Code No: R05410203 **Set No. 1**

IV B.Tech I Semester Regular Examinations, November 2008
POWER SYSTEM ANALYSIS
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. What is primitive network matrix and represent its forms? Prove $Y_{bus} = A^t[y]A$ using singular transformation? [16]

2. (a) Explain merits and demerits of building Zbus algorithm.
   (b) Write step-by-step algorithm for Z_{bus} building for a network containing no mutuals and no phase shifting transformers. [8+8]

3. Derive the basic equations for load flow studies and also write the assumptions and approximations to get the simple equations. [16]

4. (a) What is decoupled load flow? What are the advantages of such load flow solution?
   (b) Distinguish between decoupled load flow solution and fast decoupled load flow solution. [10+6]

5. (a) What are the advantages of p.u system.
   (b) For the network shown in figure 5b draw p.u impedance diagram. [10+6]

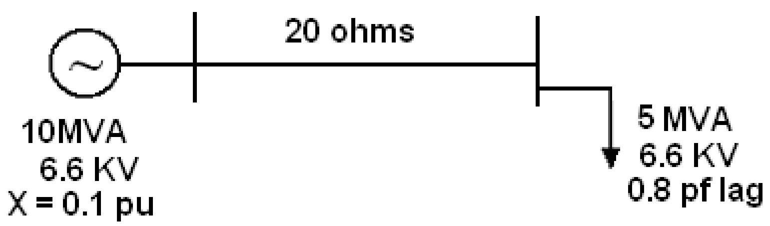

Figure 5b

6. For the system shown in figure 6. A a LL fault occurs at point F. Find fault current. [16]

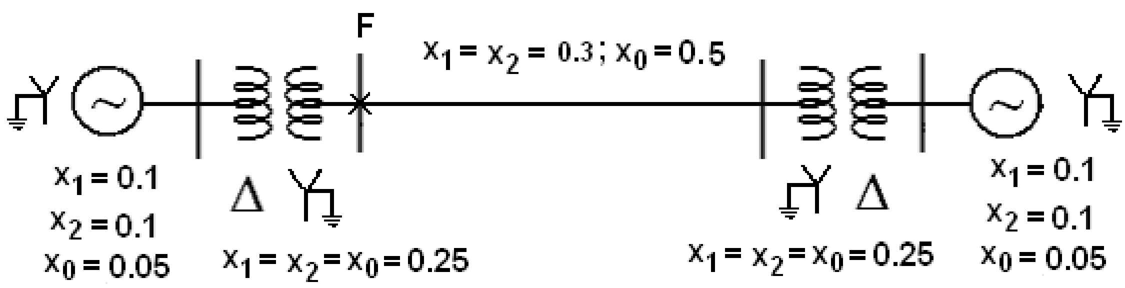

Figure 6

7. A salient pole synchronous generator is connected to an infinite bus via a line. Derive an expression for electrical power output of the generator and draw p-δ curve. [16]

8. A synchronous generator represented by a voltage source of 1.0 pu in series with a transient reactance of j 0.15 pu and inertia constant of 2.5 MJ/MVA is connected to an infinite bus through a line of reactance of j 0.3 pu. The infinite bus is represented by a voltage source of 1.0 pu in series with a reactance of j 0.2 pu. The generator is supplying an active power of 1.0 pu when a 3 phase fault occurs at its terminals. If the fault is cleared in 100 milli seconds. Determine system stability by plotting swing curve. Take $\Delta t = 0.05$ secs. [16]

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Code No: R05410203

Set No. 2

IV B.Tech I Semester Regular Examinations, November 2008
POWER SYSTEM ANALYSIS
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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1. Form Y_{bus} for the network by direct inspection method: [16]

Element	Positive sequence reactance
E-A	0.04
E-B	0.05
A-B	0.04
B-C	0.03
A-D	0.02
C-F	0.07
D-F	0.10

2. Derive expression for a partial network adding a link to form Z_{bus}. [16]

3. The converged load flow solution is available how do you determine the slack bus complex power injection and system total loss? [16]

