2062
B.E. (Electrical and Electronics Engineering)
Sixth Semester
EE-601: Computer Aided Power System Analysis

Time allowed: 3 Hours   Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part. All questions carry equal marks.*
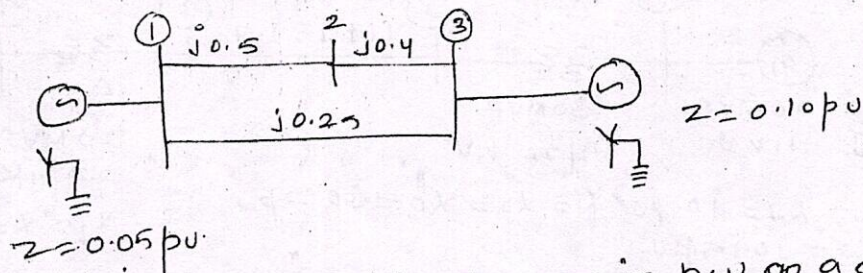
x-x-x

1.   (a)   What is the role of slack bus in power flow analysis?

     (b)   A system has m-PQ buses and n-PV buses, what will be the size of J11 and J21?

     (c) What is transient stability of power system?

     (d)   Draw sequence networks of a transmission line.

     (e)   Why Z_{bus} is preferred for fault analysis?   (5 × 2)

Part-A

2.   (a)   Formulate Y_{BUS} for a given single line diagram

Z = 0.10 pu

All values are in p.u on a common base.

Z = 0.05 pu

     (b)   Derive an expression for LFC in two-area power system.   (5,5)

3.   (a)   Derive basic non-linear equations of power flow analysis.

     (b)   A3-phase, 50 Hz synchronous generator is delivering 0.8 pu real power input to an infinite bus via transmission circuit. A temporary 3-phase fault occurs in the middle of line 2. Determine the rotor angle position before fault occurs. Determine the critical clearing angle if the fault is cleared by opening the faulted line. Assume H=5 MJ/MVA.
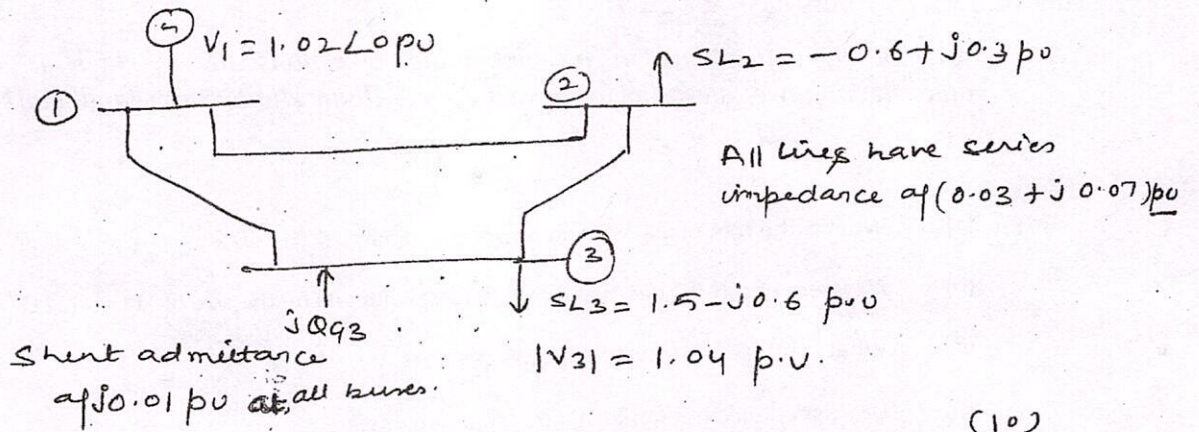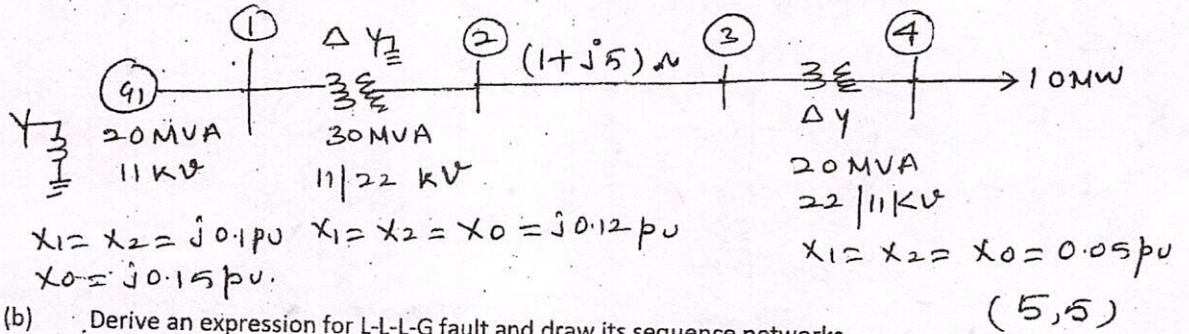

