Code No: RR320203 **RR** **Set No. 2**

III B.Tech II Semester Examinations,December 2010
MODELLING OF POWER SYSTEM COMPONENTS
Electrical And Electronics Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Develop the mathematical model of primary and secondary Control Loops and derive the transfer functions of each block.

   (b) Determine the primary Automatic load frequency control loop parameters for the following system data:

Total rated area capacity	=	2000 Mw
Normal operating load	=	1000 Mw
Inertia constant	=	5 sec.
Regulation	=	2.4 hz/ p.u. Mw

   Assume load frequency depending is linear. [10+6]

2. A synchronous generator is connected to an infinite bus through a transmission line. Neglecting the resistances draw the phasor diagram and derive the

   (a) Relation between active power and power angle.

   (b) Relation between reactive power and power angle. [8+8]

3. (a) Prove that when there is no mutual coupling the diagonal and off-diagonal elements of the admittance Y_{Bus} can be computed from
   $Y_{ii} = \sum_j Y_{ij}$

   and $Y_{ij} = -Y_{ij}$
   where Y_{ij} is the sum of the admittance of all the lines connecting buses i and j. [4]

   (b) Consider the linear graph shown in Figure 1, which represents a 3-bus transmission system with all the shunt admittance lumped together. Each line has a series impedance of (0.02 + J0.08) and half line charging admittance of J0.02,

   i. Compute Y_{Bus} by inspection
   ii. Compute Z_{Bus} analytically
   iii. Verify $Y_{Bus}Z_{Bus}$ = U. [4+5+3]

Code No: RR320203 **RR** **Set No. 2**

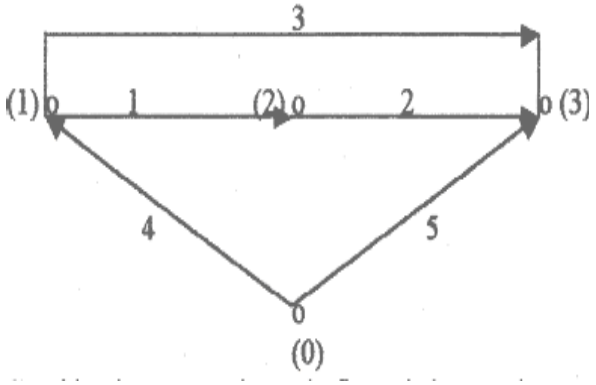

Figure 1

4. Figure shows the one line diagram of a 4-bus system. Impedances in p.u. are indicated in the figure 7.

   (a) Find Y_{Bus} assuming that the line shown dotted is not connected

   (b) What modifications need to be carried out in Y_{Bus} if the line shown dotted is connected. [10+6]

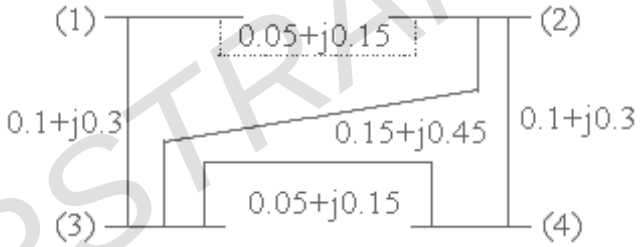

Figure 7

5. For the system shown in figure 3, obtain Z_{Bus} by Z_{Bus} building algorithm. Take bus(1) as reference. All impedances are in p.u. [16]

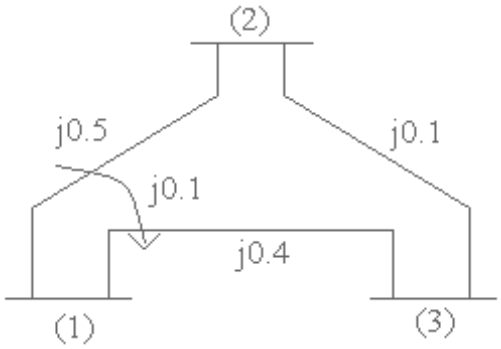

Figure 3

6. (a) Explain about the various performance requirements of excitation system.

   (b) Explain the elements of an excitation system. [8+8]

7. (a) Obtain the tie-set schedule in three phase representation for the following power system network's. As shown in figure 2a.