4. Perform one iteration of FDLF method for the system shower in figure 4:

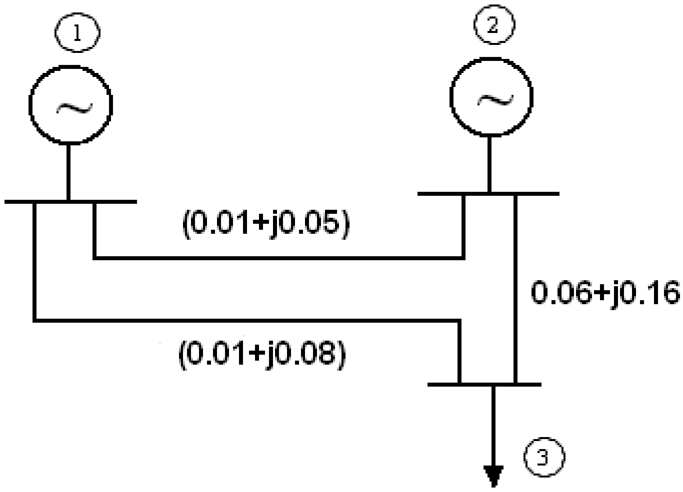

Figure 4

Slack Bus-1: V = 1.05 +j 0.0

P - V Bus -2: $|V_2| = 1.03$ p.u. : $P_2 = 0.5$ p.u.; $0.1 < Q_2 > 0.3$

Load Bus -3: $P_3 = 0.6$ p.u., $Q_3 = 0.25$ p.u. [16]

5. Draw the pu impedance diagram for the system shown in figure 5. Choose Base MVA as 100 MVA and Base KV as 20 KV. [16]

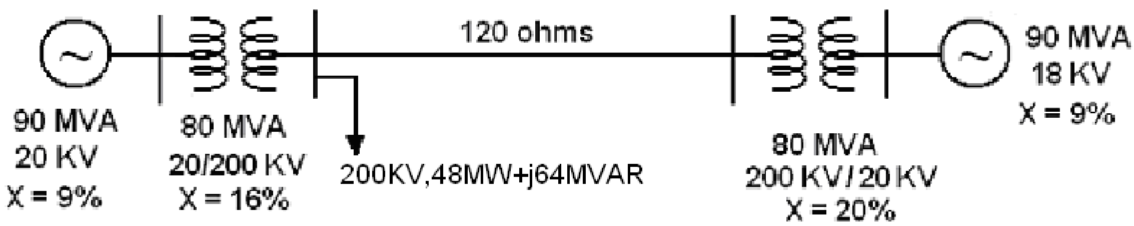

Figure 5

6. For the system shown in figure 6. A LLG fault occurs at point F. Find fault current. [16]

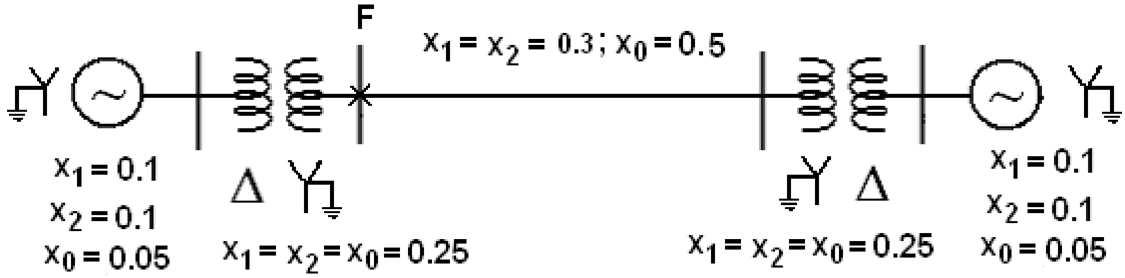

Figure 6

7. A 3 phase 50 Hz transmission line is 200 Km long. The line parameters are r = 0.1 ohm /Km; $x = 0.25$ ohm/km; $y = 3 \times 10^{-6}$ mho / Km. The line is represented by nominal π model. $I_f\ |V_S| = |V_R| = 200KV$ determine steady state stability limit. [16]

8. (a) Explain point by point method of solving swing equation.
   (b) Explain methods of improving transient stability. [8+8]

