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17EE71

Seventh Semester B.E. Degree Examination, June/July 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. With usual notations, derive an expression for formation of bus admittance matrix by singular transformation. **(06 Marks)**

b. Explain the classification of buses considered for load flow analysis. **(06 Marks)**

c. For the power system data given, determine the bus admittance matrix by singular transformation.

Element No.	Bus code	Impedance	Mutual impedance
1	1 – 2	0.6j	
2	1 – 3	0.5j	
3	2 – 3	0.5j	0.1j with element 1

(08 Marks)

OR

2 a. Explain the algorithm for Gauss-Seidel method of load flow analysis for both PQ and PV buses. **(10 Marks)**

b. Using Gauss – Sedel method, determine the voltages after first iteration for the data given below :

$y_{11} = y_{22} = y_{33} = 5 - 20j$

$y_{12} = y_{13} = y_{23} = -2.934 + 11.76j$

With reactive power limits $0 \leq Q_3 < 1.5$ pu

Bus no.	P	Q	V_i	Remark
1	-	-	1.04	Slack
2	0.5	1	1 + j0	PQ
3	1.5	-	1.04	PV

(10 Marks)

Module-2

3 a. Explain with flow chart, Newton – Raphson method of load flow analysis in polar co-ordinates. **(10 Marks)**

b. Determine the elements of Jacobian matrices J_1 and J_4 for the power system data given :

$$y_{bus} = \begin{bmatrix} -15j & 10j & 5j \\ 10j & -15j & 5j \\ 5j & 5j & -10j \end{bmatrix} \quad V = \begin{bmatrix} V_1 & V_2 & V_3 \\ 1 + j0 & 1.1 + j0 & 1 + j0 \end{bmatrix}$$

(10 Marks)

OR

4 a. Stating all the assumption made, deduce Fast decoupled load flow model. **(10 Marks)**

b. Explain the different methods employed for control of voltage profile. **(10 Marks)**

Module-3

5 a. Explain the optimal generation scheduling considering transmission losses and derive equations. **(10 Marks)**

b. The incremental fuel costs in Rs/Mwhr for 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 load varies from 40MW to 250MW

i) How will the load be shared for a load for 200mW

ii) Determine saving in fuel cost in Rs/day for optimal scheduling of a total load of 250MW as compared to equal sharing of load between two units. **(10 Marks)**

OR

6 a. Stating the assumptions made, derive transmission loss formula and hence obtain B-coefficient for a two plant system. **(10 Marks)**

b. Compute the loss coefficient for the network shown in Fig Q6(b) using given data :

$I_a = 1.0 - j0.15$ pu $Z_a = 0.02 + j0.15$ pu

$I_b = 0.5 - j0.1$ pu $Z_b = 0.03 + j0.15$ pu

$I_c = 0.2 - j0.05$ pu $Z_c = 0.02 + j0.25$ pu

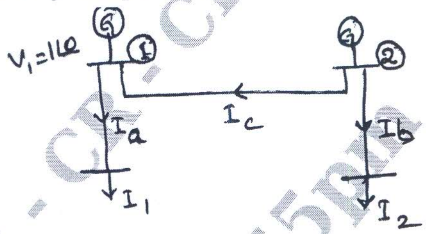

Fig Q6(b) **(10 Marks)**

Module-4

7 a. Explain problem formulation and solution procedure of optimal scheduling for hydro-thermal plants. **(10 Marks)**

b. Name the three major functions carried out in an energy control center for system security assessment and explain. **(10 Marks)**

OR

8 a. Discuss : i) Power system security ii) Power system Reliability. **(10 Marks)**

b. Explain : i) Loss of load probability ii) Frequency and duration of curve (FAD) **(10 Marks)**

Module-5

9 a. Explain the modification of Z_{bus} when

i) a link is added between two old buses

ii) a branch is added between a new bus and an old bus. **(10 Marks)**

b. Explain point-by point method of solving swing equation. **(10 Marks)**

OR

10 a. Form the Z_{bus} for the power system network data shown below :

Element no.	Bus code	Z Ω
1	1 – 0	0.25Ω
2	2 – 1	0.10Ω
3	3 – 1	0.1Ω
4	2 – 0	0.25Ω

(10 Marks)

b. Explain Runge Kutta method of solving swing equation. **(10 Marks)**