SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

Accredited by NBA-AICTE and Accredited by NAAC – UGC with A+ Grade

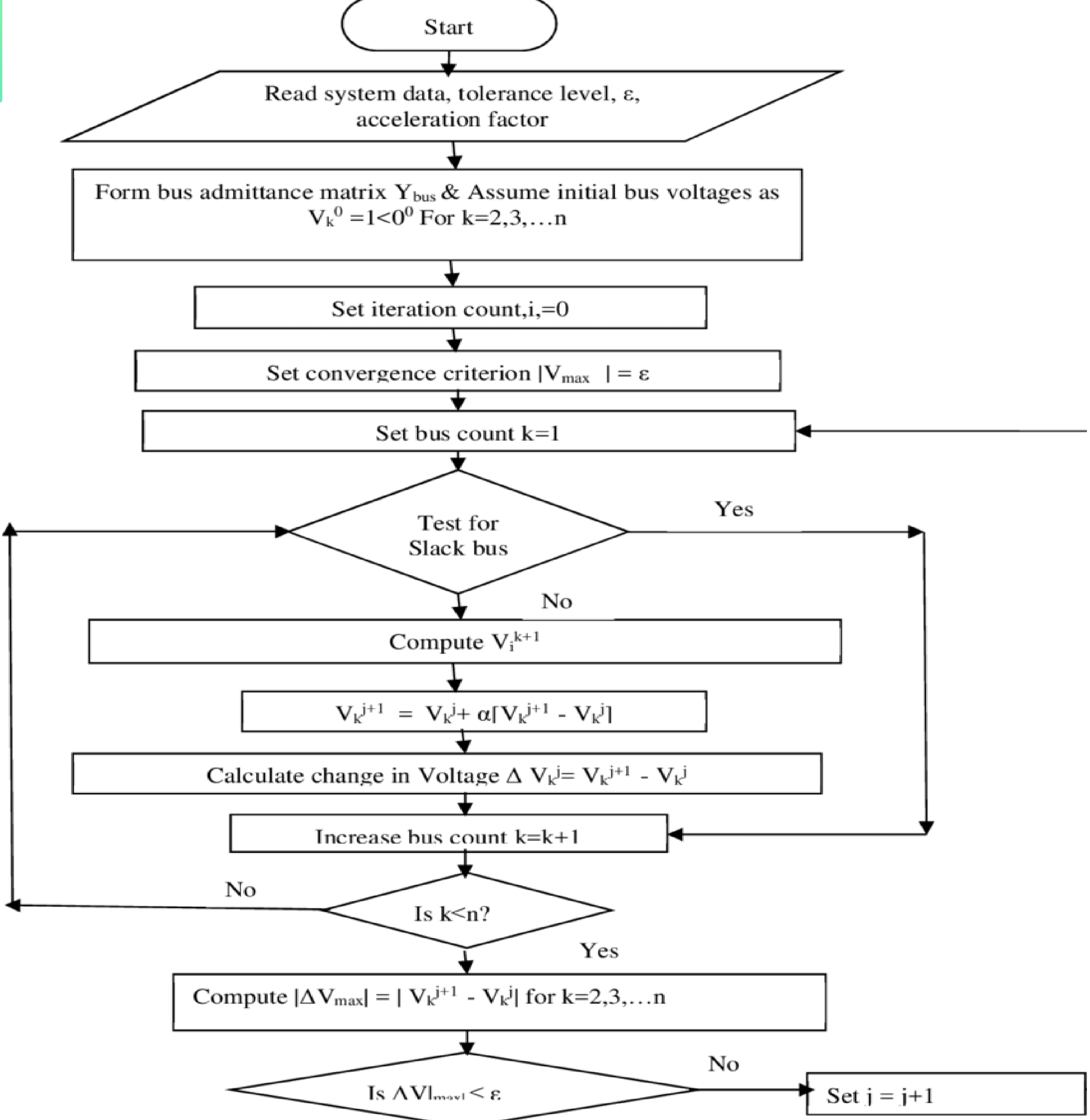
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