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Code No: R05410203 **Set No. 3**

IV B.Tech I Semester Regular Examinations, November 2008
POWER SYSTEM ANALYSIS
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Form Y_{bus} for the network by singular transformation: [16]

Element	Positive sequence reactance
E-A	0.04
E-B	0.05
A-B	0.04
B-C	0.03
A-D	0.02
C-F	0.07
D-F	0.10

2. Build Z_{bus} for the 3-bus system connection given as: [16]

element	bus code	impedance
1	1-2	j0.1
2	1-2	j0.25
3	1-3	j0.1
4	2-3	j0.1

3. Explain modeling of transformer, transmission line, loads and generators for a load flow study. And derive general load flow equations. [16]

4. Derive necessary expressions for the off-diagonal and diagonal elements of the sub-matrices J_1, J_2, J_3 and J_4 for carrying out a load flow study on power system by using N-R method in Polar form. [16]

5. (a) Prove that Base impedance = $\frac{KV^2_{LL(Base)}}{MVA_{3-\phi(Base)}}$

   (b) Obtain pu impedance diagram of the power system of figure 5b. Choose base quantities in generagor circuit.
   Generator: 20 MVA, 11 KV, X''= 0.1 pu
   Transformer: 25 MVA, 11/33 KV, X = 0.1 pu
   Load: 10 MVA, 33 KV, 0.8 pf lag. [16]

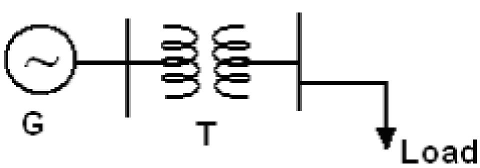

Figure 5b

6. A balanced 200 V, 3 phase supply feeds balanced resistive load as shown in figure 6. If the resistance R_{bc} is disconnected. Determine I_a, I_b and I_c and symmetrical components of I_a, I_b and I_c. [16]

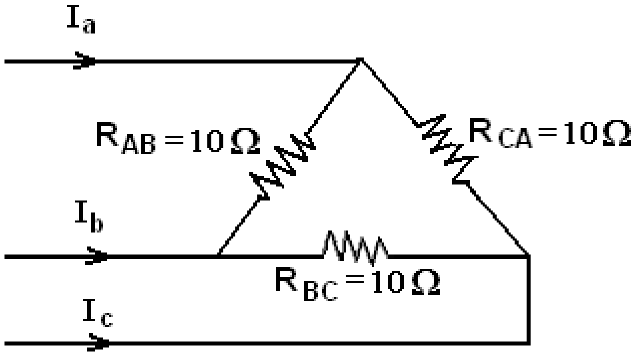

Figure 6

7. (a) Define steady state stability.
   (b) Two turbo alternators with ratings given below are connected via a short line.
   Machine 1: 4 pole, 50 Hz, 60 MW, 0.8 pf lag.
   moment of inertia 30, 000 kg-m^2
   Machine 2: 2 pole, 50 Hz, 80 MW, 0.85 pf lag.
   moment of inertia 10,000 kg-m^2.
   Calculate the inertia constant of single equivalent machine on a base of 200 MVA. [16]

8. (a) What are the assumptions made in deriving swing equation.
   (b) Explain point by point method of determine swing curve. [6+10]

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Code No: R05410203 **Set No. 4**

IV B.Tech I Semester Regular Examinations, November 2008
POWER SYSTEM ANALYSIS
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks
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1. Form the Y_{bus} for the given network: [16]

Element	Positive sequence reactance
1-2	j1.0
2-3	j0.4
2-4	j0.2
3-4	j0.2
3-1	j0.8
4-5	j0.08

2. If an impedance of j1.5 pu is connected between bus-3 and ground of the network Z_{bus} given below, compute the new Z_{bus}(all values are in pu): [16]

$$Z_{bus} = \begin{array}{c|ccc} & 1 & 2 & 3 \\ 1 & j1.2 & j1.2 & j1.2 \\ 2 & j1.2 & j1.4 & j1.2 \\ 3 & j1.2 & j1.2 & j1.5 \end{array}$$

