**CBCS SCHEME**

USN | | | | | | | | | | |  **15EE71**

## 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.***

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.

1 a. With usual notations, prove that $Y_{bus} = A^T YA$ using singular transformation. **(06 Marks)**

b. For the power system shown in Fig.Q1(b), obtain $Y_{bus}$ using singular transformation. **(10 Marks)**

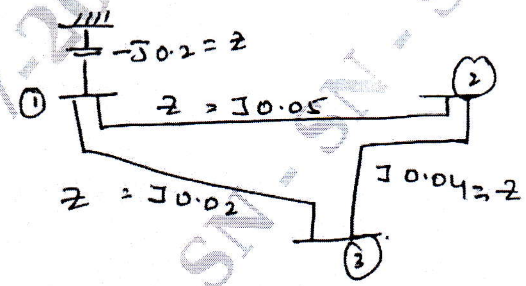


Fig.Q.1(b)

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 $V_1 = 1\underline{|0}$ 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.

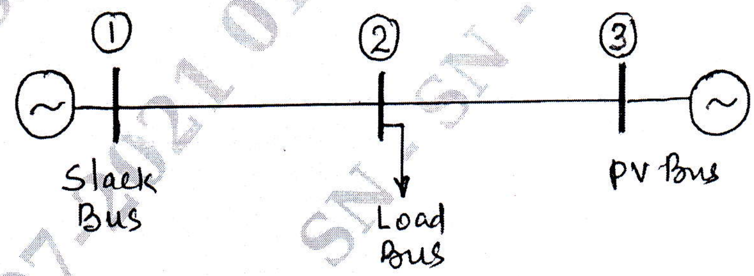


Fig.Q2(c)

**(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)**

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.

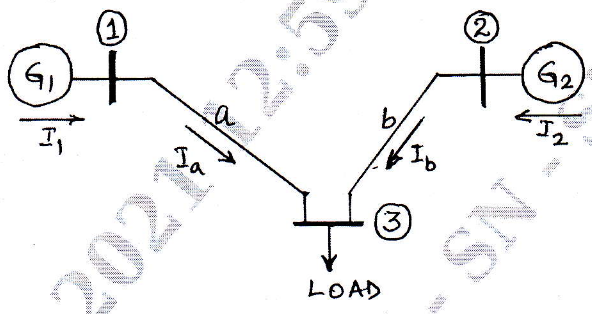


Fig.Q5(b)

**(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 $\qquad F_2 = 0.25P_2^2 + 30P_2 + 150$ 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 interms 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 in added to the partial network. **(08 Marks)**

b. For the three-bus network shown in Fig.Q.9(b) build $Z_{bus}$. **(08 Marks)**

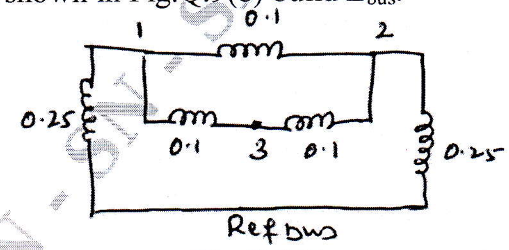


Fig.Q.9(b)

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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