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Roll No. **Total No. of Pages : 02**

Total No. of Questions : 08

M.Tech.(EE) (2013 Onwards)/(Power System) (2013 & Onwards)
(Sem.–1)

POWER SYSTEM ANALYSIS AND DESIGN

Subject Code : MTEE/MTPS-101

Paper ID : [E1361]

Time : 3 Hrs. **Max. Marks : 100**

INSTRUCTION TO CANDIDATES :

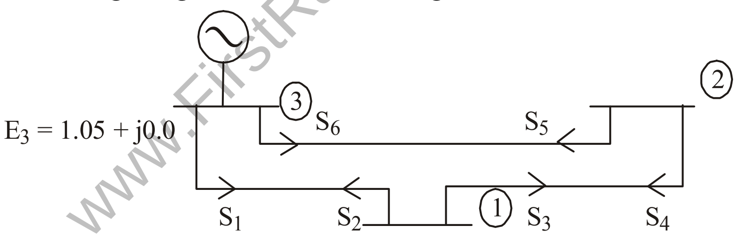
1. **Attempt any FIVE questions out of EIGHT questions.**
2. **Each question carry TWENTY marks.**
3. **Assume any missing data approximately.**

Q1. (a) Explain the procedure to develop $[Y_{BUS}]$ Using Singular Transformation. (10)

(b) Explain various data storage methods used in power system to enhance computational time and efficient space utilization. (10)

Q2. (a) State the assumption to be taken while explaining the weighting factor, and the performance index for weighted measurements. (08)

(b) Real and reactive power line flows are measured at both ends of three transmission lines on three buses, three-line transmission system shown in figure. The set of power flow measurements, using a 200 MVA floating voltage base are S_1-S_6, impedances Z_{12}, Z_{23}, Z_{31}, weighting factors W_1-W_6 as given in Table :



Power		Line Impedances		Weighting Factors x10^{-6}	
S_1	0.45 -j0.11	Z_{12}	0.09 + j0.28	w_1	27.4755
S_2	-0.45 + j0.1	Z_{23}	0.09 + j0.20	w_2	28.4962
S_3	-0.15 + j0.1 1	Z_{31}	0.09 + j0.08	w_3	77.323
S_4	0.14 – j0. 14			w_4	62.2836
S_5	0.75 - j0.37			w_5	11.1353
S_6	-0.75 + 0.35			w_6	11.7226

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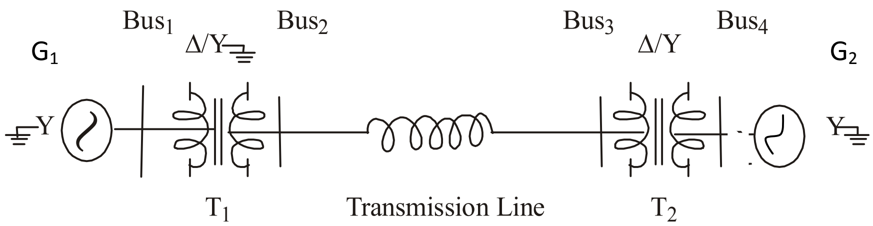
Find the state vector, E_{BUS}, so the absolute magnitude of the error in voltage at any bus between successive iterations is less than 0.01 pu. (12)

Q3. (a) A single-line diagram of a three-phase power system having G_1 at Bus 1, Generator G_2 at Bus 4, The star point of generators are grounded. The transmission line between Bus 2 and Bus 3, is connected to G_1, through transformer T_1 and to G_2 through transformer T_2.



The ratings of the various apparatus are as follows:

Generators : G_1 : 150 MVA, 20kV, X = 0.20 pu., G_2 : 90 MVA, 20kV, X = 0.20 pu.,

Transformers : T_1: 200MVA, 20/138kV, Primary /secondary Δ/Y, X= 0.085pu.

T_2: 200MVA, 20/138kV, Primary /secondary Δ/Y , X = 0.045pu.

Line : 200MVA, X_L = 25 Ω.

A 3-Φ balanced fault occurs at bus no. 4. Determine :

(i) short-circuit current kVA, and

(ii) short-circuit current. (15)

(b) Explain the simulation of tap-changing transformer in load flow studies. (05)

Q4. (a) What do you understand by contingency analysis for power system? (10)

(b) Explain how three-phase power system apparatus can be represented through positive, negative, and zero sequence components. (10)

Q5. (a) Write an algorithm for preparation of three-phase bus impedance matrix. (10)

(b) Write the list of adjustable or control variables that are to be specified in optimal power flow problems. Also mention the area of application of OPF. (10)

Q6. (a) Explain the quick method to determine overloads using linear sensitivity factors, emphasize upon line outage. (10)

(b) Explain linear programming used for correcting the generation from power system security point of view. (10)

Q7. (a) What are the factors affecting power system security? Explain in detail. (10)

(b) Explain the alterations in three phase bus impedance matrix for network changes. (10)

Q8. (a) What do you understand by state estimation and noisy measurements? (08)

(b) Explain why, during unsymmetrical faults, the power system cannot be analyzed on per phase basis? Explain how, matrix transformation, helps analysis during such disturbances? What are properties of transformation matrix? (12)

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