3. The $\underline{Y_{Bus}}$ of a 5-bus system is (5×5)matrix. The system has an off nominal tap ratio transformer between buses 3 and 5 as shown in figure 3 if the transformer outage takes place, how are the Y_{BUS} elements are modified. [16]

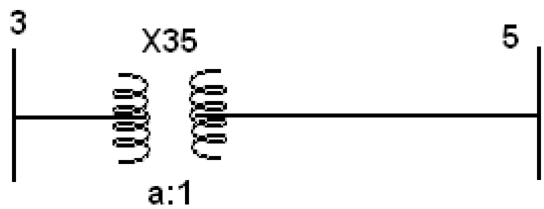

Figure 3

4. Draw the flow chart of decoupled method and explain. [16]

5. (a) Prove that $Z_{pu(new)} = Z_{pu(old)} \times \frac{(MVA)_{Base(new)}}{(MVA)_{Base(old)}} \times \frac{(KV_{LL})^2_{Base\ old}}{(KV_{LL})^2_{Base\ old}}$

   (b) Obtain pu impedance diagram of the power system of figure 5. Choose base quantities as 15 MVA and 33 KV.

Generator: 30 MVA, 10.5 KV, $X'' = 1.6$ ohms.
Transformers T_1 & T_2: 15 MVA, 33/11 KV, X = 15 ohms referred to HV
Transmission line: 20 ohms / phase
Load: 40 MW, 6.6 KV, 0.85 lagging p.f. [4+12]

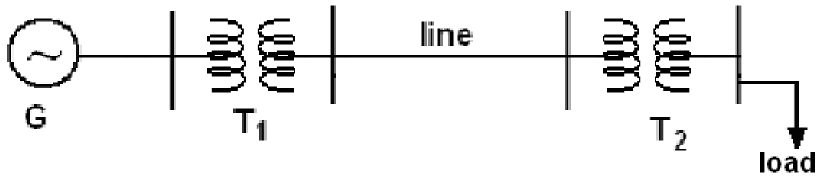

Figure 5

6. A LG fault occurs at point F on the system shown in figure 6. Find fault current. [16]

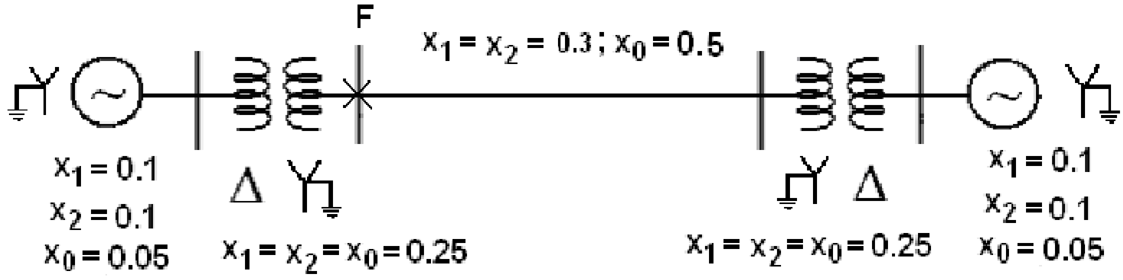

Figure 6

7. (a) Define steady state stability limit.
   (b) Derive steady state stability limit of a line with generalised circuit constants of A, B, C and D if sending end and receiving end voltages are V_S and V_R. [16]

8. For the system shown in figure 8, a 3 phase fault occurs at the middle of one of the transmission lines and is cleared by simultaneous opeining of circuit breakers at both ends. If initial power of generator is 0.8 pu, determine the critical clearing angle. [16]

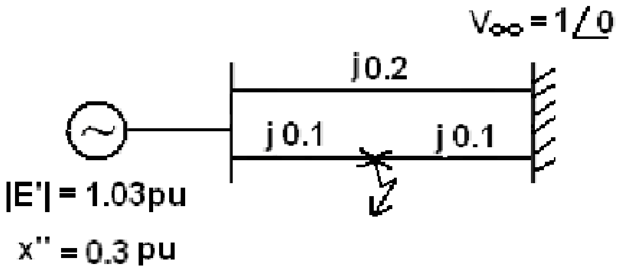

Figure 8

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