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10EE71

Seventh Semester B.E. Degree Examination, June/July 2016
Computer Techniques in Power System Analysis

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain the terms: (i) Tree (ii) Co-Tree (iii) Tree branch path incidence matrix with an example. **(10 Marks)**

b. For the power system shown below. Select ground as reference and a tree for which the link elements are 1 – 2, 1 – 4, 2 – 3 and 3 – 4. Write the basic cut set and basic loop incidence matrix. Verify the relation $C_b = -B_f^T$ **(10 Marks)**

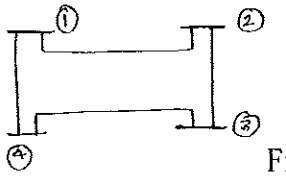

Fig. Q1 (b)

2 a. Consider the power system network shown below:

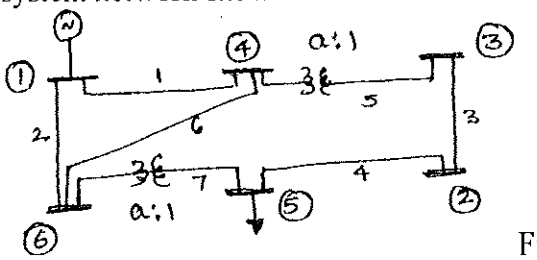

Fig. Q2 (a)

The data is given below:

Line No.	Between lines	Line impedance	$\frac{y'_{pq}}{2}$	Off nominal turns ratio
1	1 – 4	0.08 + j0.37	0.007	-
2	1 – 6	0.123 + j0.518	0.010	-
3	2 – 3	0.723 + j1.05	0	-
4	2 – 5	0.282 + j0.64	0	-
5	4 – 3	0 + j0.133	0	0.909
6	4 – 6	0.097 + j0.407	0.0076	-
7	6 – 5	0 + j0.30	0	0.976

A static shunt capacitor is connected at bus 4 with the admittance j0.005 pu. Formulate Y_{BUS} by inspection method. **(12 Marks)**

b. Form the Z_{BUS} for the power system shown below. Select node ① as reference. The line reactances are marked in pu. **(08 Marks)**

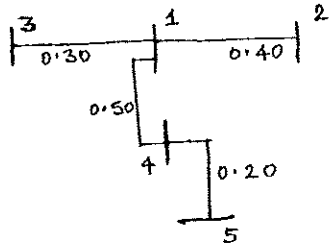

Fig. Q2 (b)

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.

3 a. Explain with the help of a flow chart Gauss Seidel method of load flow analysis in a power system. **(10 Marks)**

b. Compute the line flows and line losses for a 3-Bus power system network shown below. The data obtained from load flow is as follows: **(10 Marks)**

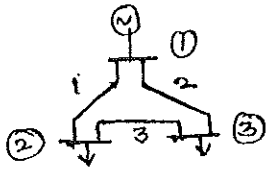

Fig. Q3 (b)

Element No.	Bus From To	R	X	Bus No.	|V|	δ
1	1 – 2	0.02	0.04	1	1.05	0.0
2	1 – 3	0.01	0.03	2	0.9818	-3.5°
3	2 – 3	0.02	0.025	3	1.00125	-2.665°

4 a. In a two bus system shown in Fig. Q4 (a). The bus 1 is slack bus with $V = 1.0\angle 0°$ pu and bus 2 is a load bus with P = 100 MW, Q = 50 MVAr. The line impedance is $(0.12 + j0.16)$ pu on a base of 100 MVA. Using Newton Raphson load flow method compute $|V_2|$ and δ_2 upto one iteration. **(10 Marks)**

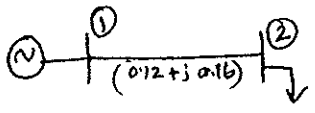

Fig. Q4 (a)

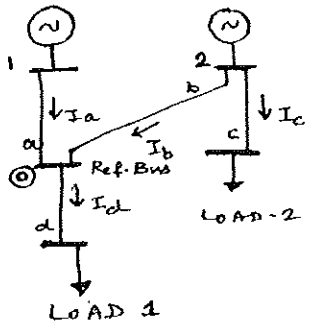

Fig. Q6 (b)

b. Explain the algorithm with Fast Decoupled load flow analysis, clearly stating all the assumptions made. **(10 Marks)**

PART – B

5 a. What is meant by economic load scheduling? Explain the Hydro and Thermal unit input-output curves. **(10 Marks)**

b. A power plant has three units with following cost characteristics:

$F_1 = 0.05P_1^2 + 21.5P_1 + 800$ Rs./hr; $F_2 = 0.10P_2^2 + 27P_2 + 500$ Rs./hr

$F_3 = 0.07P_3^2 + 16P_3 + 900$ Rs./hr

Find the optimum scheduling and total cost in Rs./hr for a total load demand of 200 MW. Given that $P_{imax} = 120$ MW: $P_{imin} = 39$ MW: where i = 1, 2, 3. **(10 Marks)**

6 a. Explain optimal scheduling of hydro-thermal plants and also explain its problem formulation. **(10 Marks)**

b. Figure shown in Fig.Q6(b) is having two plants 1 and 2 which are connected to the buses 1 and 2 respectively. There are two loads and 4 branches. The reference bus with a voltage of $1.0\angle 0°$ pu is shown in the diagram. The branch currents and impedances are as follows:

$I_a = (2 - j0.5)$pu; $I_b = (1.6 - j0.4)$pu; $I_c = (1 - j0.25)$pu; $I_d = (3.6 - j0.9)$pu;

$Z_a = Z_b = (0.015 + j0.06)$pu; $Z_c = Z_d = (0.01 + j0.04)$pu

Calculate the loss coefficients in the system in pu. **(10 Marks)**

7 a. Explain the computational algorithm for obtaining the swing curves using Runge Kutta method. **(10 Marks)**

b. Explain the load models employed in multi-machine stability analysis with neat sketch. **(10 Marks)**

8 a. Explain Milne's predictor corrector method for solving the swing equation of multi-machine system. **(10 Marks)**

b. Explain the swing equation and its importance in stability studies. **(10 Marks)**

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