Consider the below two flow-charts.

INITIALIZATION :

```
┌─────────────────────────┐
│ Compute                 │
│ LOAD FLOW SOLUTION      │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ EXTEND, Y-bus to        │
│ OBTAIN  $Y_1''$         │
├─────────────────────────┤
│ INCLUDE LOAD shunts     │
│ To OBTAIN  $Y_1'$       │
├─────────────────────────┤
│ Reduce Y-bus To         │
│ OBTAIN  $Y_1$           │
├─────────────────────────┤
│ Compute GEN Currents    │
├─────────────────────────┤
│ Compute Gen INT. VOLTAGES│
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ Go To SOLUTION          │
│ Routine                 │
└─────────────────────────┘
```
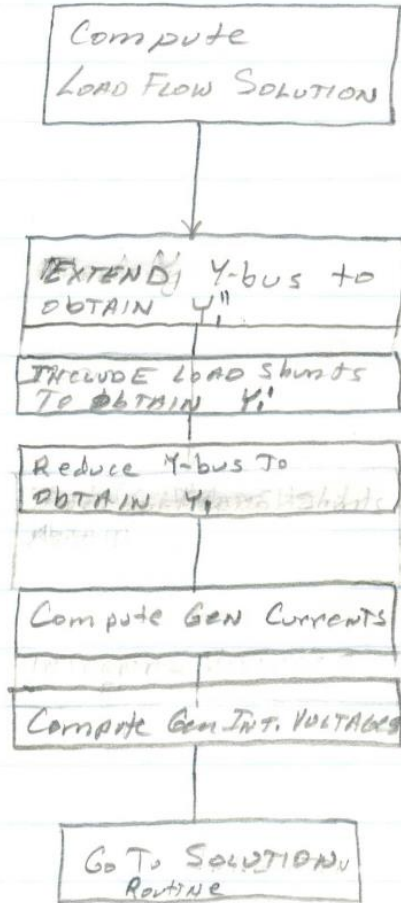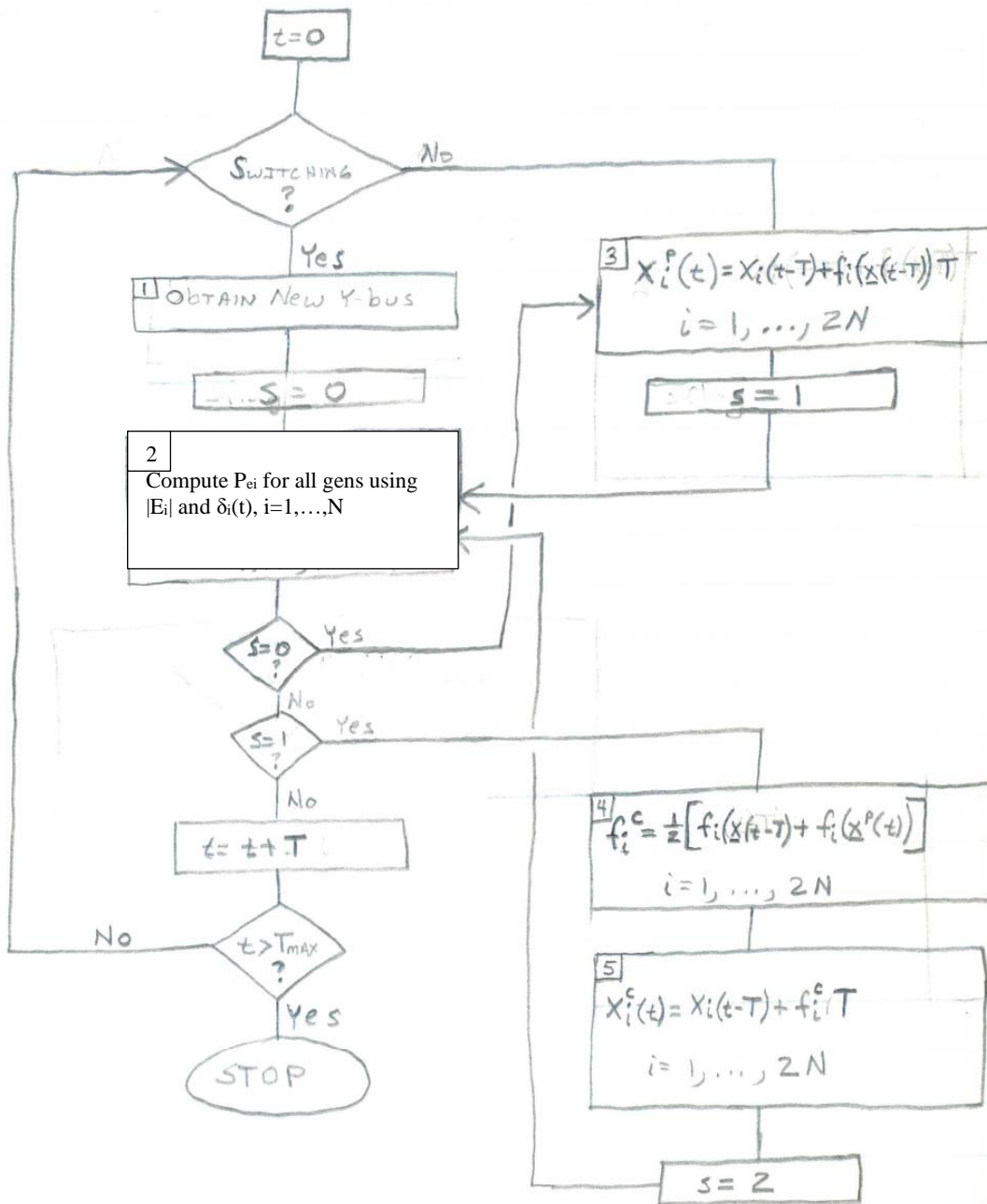
Pre-FAULT :