Code No: RR320203 **RR** **Set No. 2**

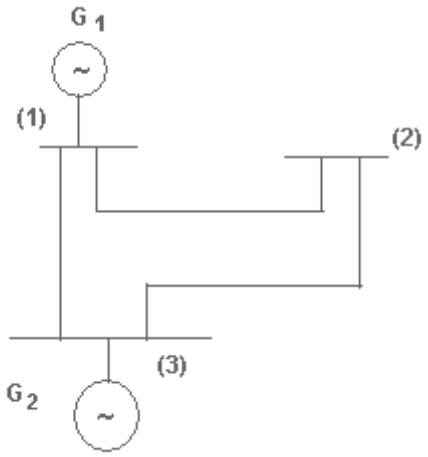

figure 2a

(b) Develop the primitive network three phase representation of elements in impedance and admittance forms. [6+10]

8. (a) Define the following terms with suitable example: Basic
   i. tree
   ii. branches
   iii. links
   iv. co-tree
   v. loop.

(b) Write the relation among the number of nodes, number of branches, number of Links and number of elements.

(c) For the graph given in figure 4, draw the tree and the corresponding co-tree. Choose a tree of your choice, and hence write the cutest schedule. [5+2+9]

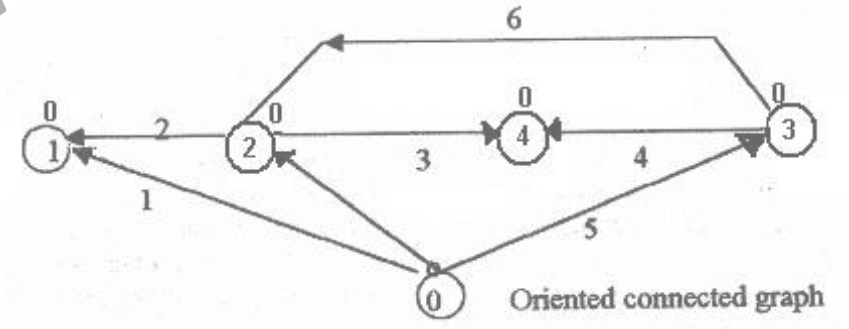

figure 4

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Code No: RR320203 **RR** **Set No. 4**

III B.Tech II Semester Examinations,December 2010
MODELLING OF POWER SYSTEM COMPONENTS
Electrical And Electronics Engineering

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

Answer any FIVE Questions
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⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Define the following terms with suitable example: Basic
   i. tree
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   iv. co-tree
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   (c) For the graph given in figure 4, draw the tree and the corresponding co-tree. Choose a tree of your choice, and hence write the cutest schedule. [5+2+9]

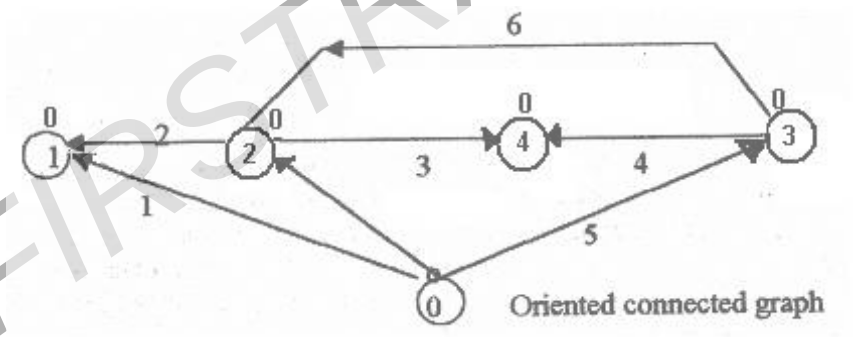

figure 4

2. A synchronous generator is connected to an infinite bus through a transmission line. Neglecting the resistances draw the phasor diagram and derive the
   (a) Relation between active power and power angle.
   (b) Relation between reactive power and power angle. [8+8]

3. (a) Explain about the various performance requirements of excitation system.
   (b) Explain the elements of an excitation system. [8+8]

