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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Seventh Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination ; Dec. - 2014

Computer Techniques in Power Systems

Time: 3 hrs *Max. Marks: 100*

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

PART - A

1. a. Define the following and give an illustrative example:
   (i) tree and cotree (ii) Basic loops (iii) Basic cutsets
   (iv) primitive network (v) Bus frame of reference — 10

   b. For the power system showed in shown in Fig 1(b), Obtain the incidence matrices A, B, C and K, with ground node as reference. Hence verify the identities (i) $B_l = A_l k^t$ (ii) $B^t C = 0$ — 10

2 a. With usual notations, prove that $[y_{Bus}] = A^t[y]A$ for singular transformations — 6

   b. The bus admittance matrix with ground node 0 as reference of a power system network with four buses is given below. Obtain the admittance diagram. Assume no mutual coupling — 6

Y_{bus} =

	1	2	3	4
1	-j15	j10	0	j5
2	j10	-j17	j5	0
3	0	j5	-j19	j10
4	j5	0	j10	-j15

   c. For the network graph shown in Fig 2(c) determine $[Z_{Bus}]$, with node '1' as reference using building algorithm. Neglect mutual coupling. Self impedance of elements are marked on the diagram. Add elements in the order specified. — 8

3 a. Give the bus classification for load flow, explaining the significance. — 4

   b. Explain flow solution at the end of first iteration, with data given below. Assume all buses except bus '1' are PQ buses. — 10

Line Data					Bus Data			
From bus	To Bus	R(pu)	X(pu)		Bus no.	Pi (pu)	Qi (pu)	Vi (pu)
1	2	0.05	0.15		1	-	-	1.04∠0
1	3	0.1	0.3		2	0.5	-0.2	-
2	3	0.15	0.45		3	-1.0	0.5	-
3	4	0.05	0.015		4	-0.3	-0.1	-

Contd….2

c. Listing out the important assumptions involved, explain the fast-decoupled load flow method. 6

4 a. Draw the flow chart of Newton Raphson method in polar co-ordinate for load flow analysis. 10

b. "Compare Newton Raphson Method and Gauss Seidal methods for load flow analysis in respect of the following: 10

(i) Time per iteration (ii) Total solutions time

(iii) Acceleration factor (iv) Number of iterations.

PART - B

5 a. Obtain the necessary conditions for optimal operations of thermal plants, when transmission losses are considered. 10

b. The fuel inputs per hour of plants 1 and 2 are given as

$F_1 = 0.2P_1^2 + 40P_1 + 120 \quad Rs./hr$

$R_2 = 0.25P_2^2 + 30P_2 + 150 \quad Rs./hr$

Determine the economic operating schedule and the corresponding cost of generations, if the maximum and minimum loading on each unit is 100 MW and 25 MW. 10

The demand is 180 MW and transmission losses are neglected. If the load is equally shared by both the units, determine the saving obtain by loading the units as per equal incremental production cost.

6. a What are B-coefficients? Obtain the general loss coefficient formula, with usual notations. 10

b. For a system, one line diagram is shown in Fig 6(b) Assume I_1 = 1pu, I_2 = 0.8 pu. Voltage at bus is 3 is V_3 = 1pu. Find loss coefficients and power loss. 10

$Z_a = 0.04 + j0.16$; $Z_b = 0.03 + j0.12$ and $Z_c = 0.02 + j0.08$pu

7 a. Explain the point-by point method of solving the swing equation. 10

b. Explain the RungeKutta method for the solution of swing equation. 10

8 Write short notes on any four: 20

(i) Representation of load for transient stability studies

(ii) Penalty factory in economic operation

(iii) Formation of Y_{bus} by singular equation

(iv) Network performance equation

(v) Swing equation and its importance for stability studies.

Contd….3

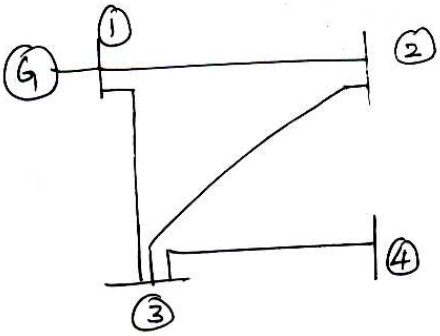

fig. Q1(b)

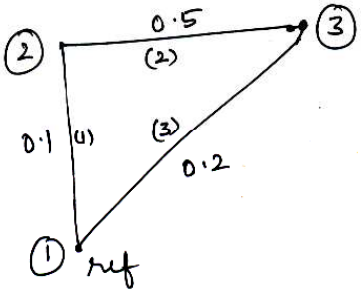

fig. Q 2 (c)

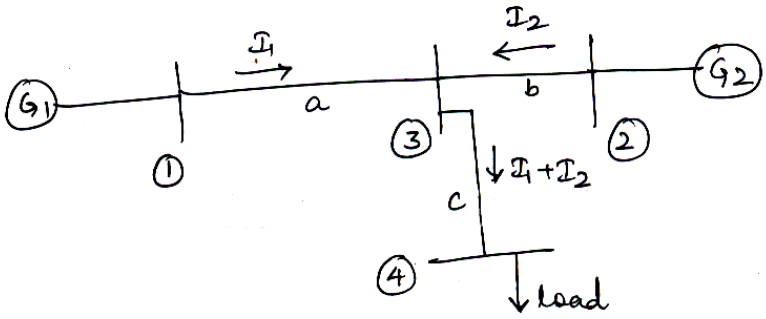

fig. Q6(b)

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