Code No: 09A60203 **R09** **Set No. 2**

III B.Tech II Semester Examinations,April/May 2012
COMPUTER METHODS IN POWER SYSTEMS
Electrical And Electronics Engineering

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Distinguish between steady state and dynamic stability of a power system network.
   (b) What is meant by power angle curve and write its significance.
   (c) How can the steady state stability of power system be increased? [5+5+5]

2. (a) For the power system network shown in figure 1, draw
      i. Graph
      ii. Tree
      iii. Co-Tree
      iv. Basic loops
      v. Basic cut-sets.
   (b) Write the network performance equations. [7+8]

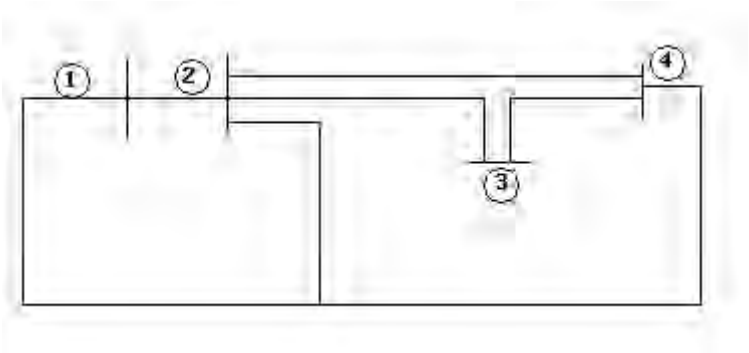

Figure 1:

3. Explain the p.u. system of analyzing power system problems. Discuss the advantages of this method over the absolute method of analysis. [15]

4. A synchronous generator is operating at an infinite bus and supplying 45% of its peak power capacity. As soon as a fault occurs, the reactance between the generator and the line becomes four times its value before the fault. The peak power that can be delivered after the fault is cleared is 70% of the original maximum value. Determine the critical clearing angle. [15]

5. A 65-MVA star-connected 16 kV synchronous generator is connected to 20kV/120 kV, 75 MVA Δ/Y transformer. The sub-transient reactance of the machine is 0.32 p.u. and the reactance of transformer is 0.1 p. u. When the machine is unloaded, a 3-phase fault takes place on the HT side of the transformer. Determine:

(a) the sub transient symmetrical fault current on both sides of the transformer,

(b) the maximum possible value of the d.c. current. Assume 1 p.u. generator voltage. [15]

6. (a) Write the algorithm for FDLF method.

   (b) Compare G-S method and N-R methods. [8+7]

7. Consider the 3-bus system shown in figure 2. The PU line reactances are indicated on the fig. The line resistances are negligible. The magnitudes of all the three bus voltages are specified to be $|V_1| = 1.00$ pu, $|V_2| = 1.04$ pu, $|V_3| = 0.96$ pu. The bus powers are specified in below table .

Bus	Real demand	Reactive demand	Real generation	Reactive generation
1	Pd1=1.0	Qd1=0.6	Pg1=0.7	Qg1 (unspecified)
2	Pd2=0	Qd2=0	Pg2=1.4	Qg2 (unspecified)
3	Pd3=1.0	Qd3=1.0	Pg4=0	Qg3 (unspecified)

Carry out the complete approximate load flow solution. Take bus-1 as slack bus. [15]

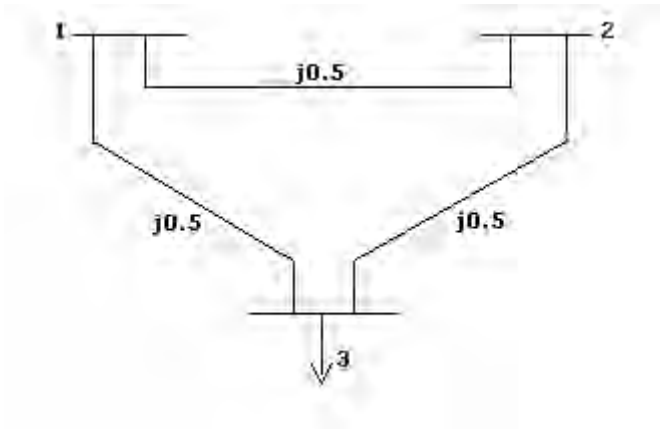

Figure 2:

8. The bus impedance matrix for a 3-bus system is

$$Z_{bus} = \begin{bmatrix} \text{j } 0.3 & \text{j } 0.2 & \text{j } 0.275 \\ \text{j } 0.2 & \text{j } 0.4 & \text{j } 0.25 \\ \text{j } 0.275 & \text{j } 0.25 & \text{j } 0.418 \end{bmatrix}$$

