

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.

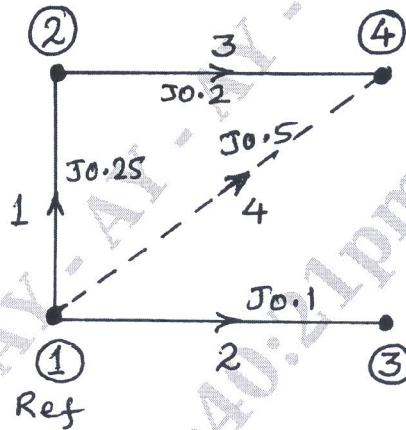


Fig.Q1(c)

(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.

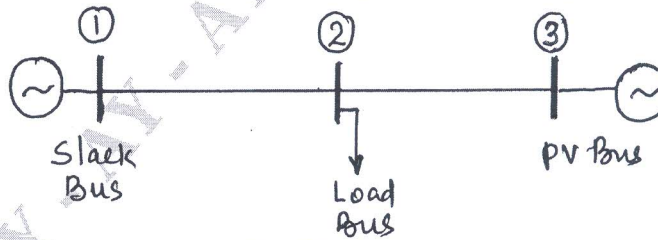


Fig.Q2(c)

(06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-2

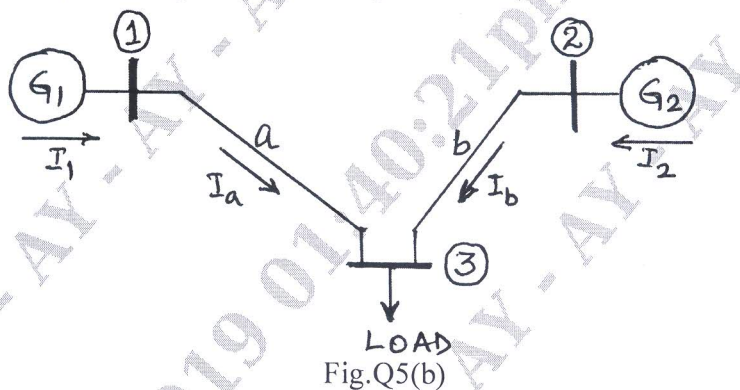
- 3 a. Differentiate between NR and GS methods of load flow analysis in respect of the following:
- Time per iteration
 - Total solution time
 - Acceleration of convergence of iterative solution
 - Adoptability for power system calculations
- (04 Marks)
- b. Discuss how the voltage profile is controlled in an interconnected power system by
- Adjusting generator excitation
 - 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.



(10 Marks)

OR

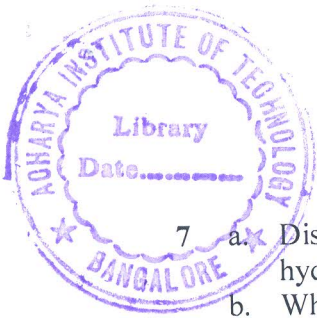
- 6 a. State unit commitment problem. Describe the dynamic programming method for computation of optimal unit commitment. (07 Marks)
- b. The incremental fuel costs in Rs/MWh for a plant consisting of two units are:

$$\frac{dc_1}{dP_{g_1}} = 0.25 P_{g_1} + 40$$

$$\frac{dc_2}{dP_{g_2}} = 0.3 P_{g_2} + 30$$

Assume that both units are operating at all times and the total load varies from 40 MW to 250 MW.

- How will the load be shared for a load of 200 MW? What is the corresponding value of plant incremental cost?
 - 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.

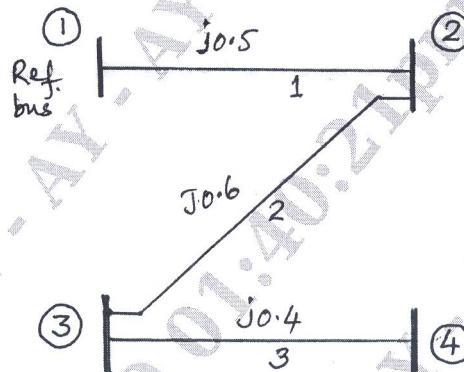


Fig.Q10(b)

(08 Marks)