19EEB302/ POWER SYSTEMS – II

III YEAR / VI SEMESTER

UNIT-I: POWER FLOW ANALYSIS

GAUSS SEIDAL METHOD


Start
Read system data, tolerance level, ε, acceleration factor
Form bus admittance matrix Y_{bus} & Assume initial bus voltages as $V_k^0 = 1<0^0$ For k=2,3,…n
Set iteration count,i,=0
Set convergence criterion $|V_{max}| = ε$
Set bus count k=1
Test for Slack bus
Yes
No
Compute V_i^{k+1}
$V_k^{j+1} = V_k^j + α[V_k^{j+1} - V_k^j]$
Calculate change in Voltage $Δ V_k^j = V_k^{j+1} - V_k^j$
Increase bus count k=k+1
No
Is k<n?
Yes
Compute $|ΔV_{max}| = | V_k^{j+1} - V_k^j|$ for k=2,3,…n
Is $|ΔV|_{max} < ε$
No
Set j = j+1

Gauss-Seidel Method is used to solve the linear system Equations.

It is a method of iteration for solving n linear equation with the unknown variables. This method is very simple and uses in digital computers for computing.

The Gauss-Seidel method is the modification of the gauss-iteration method.This modification reduces the number of iteration.

In this methods the value of unknown immediately reduces the number of iterations, the calculated value replace the earlier value only at the end of the iteration. .

Because of it, the gauss-seidel methods converges much faster than the Gauss methods. In gauss seidel methods the number of iteration method requires obtaining the solution is much less as compared to Gauss method.

Let us understand the Gauss-Seidel Method with the help of an example. Consider the total current entering the kth bus of an ‘n’ bus system is given by the equation shown below.

$$I_k = Y_{k1}V_1 + Y_{k2}V_2 + \dots\dots + Y_{kn}V_n = \sum_{i=1}^{n} Y_{ki}V_i \dots\dots (1)$$

The complex power injected into the k^{th} bus is given as

$$S_k = P_k + jQ_k = V_k I_k \;\ldots\ldots..(2)$$

The complex conjugate of the above equation becomes

$$S_k = P_k - jQ_k = V_k I_k \;\ldots\ldots..(3)$$

$$I_k = \frac{1}{V_k}(P_k - jQ_k) \;\ldots\ldots.(4)$$

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$$S_k = P_k - jQ_k = V_kI_k \dots\dots (3)$$

$$I_k = \frac{1}{V_k}(P_k - jQ_k) \dots\dots (4)$$

Elimination of I_k from the equation (1) and (4) gives

$$Y_{k1}V_1 + Y_{k2}V_2 + \dots\dots + Y_{kk}V_k + \dots\dots + Y_{kn}V_n = \frac{1}{V_k}(P_k - jQ_k) \dots\dots (5)$$

Therefore, the voltage at any bus 'k' where P_k and Q_k are specified is given by the equation shown below.

$$V_k = \frac{1}{Y_{kk}}\left[\frac{P_k - jQ_k}{V_k} - \sum_{\substack{i=1 \\ i \neq k}}^{n} Y_{ki}V_i\right] \dots\dots\dots (6)$$

Equation (6) shown above is the major part of the iterative algorithm.

At the bus 2, the equation becomes

$$V_2 = \frac{1}{Y_{22}}\left[\frac{P_2 - jQ_2}{V_2} - Y_{21}V_1 - Y_{23}V_3 - \ldots\ldots - Y_{2n}V_n\right] \ldots\ldots\ldots (7)$$

At the bus 3, the equation becomes

$$V_3 = \frac{1}{Y_{33}}\left[\frac{P_3 - jQ_3}{V_3} - Y_{31}V_1 - Y_{32}V_2 - Y_{34}V_4 \ldots\ldots - Y_{3n}V_n\right] \ldots\ldots\ldots (8)$$

Now for the kth bus, the voltage at the (r + 1)th iteration is given by the equation shown below.

$$V_k^{(r+1)} = \frac{1}{Y_{kk}}\left[\frac{P_k - jQ_k}{V_k^{(r)}} - \sum_{i=1}^{k-1} Y_{ki}\, V_i^{(r+1)} - \sum_{i=k+1}^{n} Y_{ki}\, V_1^{(r)}\right] \ldots\ldots\ldots (9)$$

RECAP....

...THANK YOU