There is a line outage and the line from 1 to 2 is removed. Using the method of building algorithm, determine the new bus impedance matrix. [15]

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Code No: 09A60203 **R09** **Set No. 4**

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COMPUTER METHODS IN POWER SYSTEMS
Electrical And Electronics Engineering

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
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1. (a) Wat is the load flow study and explain the need for load flow solution.
   (b) What are the assumptions in SLFE(static load flow equations) and derive the approximate load flow equations. [6+9]

2. Four bus bar sections have each a generator of 40 MVA 10% reactance and a bus bar reactor of 8% reactance. Determine the maximum MVA fed into a fault on any bus bar section and also the maximum MVA if the number of similar bus bars in sections is very large. [15]

3. (a) What are the assumptions in FDLF method?
   (b) Compare the different methods of load flow techniques. [3+12]

4. (a) Derive the formula for power transfer through a transmission line.
   (b) A 4-pole ,50 Hz, 22 kV turbo alternator has a rating of 100 MVA,p.f 0.8 lag.The moment of inertia of rotor is 9000 kg-m^2. Determine M and H. [7+8]

5. A 50 Hz, three-phase synchronous generator delivers 1.00 p.u. power to an infinite busbar through a network in which resistance is negligible. A fault occurs which reduces the maximum power transferable to 0.40 p.u. whereas, before the fault, this power was 1.8 p.u. and, after the clearance of the fault 1.30 p.u. By the use of equal area criterion, determine the critical angle. [15]

6. (a) Prove that when there is no mutual coupling, the diagonal and off-diagonal elements of Y_{Bus} can be computed from $Y_{ii} = \Sigma y_{ij}$ and $Y_{ij} = -y_{ij}$.
   (b) Define the terms graph, tree, co-tree, tree branches, and links. Write the relation between branches, links & no. of nodes. [7+8]

7. A three-phase transmission line operating at 33 kV and having a resistance and reactance of 5 ohms and 20 ohms respectively is connected to the generating station bus bar through a 5,000 kVA step-up transformer which has a reactance of 6 per cent, which is connected to the bus bar being supplied by two alternators, one 10,000 kVA having 10% reactance, and another 5,000 kVA having 7.5% reactance. Calculate the kVA at a short-circuit fault between phases occurring
   (a) at the high voltage terminals of the transformers
   (b) at load end of transmission line. [15]

8. Explain the algorithm for the addition and removal of lines in power system. [15]

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Code No: 09A60203 **R09** **Set No. 1**

III B.Tech II Semester Examinations,April/May 2012
COMPUTER METHODS IN POWER SYSTEMS
Electrical And Electronics Engineering

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
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1. Three generators are rated as follows: Generator 1:100 MVA, 33 kV, reactance 10%, Generator 2:150 MVA, 32 kV, reactance 8% and Generator 3:110 MVA, 30 kV, reactance 12%. Determine the reactance of the generators corresponding to base values of 200 MVA and 35 kV. [15]

2. (a) Define the following terms with suitable example.
   i. Graph
   ii. Tree
   iii. Co-Tree
   iv. Cut-set
   v. Basic Loop.

   (b) Explain the incidence matrices: $\hat{A}$, A, B and C. [7+8]

3. Differentiate between steady state stability and transient stability of a power system. Discuss the factors that affect:

   (a) steady state stability, and

   (b) transient state stability of the system. [15]

4. Develop load flow equations suitable for solution by N-R method using rectangular coordinates when only PQ buses are present. [15]

5. The following is the system data for load flow solution. The line admittances are given in table 1 and active and reactive powers are given in table 2.

Bus Code	P, pu	Q, pu	V, pu	Remarks
1	-	-	1+j0	Slack bus
2	1	0.1	-	PQ bus
3	3.5	0.3	-	PQ bus

Table 2:

Bus Code	Impedance
1-2	-j5
1-3	-j5
2-3	-j10

Table 1:

Find the voltages at the end of first iteration by using G-S method. [15]

6. A power plant has two generators of 10 MVA. 15% reactance each and two 5 MVA generators of 10% reactance paralleled at a common bus bar from which load is taken through a number of 4 MVA step up transformers each having a reactance of 5%. Determine the short circuit capacity of the breakers on the:
   (a) low voltage, and
   (b) high voltage side of the transformer. [15]

