(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 121602 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. VI) THEORY EXAMINATION 2013-14

POWER SYSTEM ANALYSIS

Time : 3 Hours *Total Marks : 100*

Note :– (i) Attempt **all** questions.

(ii) All questions carry equal marks.

1. Attempt any **four** parts of the following : **(4×5=20)**

(a) What do you understand by "PER UNIT SYSTEM" ? What are the significances in power system analysis ? Also mention its limitations.

(b) What do you mean by "SINGLE LINE DIAGRAM" in power system analysis ? Also mention its importances in Power System Analysis.

(c) The line-to-ground voltages on the high voltage side of a set-up transformer are 160 KV, 33 KV and 38 KV on phases a, b and c respectively. The voltages of phase 'a' leads that of phase 'b' by 100° and lags that of phase 'c' by 176.5°. Determine analytically the Symmetrical components of voltage.

(d) Explain the positive, negative and zero sequence components. Also mention its significance in Power System Analysis. Discuss the limitations of sequence components.

(e) Consider a balanced 3-ϕ system shown in Fig. 1

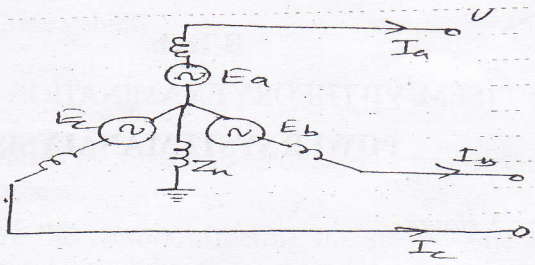

Fig. 1 : 3 ϕ Balanced System

Draw and explain the following :

(i) Positive sequence network of Fig. 1.

(ii) Negative sequence network of Fig. 1.

(iii) Zero sequence network of Fig. 1.

(f) A 25 MVA, 13.2 KV alternator with solidly grounded neutral has a subtransient reactance of 0.25 p.u. The negative and zero sequence reactances are 0.35 and 0.1 p.u. respectively. A single line to ground fault occurs at the terminals of an unloaded alternator; determine the fault current and the line-to-line voltages. Neglect resistances.

2. Attempt any **two** parts of the following : **(10×2=20)**

(a) Write short notes on the following :

(i) Analysis of single-line to ground fault on an unloaded generator and power system network with and without fault impedance.

(ii) Analysis of line-to-line fault on an unloaded generator and power system network with and without fault impedance.

(b) Explain the procedure of formation of Z_{BUS} by using singular transformation and algorithms. What are the importances of Z_{BUS} Matrix in Power System Analysis ?

(c) Discuss the computer method for short circuit calculations in power system networks. Also mention its importances in Power System Analysis.

3. Attempt any **two** parts of the following : **(10×2=20)**

(a) What do you mean by "LOAD FLOW ANALYSIS" in power system networks ? Discuss the classification of buses in load flow analysis. Also mention the importances of buses in load flow analysis.

(b) Draw and explain the algorithms and flow chart of Newton Raphson method used for load flow analysis in power system networks.

(c) Consider the power system networks shown in Fig. 2.

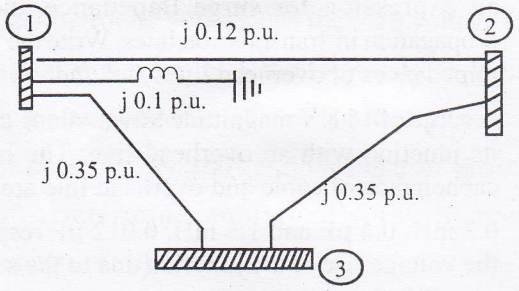

Fig. 2

Determine the Y_{bus} matrix of Fig. 2. (all the values of lines are given in p.u. impedances). Also find Z_{bus} matrix from Y_{bus} matrix.

4. Attempt any **two** parts of the following : **(10×2=20)**

   (a) Define the following terms regarding power system stability :

   (i) Voltage stability

   (ii) Rotor angle stability

   (iii) Frequency stability.

   Also mention the significances of above terms related to power system.

   (b) What are the factors affecting the steady-state and transient stability of the power system networks ? How is it minimized (Improvement) ? Derive swing equation. Also mention its applications in Power System Analysis.

   (c) What do you mean by "EQUAL-AREA CRITERION" ? What are the basic roles of equal area criterion in power system analysis ? Also mention its limitations.

5. Attempt any **two** parts of the following : **(10×2=20)**

   (a) A surge of 100 KV travelling in a line of natural impedance 600 Ω arrives at a junction with two lines of impedances 800 Ω and 200 Ω respectively. Find the surge voltages and currents transmitted into each branch line.

   (b) What do you understand by "Surge impedance" and "velocity of propagation" in travelling waves ? Also derive an expression for surge impedance and velocity of propagation in transmission lines. Write the values of surge impedances of overhead lines and underground cables.

   (c) A surge of 15 KV magnitude travels along a cable towards its junction with an overhead line. The inductance and capacitance of cable and overhead line are :

   0.3 mH, 0.4 μF and 1.5 mH, 0.012 μF respectively. Find the voltage rise at the junction due to the surge.