Y_1'' ≈ extended pre-fault Y-bus
(with internal gen nodes included)

Y_1' : with load shunts

Y_1 : reduced

SOLUTION ROUTINE

$t=0$

SWITCHING ? — No

Yes

1 OBTAIN New Y-bus

$S = 0$

2
Compute P_{ei} for all gens using $|E_i|$ and $\delta_i(t)$, $i=1,\ldots,N$

3 $x_i^p(t) = x_i(t-T) + f_i(x(t-T))\,T$
$i = 1, \ldots, 2N$

$s = 1$

$S=0$? — Yes

No

$S=1$? — Yes

No

$t = t + T$

4 $f_i^c = \frac{1}{2}\left[f_i(x(t-T)) + f_i(x^p(t))\right]$
$i = 1, \ldots, 2N$

$t > T_{MAX}$? — No

Yes

STOP

5 $x_i^c(t) = x_i(t-T) + f_i^c\,T$
$i = 1, \ldots, 2N$

$s = 2$

The numbers in the following questions correspond to the numbers in the blocks of the flow-chart.
1. In obtaining the new Y-bus,
   a. What are the most typical switching events to consider?
   b. What techniques do you use for these events in modifying the Y-bus?
2. Consider the block where the bus powers are computed.
   a. What is N?
   b. What is the equation used to compute P_{ei} ?

c. When computing P_{ei} **for a particular bus i,** we must obtain voltages at other nodes.
    i. Do we need to obtain the terminal bus voltages? Why or why not?
    ii. What other nodes are there for which we need information? What information?
    iii. How would this step need to be changed if there were constant power loads represented in the network at the load buses?
3. Consider the integration scheme represented only in this block.
    a. What kind of integration scheme is it?
    b. Why do we recompute P_{ei} before taking another step?
    c. Why is the argument of f_i a vector?
    d. Why are there 2N of these equations?
    e. Give the form of these equations for 1 generator in terms of angles, speeds, P_{mi}, and P_{ei}.
4,5. Consider the steps in blocks 4 and 5.
    a. What kind of integration scheme is used as a result of steps 4 and 5?
    b. Give the form of the equations in steps 4 and 5 in terms of angles, speeds, P_{mi}, and P_{ei}.