4. Figure shows the one line diagram of a 4-bus system. Impedances in p.u. are indicated in the figure 7.
   (a) Find Y_{Bus} assuming that the line shown dotted is not connected
   (b) What modifications need to be carried out in Y_{Bus} if the line shown dotted is connected. [10+6]

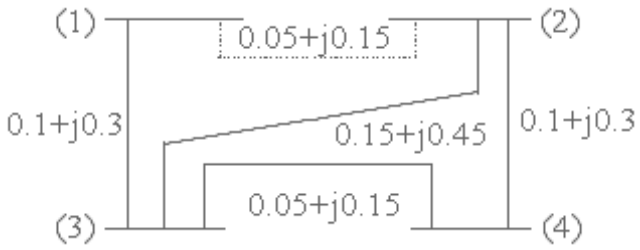

Figure 7

5. For the system shown in figure 3, obtain Z_{Bus} by Z_{Bus} building algorithm. Take bus(1) as reference. All impedances are in p.u. [16]

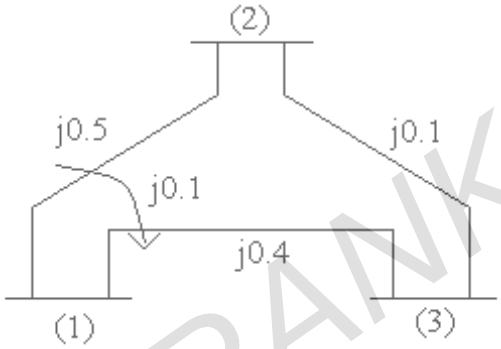

Figure 3

6. (a) Develop the mathematical model of primary and secondary Control Loops and derive the transfer functions of each block.

   (b) Determine the primary Automatic load frequency control loop parameters for the following system data:

Total rated area capacity	=	2000 Mw
Normal operating load	=	1000 Mw
Inertia constant	=	5 sec.
Regulation	=	2.4 hz/ p.u. Mw

   Assume load frequency depending is linear. [10+6]

7. (a) Obtain the tie-set schedule in three phase representation for the following power system network's. As shown in figure 2a.

Code No: RR320203 **RR** **Set No. 4**

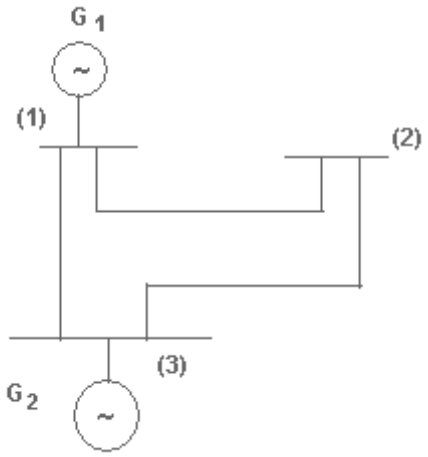

figure 2a

(b) Develop the primitive network three phase representation of elements in impedance and admittance forms. [6+10]

8. (a) Prove that when there is no mutual coupling the diagonal and off-diagonal elements of the admittance Y_{Bus} can be computed from
$Y_{ii} = \sum_{j} Y_{ij}$

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(b) Consider the linear graph shown in Figure 1, which represents a 3-bus transmission system with all the shunt admittance lumped together. Each line has a series impedance of (0.02 + J0.08) and half line charging admittance of J0.02,

i. Compute Y_{Bus} by inspection
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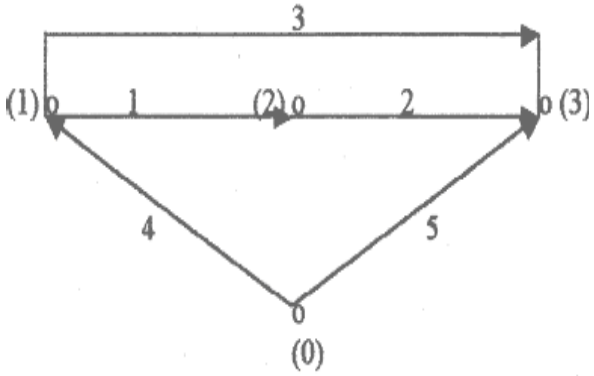