7. For the 3-bus system shown in figure 3 obtain Zbus. [15]

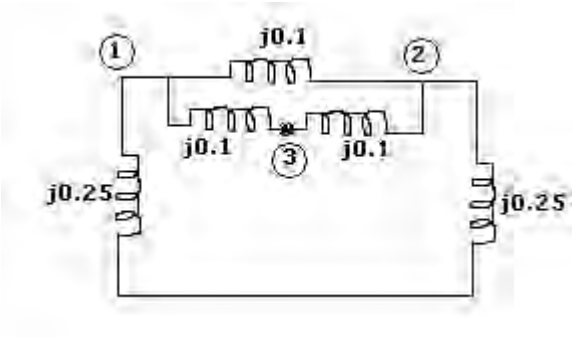

Figure 3:

8. (a) Explain breifly the two forms of instability in power system.
   (b) Does over compensation of a transmission line affects the stability of a power sytem? Justify the answer. [7+8]

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Code No: 09A60203 **R09** **Set No. 3**

III B.Tech II Semester Examinations,April/May 2012
COMPUTER METHODS IN POWER SYSTEMS
Electrical And Electronics Engineering

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
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1. Two generators rated at 10 MVA 13.2 kV and 15 MVA 13.2kV are connected in parallel to a bus bar. They feed supply to two motors of inputs 8 MVA and 12 MVA respectively. The operating voltage of motors is 12.5 kV. Assuming base quantities as 50 MVA and 13.8 kV draw the reactance diagram. The percent reactance for generators is 15% and that for motors is 20%. [15]

2. (a) Derive the static load flow equations of a n-bus system.
   (b) Explain the advantages and disadvantages of G-S method. [8+7]

3. A motor is receiving 25% of the power that it is capable of receiving from an infinite bus. If the load on the motor is doubled, calculate the maximum value of load angle during the swinging of the rotor around its new equilibrium position. [15]

4. (a) Compare G-S method and N-R methods.
   (b) Write the algorithm for N-R method using rectangular coordinates when PV buses are absent. [7+8]

5. Derive the formulae for Z_{bus} using building algorithm for the addition of link with mutual coupling to other elements. [15]

6. A 50 Hz synchronous generator is connected an infinite bus through a line. The p.u. reactances of generator and the line are j0.2 p.u. and j0.4 p.u. respectively. The generator no load voltage is 1.1 p.u. and that of infinite bus is 1.0 p.u. The inertia constant of the generator is 4 MW-sec/MVA. Determine the frequency of natural oscillations if the generator is loaded to 80% of its maximum power transfer capacity and small perturbation in power is given. [15]

7. A 3 phase, 30 MVA, 6.6kV alternator having 10% reactance is connected through a 30 MVA, 6600/33,000 v delta-star connected transformer of 5% reactance to a 33 kV transmission line having a negligible resistance and a reactance of 4 ohms. At the receiving end of the line there is a 30 MVA, 33,000/6600 volt delta-star connected transformer of 5% reactance stepping down the voltage to 6.6 kV. Both the transformers have their neutral solidly grounded. Draw the one-line diagram and the positive, negative and zero sequence networks of this system and determine the fault currents for single line grounded fault at the receiving station L.V. bus bars.For generator assume -ve sequence reactance as 70% that of + ve sequence. [15]

8. (a) For the 3-bus system shown in figure 4, let a new bus (bus no.4) be added with bus no.2 through a transmission line of impedance (0.01+j0.3)p.u. Obtain Y_{bus} for the new system?

   (b) Explain why Y_{bus} is often used in load flow study. [15]

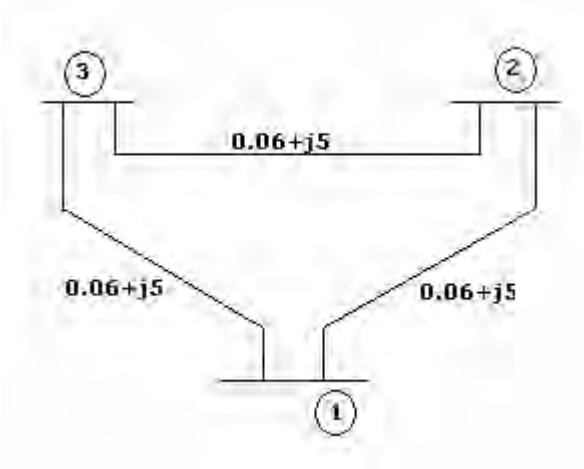

Figure 4:

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