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10EE71

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
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 the following with example :
i) Oriented graph ii) Basic loop iii) Co tree. **(06 Marks)**

b. Two primitive elements p – q and r – s are given with mutual admittance $Y_{pq, rs}$ between them. Represent the elements in admittance form and obtain the primitive performance equations in matrix form. **(06 Marks)**

c. For the power system shown in fig. Q1(c), choosing bus – 1 as reference bus, obtain Incidence matrices B, C and K. Hence verify the identity $B^t C = 0$. **(08 Marks)**

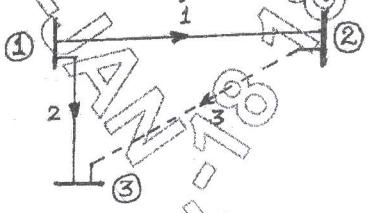

Fig.Q1(c)

2 a. With usual notation, deduce the expression for Y_{bus} using singular transformation method. **(06 Marks)**

b. With the help of singular transformation method, determine the bus admittance matrix Y_{bus} for the power system shown in fig. Q2(b). Self impedances and element numbers are marked on the diagram. Take node – 1 as reference node. Neglect mutual coupling. **(08 Marks)**

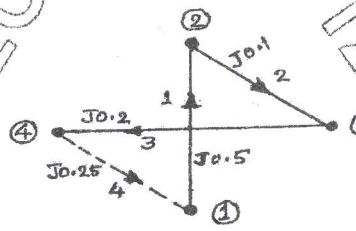

Fig.Q2(b)

c. Form Z_{bus} using building algorithm of the power system shown in fig. Q2(c). Self impedances of the elements are given in the table below. Take element – 3 as link and bus – 1 as reference bus. **(06 Marks)**

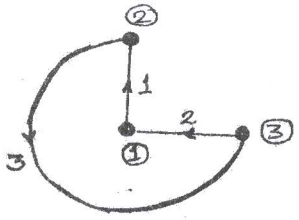

Fig.Q2(c)

Table Q2(c)

Element No.	1	2	3
Self Impedance $Z_{pq, pq}$	J0.5	J0.25	J0.3

3 a. Why load flow analysis in a power system is necessary? Explain. **(04 Marks)**

b. What is the data required to conduct load flow analysis? Discuss the need of acceleration factor in load flow solution. **(04 Marks)**

c. For the three bus system shown in fig. Q3(c), use Gauss – Siedel method and determine the voltages at bus – 2 and bus – 3 at the end of first iteration. Line impedances marked on the diagram are in pu. The information relating to bus data is given in table Q3(c). **(12 Marks)**

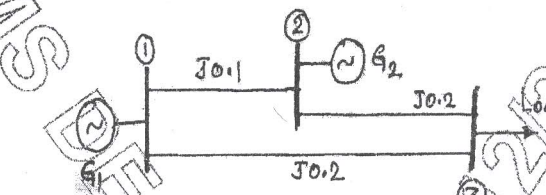

Fig.Q3(c)

Table Q3(c)

Bus No	Type	Generation		Load		Voltage Magnitude	Reactive Power LIMIT	
		P	Q	P	Q	|V|	Q_{min}	Q_{max}
1	Slack	-	-	-		1.0	-	-
2	PV	5.32	-	-	-	1.1	0	5.32
3	PQ	-	-	3.64	0.53	-	-	-

4 a. Discuss the algorithm procedure for load flow analysis using Newton – Raphson's method in polar coordinates. Mention the conditions under which N-R method is superior over G-S method for load flow analysis. **(10 Marks)**

b. Stating all assumptions, deduce the FDLF model. Explain the step by step procedure for load flow solution using FDLF method. **(10 Marks)**

PART – B

5 a. Define Penalty factor. Derive an expression for optimal loading of an n – plant system considering transmission losses. **(10 Marks)**

b. The incremental fuel costs in Rs/ MWh for a plant consisting of two units are :

$$\frac{dF_1}{dP_{g_1}} = 0.25P_{g_1} + 40 \quad , \quad \frac{dF_2}{dP_{g_2}} = 0.3P_{g_2} + 30 .$$

Assume that all units are operating at all times and total load varies from 40MW to 300MW. The minimum and maximum loads on each unit are 25MW and 150 MW respectively. Determine i) The most economical division of load between the generators for a load of 250MW ii) The saving in Rs/day obtained compared to equal load sharing between the two units. **(10 Marks)**

6 a. For a two plant power system derive an expression for transmission loss as a function of plant generation. Mention the assumptions made in deriving transmission loss coefficients formula. **(10 Marks)**

b. For the Power System in fig. Q6(b), obtain the loss coefficients and the power loss in transmission. Take plant currents, $I_1 = 1\angle 0$ pu and $I_2 = 0.8\angle 0$ pu and voltage at bus – 3 , $V_3 = 1\angle 0$ pu. Line Impedances in pu are $Z_a = 0.02 + J0.25$, $Z_b = 0.03 + J0.35$. **(10 Marks)**

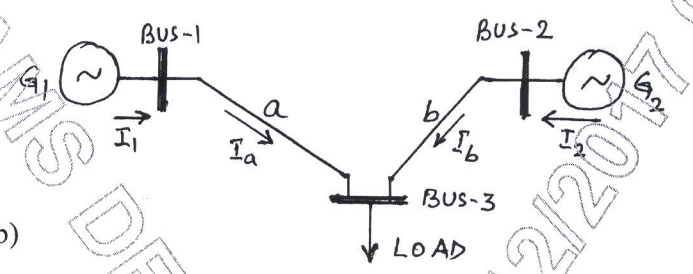

Fig.Q6(b)

7 a. Explain clearly the point – by – point method of solving swing equation. Mention the assumptions made. **(10 Marks)**

b. Under transient conditions, a machine is represented by a constant voltage source behind a transient reactance. Discuss with the help of suitable expressions, how the transient stability studies is obtained using modified Euler's method. **(10 Marks)**

8 a. Describe the methodology of using Runge – Kutta technique for transient stability studies of a power system. **(10 Marks)**

b. Explain Milne Predictor corrector method of solving swing equation in transient stability studies. **(10 Marks)**

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