Figure 1

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Code No: RR320203 **RR** **Set No. 1**

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MODELLING OF POWER SYSTEM COMPONENTS
Electrical And Electronics Engineering

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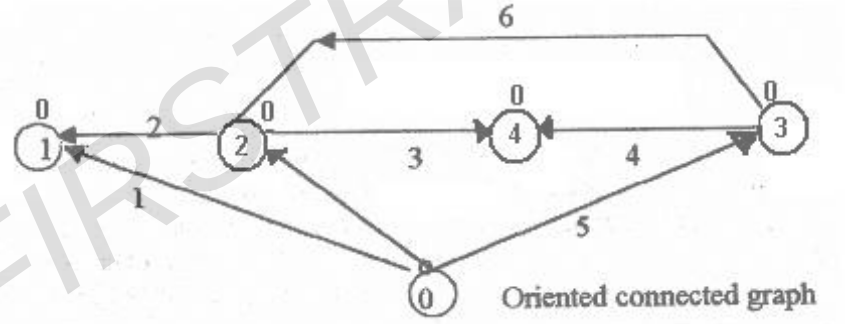

figure 4

2. (a) Obtain the tie-set schedule in three phase representation for the following power system network's. As shown in figure 2a.

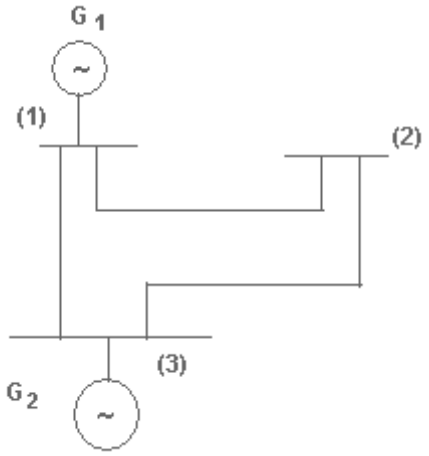

figure 2a

(b) Develop the primitive network three phase representation of elements in impedance and admittance forms. [6+10]

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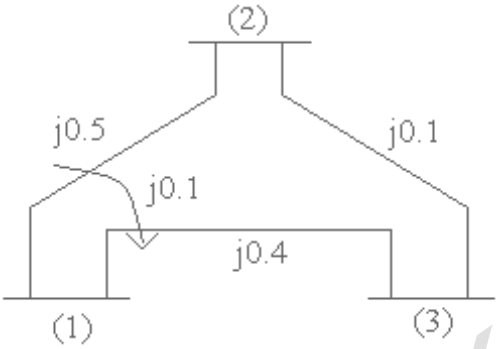

Figure 3

4. (a) Develop the mathematical model of primary and secondary Control Loops and derive the transfer functions of each block.

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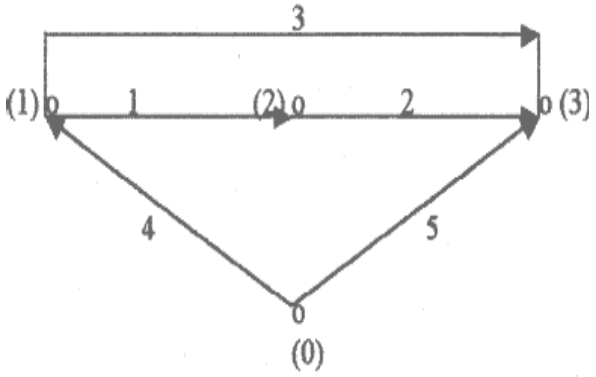

Figure 1

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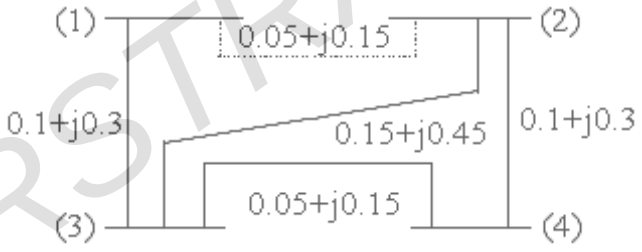

Figure 7

8. (a) Explain about the various performance requirements of excitation system.