(5,5)
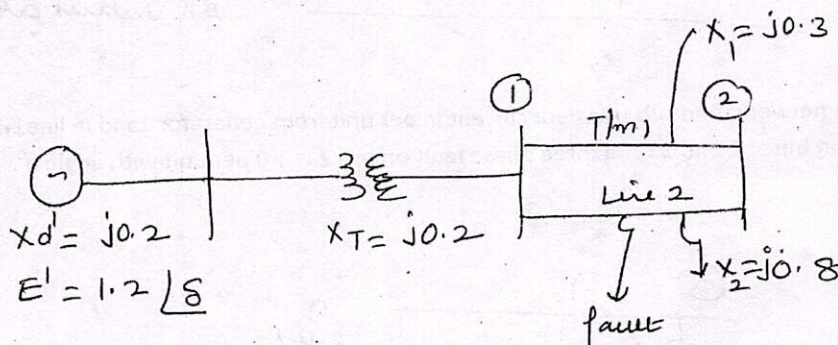
4. Find bus voltages at bus 2 and 3 and line flows using NR load flow analysis as shown below:

$V_1 = 1.02 \angle 0 \, pu$

$SL_2 = -0.6 + j0.3 \, pu$

All lines have series impedance of $(0.03 + j0.07) \, pu$

jQ_{g3}

Shunt admittance of $j0.01 \, pu$ at all buses.

$SL_3 = 1.5 - j0.6 \, pu$

$|V_3| = 1.04 \, p.u.$

(10)

PART-B

5. (a) Determine fault current and voltages (line) for a single line to ground fault at bus 3. Assume fault resistance is 6.6 ohms.

g_1 20 MVA 11 KV

30 MVA 11/22 KV

$(1 + j5) \, \Omega$

20 MVA 22/11 KV $\to$ 10 MW

$X_1 = X_2 = j0.1 \, pu$
$X_0 = j0.15 \, pu.$

$X_1 = X_2 = X_0 = j0.12 \, pu$

$X_1 = X_2 = X_0 = 0.05 \, pu$

(5,5)

(b) Derive an expression for L-L-L-G fault and draw its sequence networks.

6. Formulate Z_{Bus} using step-step method algorithm for a given system.

$j0.2 \, pu$

$j0.4$ $j0.5$

$j0.2$

$j0.3 \, pu.$

g_1

g_2

All values are in pu.

(10)
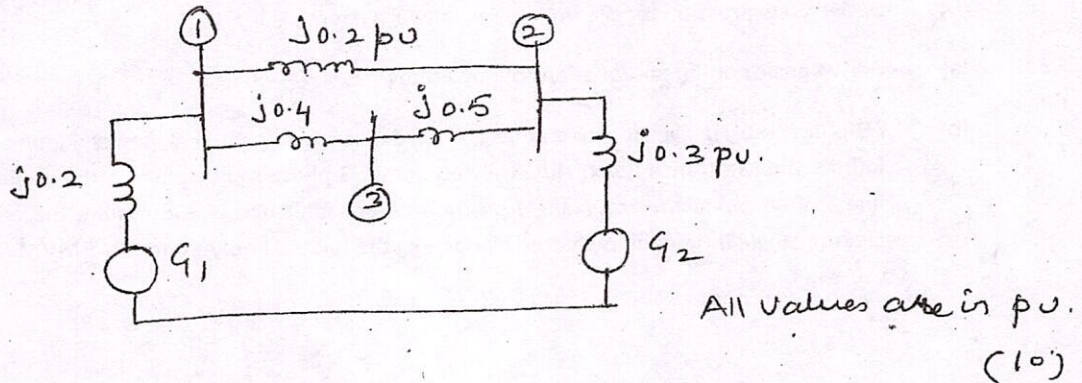
7. For the given network, find sub transient current in per unit from generator 1 and in line1-2, and the voltages at buses 1 and 3 for a three phase fault on bus 2 is 1.0 per unit with angle $0°$.

(10)

$j0.2$ $j0.4$

$j0.5$

$Xd' = 0.2$ $Xd'' = 0.3$

g_1 g_2

x-x-x