🔥 Mathematics-III Unit 1 Important Questions (RGPV)

🔴 MUST STUDY (Almost Guaranteed)

Newton-Raphson Method

1. Explain Newton-Raphson Method with derivation and algorithm.
2. Find the real root of a polynomial equation using Newton-Raphson Method.
3. Find the real root of a transcendental equation using Newton-Raphson Method.
4. Show that Newton-Raphson Method is quadratically convergent.
5. What is the rate/order of convergence of Newton-Raphson Method?

PYQ Frequency: ⭐⭐⭐⭐⭐

Newton Forward Interpolation

6. Derive Newton Forward Interpolation Formula.
7. Find the value of f(x) using Newton Forward Interpolation Formula.
8. Find missing values using Newton Forward Difference Table.

PYQ Frequency: ⭐⭐⭐⭐⭐

Newton Divided Difference Formula

9. Derive Newton Divided Difference Formula.
10. Find f(8) and f(15) using Newton Divided Difference Formula.
11. Calculate f(6) using Newton Divided Difference Formula.

PYQ Frequency: ⭐⭐⭐⭐⭐

Lagrange Interpolation Formula

12. Derive Lagrange Interpolation Formula.
13. Find the interpolating polynomial using Lagrange Formula.
14. Fit a polynomial using Lagrange Interpolation Method.

PYQ Frequency: ⭐⭐⭐⭐⭐

🟡 HIGHLY IMPORTANT

Regula-Falsi Method

15. Explain Regula-Falsi Method with algorithm.
16. Find the real root of xe^x − 3 = 0 using Regula-Falsi Method.
17. Find the real root of $x \log_{10} x - 1.2 = 0$ using Regula-Falsi Method.
18. Compare Bisection and Regula-Falsi Methods.

PYQ Frequency: ⭐⭐⭐⭐

Finite Difference Operators

19. Define Forward Difference Operator (Δ).
20. Define Backward Difference Operator (∇).
21. Define Shift Operator (E).
22. Define Central Difference Operator (δ).
23. Construct Forward Difference Table.
24. Construct Backward Difference Table.
25. Find higher-order differences.

PYQ Frequency: ⭐⭐⭐⭐

Relation Between Operators

26. Prove relations among E, Δ, ∇ and δ.
27. Prove:

E=1+ΔE = 1+\DeltaE=1+Δ

28. Prove:

$$E = \frac{1}{1-\nabla} = 1 - \nabla^{-1}$$

29. Derive relation between Δ and δ.
30. Prove operator identities asked in PYQs.

PYQ Frequency: ⭐⭐⭐⭐

🟢 MEDIUM IMPORTANCE

Bisection Method

31. Explain Bisection Method with algorithm.
32. Solve a polynomial equation using Bisection Method.
33. What is the rate of convergence of Bisection Method?
34. Compare Bisection and Newton-Raphson Methods.

PYQ Frequency: ⭐⭐⭐

Newton Backward Interpolation

35. Derive Newton Backward Interpolation Formula.
36. Find f(x) using Newton Backward Formula.
37. When is Newton Backward preferred over Newton Forward?

PYQ Frequency: ⭐⭐⭐

🎯 Top 10 Expected Long Questions (14 Marks)

1. Newton-Raphson Method with derivation and numerical.
2. Newton Forward Interpolation Formula derivation.

3. Newton Divided Difference Formula derivation and numerical.
4. Lagrange Interpolation Formula derivation and numerical.
5. Regula-Falsi Method with numerical.
6. Bisection Method with numerical.
7. Construction of Forward and Backward Difference Tables.
8. Relations among E, Δ, ∇, δ operators.
9. Proof of operator identities.
10. Comparison of all root-finding methods.

⚡ One-Night Priority Order

If only **1 day is left**, study in this order:

1. Newton-Raphson Method ⭐⭐⭐⭐⭐
2. Newton Forward Interpolation ⭐⭐⭐⭐⭐
3. Newton Divided Difference ⭐⭐⭐⭐⭐
4. Lagrange Formula ⭐⭐⭐⭐⭐
5. Regula-Falsi Method ⭐⭐⭐⭐
6. Finite Difference Operators ⭐⭐⭐⭐
7. Relation Between Operators ⭐⭐⭐⭐
8. Bisection Method ⭐⭐⭐
9. Newton Backward Interpolation ⭐⭐⭐