   (b) Explain the elements of an excitation system. [8+8]

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Code No: RR320203 **RR** **Set No. 3**

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MODELLING OF POWER SYSTEM COMPONENTS
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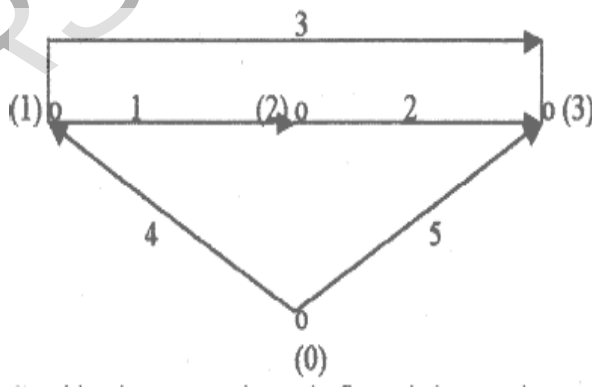
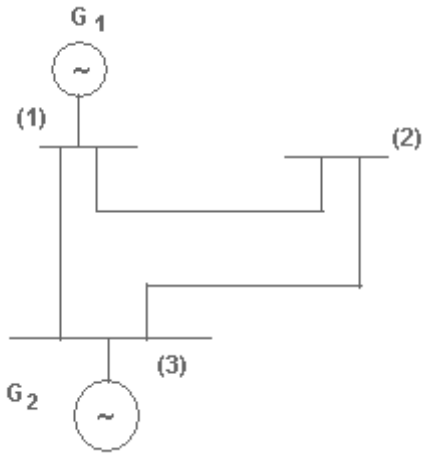


Figure 1

2. (a) Obtain the tie-set schedule in three phase representation for the following power system network's. As shown in figure 2a.

Code No: RR320203 **RR** **Set No. 3**



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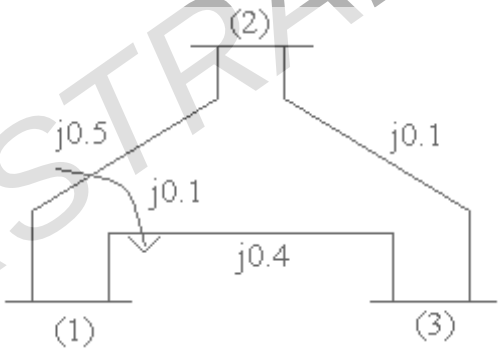

Figure 3

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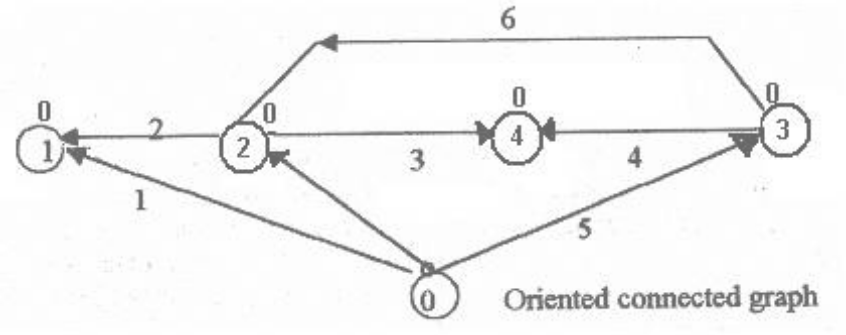

figure 4

5. A synchronous generator is connected to an infinite bus through a transmission line. Neglecting the resistances draw the phasor diagram and derive the
   (a) Relation between active power and power angle.
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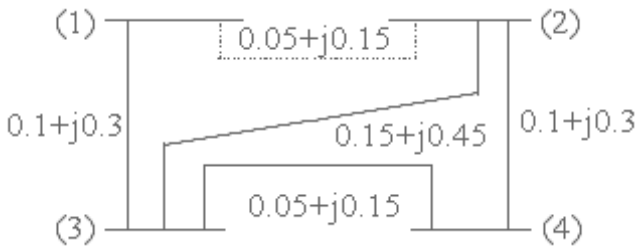

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