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10EE71

Seventh Semester B.E. Degree Examination, June/July 2019
Computer Techniques in Power System Analysis

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define primitive network. Give the representation of primitive network in impedance and admittance form. Obtain the performance equation in both the forms. **(06 Marks)**

b. For the power system network shown in Fig.Q1(b). Draw the oriented graph and form the following incidence matrices.

i) Element – node incidence matrix $\hat{A}$
ii) Bus incidence matrix A
iii) Branch - path incidence matrix K
iv) Basic cut set incidence matrix B

v) Augmented cut set incidence matrix $\hat{B}$
vi) Basic loop incidence matrix C

vii) Augmented loop incidence matrix $\hat{C}$

Chose bus ① as reference. Take element 4 and 5 as link.

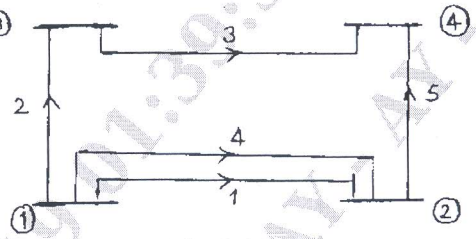

Fig.Q1(b) **(14 Marks)**

2 a. Determine Y_{BUS} by singular transformation of the system with data as below : **(06 Marks)**

Element no.	1	2	3	4	5
Bus code p-q	0 – 1	1 – 2	2 – 3	3 – 0	2 – 0
Self admittance in p.u	1.4	1.6	2.4	2.0	1.8

b. Find the admittance matrix for the system shown in Fig.Q2(b). **(06 Marks)**

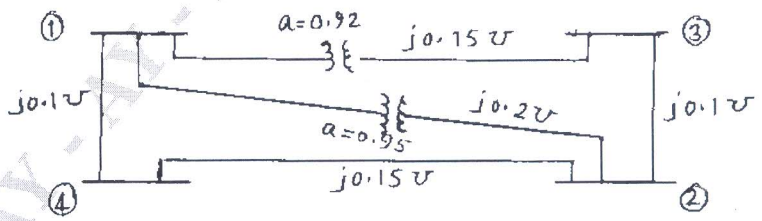

Fig.Q2(b)

c. Derive the generalized algorithm for finding the elements of bus impedance matrix Z_{BUS} when a link is added to the partial network. **(08 Marks)**

3 a. Discuss the importance of load flow analysis in power system. Enumerate the data required for carrying out load flow studies. **(10 Marks)**

b. Obtain the load flow solution at the end of 1st iteration, with data given below. Assume all buses except bus 1 are PQ buses. Use G – S method. **(10 Marks)**

Table – Line data

Line bus to bus	R (pu)	X (pu)
1 – 2	0.05	0.15
1 – 3	0.10	0.30
2 – 3	0.15	0.45
2 – 4	0.10	0.30
3 – 4	0.05	0.15

Table - Input data

Bus no.	P_i(pu)	Q_i(pu)	V_i(pu)
1	–	–	1.04
2	0.5	–0.2	–
3	–1.0	0.5	–
4	0.3	–0.1	–

4 a. Explain the algorithm procedure for load flow analysis using Newton – Raphason's method in polar coordinates. Compare N–R and G–S method for load flow analysis. **(10 Marks)**

b. What are the assumptions made in fast decoupled load flow method? Explain the algorithm through flow chart. **(10 Marks)**

PART – B

5 a. What is penalty factor? Derive an expression for optimal economic despatch including transmission losses. **(10 Marks)**

b. Incremental fuel costs in rupees per Mwhr for a plant consisting of two units are :

$$\frac{dc_1}{dp_1} = 0.20\ P_1 + 40.0$$

$$\frac{dc_2}{dp_2} = 0.25\ P_2 + 30.0$$

Assume that both units are operating at all times and total load varies from 40MW to 250 MW, and the maximum and minimum loads on each unit are to be 125 MW and 20MW respectively. How will the load be shared between the two units as the system load varies over the full range? What are the corresponding values of the plant incremental costs? **(10 Marks)**

6 a. A two bus system shown in Fig.Q6(a). If 100MW of power is imported to bus 2, a loss of 8 MW is incurred, find the required generation for each plant and the power received by the load when plant incremental cost is Rs.100/MWh. The incremental fuel cost of two plants are :

$$\frac{dc_1}{dp_1} = 0.12P_1 + 65 \text{ Rs/MWh}$$

$$\frac{dc_1}{dp_2} = 0.25P_2 + 75 \text{ Rs/MWh}$$

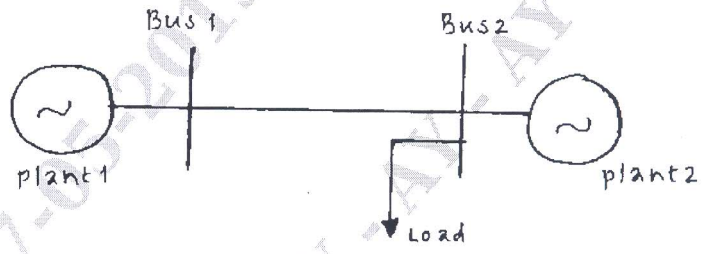

Fig.Q6(a)

(10 Marks)

b. Compute the loss coefficients for the network shown in Fig.Q6(b) using below data.

$I_a = 2 - j0.5$ pu $\quad Z_a = 0.015 + j0.06$ pu

$I_b = 1.6 - j0.4$ pu $\quad Z_b = 0.015 + j0.06$ pu

$I_c = 1 - j0.25$ pu $\quad Z_c = 0.01 + j0.04$ pu

$I_d = 3.6 - j0.9$ pu $\quad Z_d = 0.01 + j0.04$ pu **(10 Marks)**

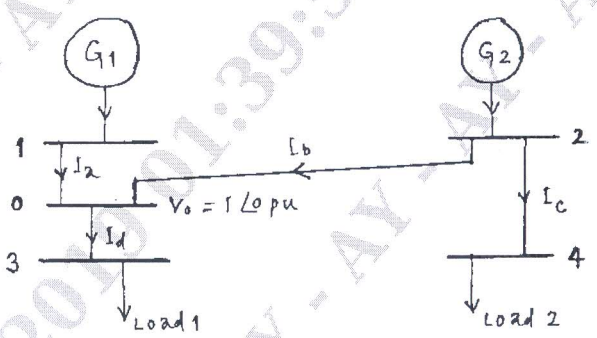

Fig.Q6(b)

7 a. Explain swing equation by point by point method. **(10 Marks)**

b. Explain the modified Euler's method used in solution of swing equation for transient stability studies. **(10 Marks)**

8 a. Explain the representation of loads in power system during transient stability period. **(10 Marks)**

b. Explain Milne predictor corrector method for solution of swing equation. **(10 Marks)**

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