USN

06EE71

Seventh Semester B.E. Degree Examination, May/June 2010
Computer Techniques in Power System Analysis

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define the following and give an illustrative example: i) Tree and cotree ii) Basic loops iii) Basic cut sets iv) Primitive network v) Bus frame of reference. **(10 Marks)**

b. The bus incidence matrix for a network of 8 elements and 5 nodes is given below. Reconstruct the oriented graph, by forming the element node incidence matrix. **(05 Marks)**

A =

x \ e	1	2	3	4	5	6	7	8
A	-1	0	0	0	1	0	1	0
B	0	-1	0	0	-1	1	0	1
C	0	0	-1	1	0	-1	0	0
D	0	0	0	-1	0	0	-1	-1

c. Derive an expression for obtaining Y-bus (bus admittance matrix), using singular transformations. **(05 Marks)**

2 a. For the network shown in Fig. Q2 (a), obtain the bus admittance matrix by singular transformation analysis. The line data is as in the table below: **(08 Marks)**

Line No.	Connecting Nodes	Admittance in p.u.
1	1 – 4	1.4
2	1 – 2	1.6
3	2 – 3	2.4
4	3 – 4	2.0
5	2 – 4	1.8

Table. Q2 (a)

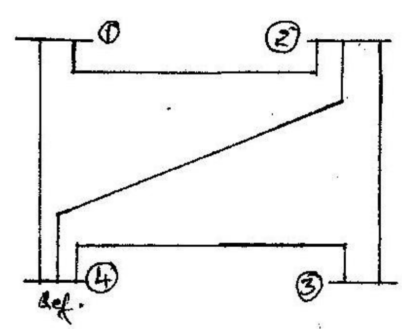

Fig. Q2 (a)

b. Obtain the general expressions for Z_{bus} building algorithm when a branch is added to the partial network. **(12 Marks)**

3 a. Using the generalised algorithmic expression for each case of analysis, explain the load flow studies (analysis) procedure, as per the Gauss-Seidal method for power system, having PQ bases and PV bases, with reactive power generation constraints. **(10 Marks)**

b. For the power system shown in figure below, find the voltage at bus 2 at the end of two iterations using the Gauss-Seidal method. The bus 1 is a slack bus with voltage equal to 1.04 (0°pu, bus 2 is P-Q bus with S_2 = (6.0-j1.5) pu and bus 3 is a P-V bus with magnitude of voltage equal to 1.02 pu and with real power equal to 0.8 pu. **(10 Marks)**

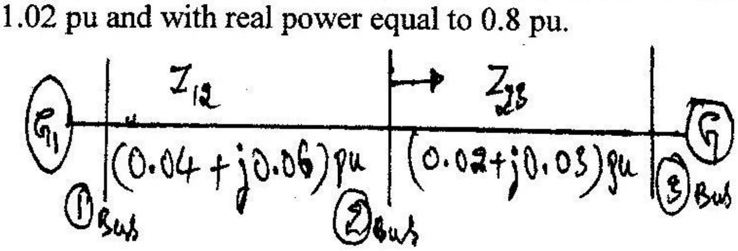

Fig. Q3 (b)

4 a. Derive the expression in polar form for the typical diagonal elements of the submatrices of the Jacobian in Newton-Raphson method of load flow analysis. **(08 Marks)**

b. Compare NR and GS methods for load flow analysis procedure in respect of the following:
i) Time per iteration ii) Total solution time iii) Acceleration factor
iv) Number of iterations. **(06 Marks)**

c. Explain briefly fast-de-coupled load flow solution method for solving the non-linear load flow equations. **(06 Marks)**

PART – B

5 a. Derive the necessary condition for optimal operation of thermal power plants with the transmission losses considered. **(10 Marks)**

b. There are two turbo generators feeding a load bus with following incremental characteristics: $IC_1 = 3 + 0.015P_1$ and $IC_2 = 2 + 0.018P_2$
i) Find the economic schedule if total load is 160 MW. Assume no generator limits.
ii) Repeat the problem (i) with the following generation limits considered :
unit – 1 : P_{max} = 100 MW, P_{min} = 20 MW.
unit – 2 : P_{max} = 100 MW, P_{min} = 10 MW. **(10 Marks)**

6 a. What are B-loss coefficients? Derive the matrix form of transmission loss equation. **(08 Marks)**

b. A two bus system, without generator limits, has been considered (shown in figure Q6 (b)), where P_{loadA} = 400 MW, P_{loadB} = 100 MW and $P_{loss} = 0.0008(P_{gA}-100)^2$.
$(IFC)_A = 0.006P_{gA} + 4.0$ Rs/MWHr; $(IFC)_B = 0.007P_{gB} + 4.0$ Rs./MWHr.
Find the optimal generation for each plant and the power loss in the line. **(12 Marks)**

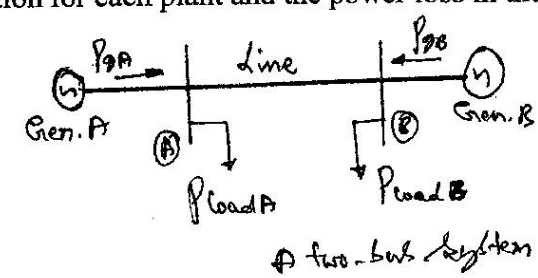

Fig. Q6 (b)

7 a. With the help of a flow diagram, explain the method of finding the transient stability of a given power system, based on Runge-Kutta method. **(12 Marks)**

b. Explain the representation of the following for power system stability studies:
i) Excitors ii) Governors. **(08 Marks)**

8 Write short notes on:
a. Swing equation and its importance for stability analysis.
b. Penalty factors and loss coefficients.
c. Classification of bases for load flow analysis.
d. Optimal scheduling for hydrothermal plants. **(20 Marks)**

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