CBCS SCHEME

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15EE71

Seventh Semester B.E. Degree Examination, June/July 2019
Power System Analysis – II

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. With the help of suitable examples, explain (i) Oriented graph (ii) Tree (iii) Cotree **(05 Marks)**

b. With usual notations, show that $Y_{bus} = A^t yA$ using singular transformation. **(05 Marks)**

c. An oriented graph of a 4-bus power system is shown in Fig.Q1(c). Determine the bus admittance matrix, Y_{bus} using singular transformation method. Element numbers and self-impedance of the elements are marked on the diagram in pu. Neglect mutual coupling.

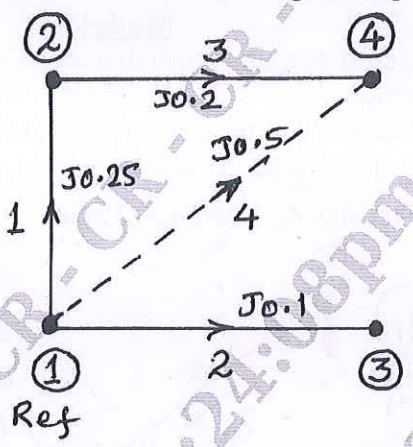

Fig.Q1(c) **(06 Marks)**

OR

2 a. What is load flow analysis? Explain the different types of buses considered during power system load flow. Discuss the significance of slack bus in load flow studies. **(06 Marks)**

b. Define primitive network. Give the representation of a typical component and arrive at their performance equations in impedance and admittance forms. **(04 Marks)**

c. One line diagram of a power system is shown in Fig.Q2(c). Using Gauss-Seidel method, determine the complex voltage at Bus-2 at the end of first iteration. Given that $V_1 = 1\angle 0$ pu, $P_2 + JQ_2 = -5.96 + J1.46$ pu, $|V_3| = 1.02$ pu, $Z_{12} = 0.04 + J0.06$ pu and $Z_{23} = 0.02 + J0.03$ pu.

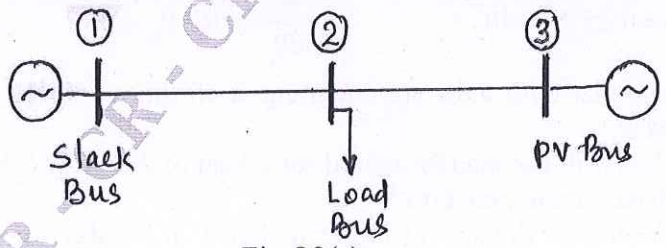

Fig.Q2(c) **(06 Marks)**

Module-2

3 a. Differentiate between NR and GS methods of load flow analysis in respect of the following:
   i) Time per iteration
   ii) Total solution time
   iii) Acceleration of convergence of iterative solution
   iv) Adoptability for power system calculations **(04 Marks)**

b. Discuss how the voltage profile is controlled in an interconnected power system by
   i) Adjusting generator excitation
   ii) VAR generators **(06 Marks)**

c. Explain the significance and properties of Jacobian matrix of Newton-Raphson load flow analysis. **(06 Marks)**

OR

4 a. Deduce FDLF model clearly stating all the assumptions made. **(08 Marks)**

b. With the help of a flow chart, explain the Newton-Raphson method of load flow analysis. **(08 Marks)**

Module-3

5 a. Derive an expression for optimal operation of 'n' units within a plant considering the effect of transmission losses. **(06 Marks)**

b. What are B-coefficients? For the system shown in Fig.Q5(b), obtain loss coefficients and the power loss. Take $I_1 = 1\angle 0$ pu. $I_2 = 0.8\angle 0$ pu, $V_3 = 1\angle 0$ pu. Transmission lines impedances, $Z_a = 0.02 + J0.25$ pu and $Z_b = 0.03 + J0.35$ pu.

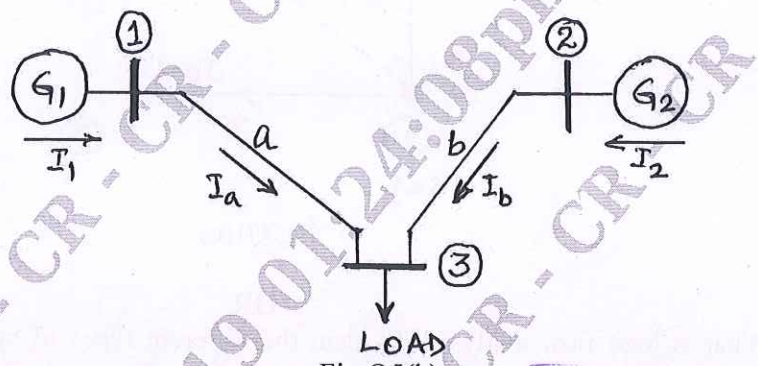

Fig.Q5(b) **(10 Marks)**

OR

6 a. State unit commitment problem. Describe the dynamic programming method for computation of optimal unit commitment. **(07 Marks)**

b. The incremental fuel costs in Rs/MWh for a plant consisting of two units are:

$$\frac{dc_1}{dP_{g_1}} = 0.25\,P_{g_1} + 40 \qquad \frac{dc_2}{dP_{g_2}} = 0.3\,P_{g_2} + 30$$

Assume that both units are operating at all times and the total load varies from 40 MW to 250 MW.
   i) How will the load be shared for a load of 200 MW? What is the corresponding value of plant incremental cost?
   ii) Determine the saving in the fuel cost in Rs./day for the optimal scheduling of a total load of 250 MW as compared to equal distribution of the same load between the two units. **(09 Marks)**

Module-4

7 a. Discuss clearly the problem formulation and solution procedure of optimal scheduling for hydro-thermal plants. **(08 Marks)**

b. What do you understand by the reliability of a power system? Explain the state space model used for power system reliability evaluation. **(08 Marks)**

OR

8 a. Describe the power system security assessment and modeling for contingency analysis. **(08 Marks)**

b. Explain with the help of a flow chart, the optimal load flow solution. **(08 Marks)**

Module-5

9 a. Derive the generalized expression for finding the diagonal element of bus impedance matrix when a branch is added to the partial network. **(08 Marks)**

b. Discuss the steps for determining multimachine stability. **(08 Marks)**

OR

10 a. With the necessary equations, explain the solution of swing equation by point by point method. Mention the assumptions made. **(08 Marks)**

b. Form Z_{bus} using building algorithm of the power system shown in Fig.Q10(b). Self impedance of elements are marked on the diagram. Add elements in the order specified. Neglect mutual coupling. Take bus-1 as reference bus.

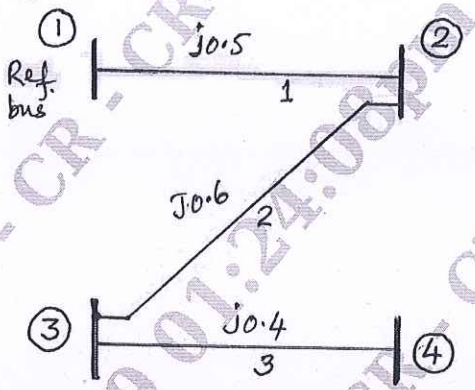

Fig.Q10(b) **(08 Marks)**

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