, say why we can not solve it.
6. Consider we can not solve $x=A^{-1} b$. How can we address the issue? Show using the equation.

Chapter 7:

1. What is the difference between trapezium and simpson rule?
2. We saw the trapezium rule and the simpson rule. Which gives the better result. Why?