



## Seventh Semester B.E. Degree Examination, July/August 2021 Power System Analysis – II

Time: 3 hrs.

Max. Marks: 80

**Note: Answer any FIVE full questions.**

- 1 a. With usual notations, prove that  $Y_{bus} = A^T Y A$  using singular transformation. (06 Marks)
- b. For the power system shown in Fig.Q1(b), obtain  $Y_{bus}$  using singular transformation. (10 Marks)

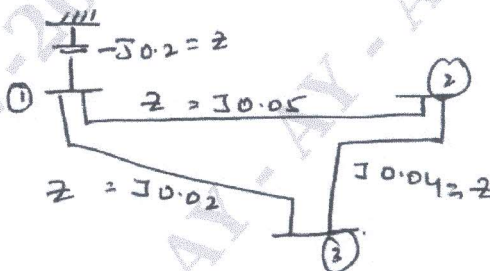


Fig.Q.1(b)

- 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.

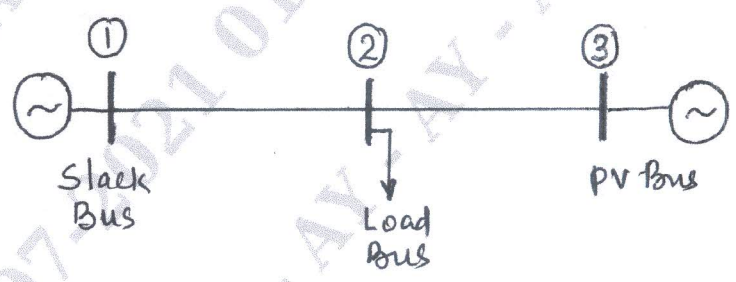


Fig.Q2(c)

(06 Marks)

- 3 a. What are Jacobian elements? Obtain Jacobian elements for basic equations for  $J_1$  and  $J_3$  only. (04 Marks)
- b. Give the algorithm for Newton-Raphson Load Flow (NRLF). (06 Marks)
- c. Explain any two methods of control of voltage profile. (06 Marks)
- 4 a. Starting all assumptions, deduce the FDLF model and give the flow-chart. (10 Marks)
- b. Compare Gauss-Seidal and Newton-Raphson methods of load flow analysis. (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.

- 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.

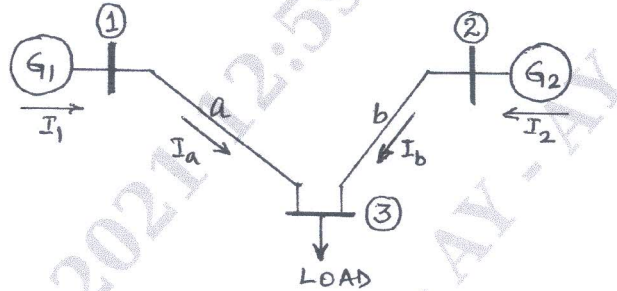


Fig.Q5(b)

(10 Marks)

- 6 a. The fuel input per hour of plant 1 and plant 2 are given by,  
 $F_1 = 0.2P_1^2 + 40P_1 + 120$  RS/Hr       $F_2 = 0.25P_2^2 + 30P_2 + 150$  RS/Hr  
 Determine the economic scheduling neglecting the losses for a load of 180 MW. Also calculate cost of production of 180 MW for the obtained schedule. (04 Marks)
- b. Obtain transmission line loss coefficients in terms of plant generation capacities for two units delivering a load. (06 Marks)
- c. Obtain economic scheduling for a system having transmission line losses and no limits on generators. (06 Marks)
- 7 a. Discuss the problem formulation and solution procedure of optimal scheduling for hydro thermal plant. (10 Marks)
- b. Draw the flow chart of optimal load flow solution. (06 Marks)
- 8 a. Describe the power system security assessment and modeling for contingency analysis. (08 Marks)
- b. Explain power system static security level classification. (08 Marks)
- 9 a. Derive the generalized algorithm for finding the elements of bus – impedance matrix  $Z_{bus}$  when a branch is added to the partial network. (08 Marks)
- b. For the three-bus network shown in Fig. Q.9(b) build  $Z_{bus}$ . (08 Marks)

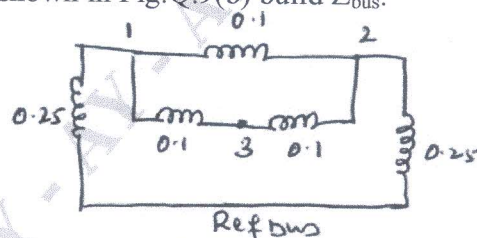


Fig.Q.9(b)

- 10 a. Explain the numerical solution of swing equation. (08 Marks)
- b. Explain clearly the steps involved in solving power system stability solution of swing equation using Range-Kutta method. (08 Marks)

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