CBCS SCHEME

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17EE71

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
Power System Analysis – II

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Determine Y_{Bus} by Singular Transformation for the system with data as follows:

Element No.	1	2	3	4	5
Bus code	0-1	1-2	2-3	3-0	2-0
Self admittance (pu)	1.4	1.6	2.4	2.0	1.8

(07 Marks)

b. In the power system shown in Fig.Q1(b), the slack bus voltage is (1 + j0). The voltage magnitude at bus 2 is maintained at 1.05 pu and the Q generation at this bus is limited between 0.0 and 0.5 pu. P_{G2} = 0.3 pu ; P_{D2} = 0.6 pu and Q_{D2} = 0.2 pu. Determine the voltage at bus 2 by the end of first iteration using G - S method.

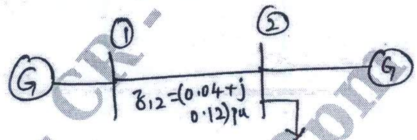

Fig.Q1(b) **(08 Marks)**

c. Explain the different types of buses considered in load flow analysis. **(05 Marks)**

OR

2 a. Obtain Y_{Bus} by inspection method for the data given below:

Starting Bus	Ending Bus	R (pu)	X (pu)
1	2	0.05	0.15
1	3	0.2	0.3
2	3	0.15	0.45
3	4	0.05	0.15

(06 Marks)

b. Draw the flowchart for Gauss Seidel method of load flow analysis for the power system. **(08 Marks)**

c. Derive the power flow equations in load flow analysis. **(06 Marks)**

Module-2

3 a. Write the algorithm for Newton Raphson method of load flow analysis of power system having both PQ and PV buses. **(06 Marks)**

b. For a 3 bus system, the elements of Y_{Bus} are as follows:

$Y_{11} = Y_{22} = Y_{23} = 24.23\angle -75.95$ pu

$Y_{12} = Y_{13} = Y_{21} = Y_{31} = Y_{32} = 12.13\angle 104.04$ pu

Bus voltages are V_1= 1.04 + j0 (slack bus) ; V_2= 1+ j0 (PQ bus) ; V_3= 1.04 (PV bus). Determine the elements of submatix J_1 and J_4 of Jacobian matrix in NR load flow equations. **(08 Marks)**

c. Explain any two methods of control of voltage profile. **(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.

OR

4 a. Draw the flowchart, describing the Newton Raphson method for load flow analysis. **(08 Marks)**

b. Stating all the assumptions, deduce the fast decoupled load flow model. **(06 Marks)**

c. Compare the load flow methods with (i) Time per iteration (ii) Total solution time (iii) Acceleration of convergence of iterative solution. **(06 Marks)**

Module-3

5 a. Deduce the condition for optimal load dispatch considering transmission losses in a system comprising n-plants. **(06 Marks)**

b. Derive the expression for transmission loss as a function of plant generation for a two plant system. **(08 Marks)**

c. Define unit commitment. Explain dynamic programming method of unit commitment solution. **(06 Marks)**

OR

6 a. In a system comprising two generating plants. The fuel costs are $F_1 = 0.004P_1^2 + 8P_1 + 10$ Rs/h $F_2 = 0.006P_2^2 + 9P_2 + 15$ Rs/h. The system is operating load on economic load dispatch with $P_1 = P_2 = 500$ MW aand $\partial P_L/\partial P_2 = 0.2$. Find the penalty factor of plant 1. **(08 Marks)**

b. For the system shown in Fig.Q6(b) obtain the loss coefficients and the power loss. Given $I_1 = 1 + j0$ pu and $I_2 = 0.8 + j0$ pu ; Voltage at bus 3 as $(1 + j0)$pu. Line impedance are $Z_a = 0.02 + j0.15$ pu ; $Z_b = Z_c = 0.03 + j0.25$ pu.

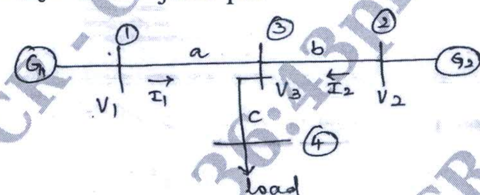

Fig.Q6(b) **(08 Marks)**

c. Explain the following : i) Input –Output curve ii) Heatrate curve related to thermal plants. **(04 Marks)**

Module-4

7 a. Explain the algorithm of optimal scheduling of hydrothermal plants along with solution technique. **(07 Marks)**

b. Explain the operating states of a power system with respect to security. **(06 Marks)**

c. Explain the optimal power flow solution without inequality constraints. **(07 Marks)**

OR

8 a. What are the considerations and features of maintenance scheduling? **(07 Marks)**

b. Explain the state space model used for power system reliability evaluation. **(06 Marks)**

c. Describe the power system security assessment and modeling for contingency analysis. **(07 Marks)**

Module-5

9 a. Derive the generalized algorithm for finding the elements of bus impedance matrix zones when a branch is added to the partial network. **(07 Marks)**

b. Explain the steps involved in solving power system stability solution of swing equation using Range-Kutta method. **(07 Marks)**

c. Form Z_{Bus} using building algorithm of the system shown in Fig.Q9(c). Self impedances of the elements are marked on the diagram. Assume are marked on the diagram. Assume bus 1 as reference.

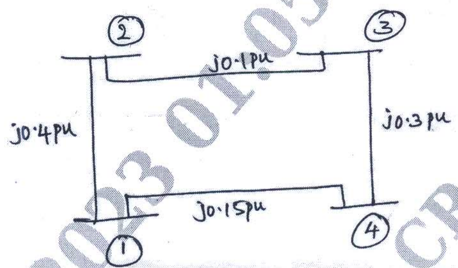

Fig.Q9(c) **(06 Marks)**

OR

10 a. Explain the algorithm for short circuit studies of an n bus system. **(07 Marks)**

b. Explain with relevant diagrams, the point-by-point method of solving the swing equation. **(08 Marks)**

c. Discuss the steps for determining multimachine stability. **(05 Marks)**

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