COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Electrical and Control Engineering
Lecturer : Dr. Mostafa Saad
Course : Power System II
Course Code : EE441 **Marks : 40**
Date : 21 /1/2015 **Time : 2 hour**

Final Exam

Answer the following questions:-

Question 1 : *(B2)*

The network shown in Fig.1 shows single line diagram of a single power network, the bus impedance matrix is given below. Each generator connected to buses 1 and 4 has a sub-transient reactance of 0.25 pu, all line impedances are in pu. Making the usual fault study assumptions;

i. Determine the sub-transient current in pu for a three-phase fault on bus 3
ii. Determine the contributions to the fault current from 1 to 3 and from 4 to 3.

$$Z_{bus} = \begin{bmatrix} j0.135 & j0.123 & j0.128 & j0.114 \\ j0.123 & j0.146 & j0.124 & j0.126 \\ j0.128 & j0.124 & j0.149 & j0.122 \\ j0.114 & j0.126 & j0.122 & j0.135 \end{bmatrix}$$

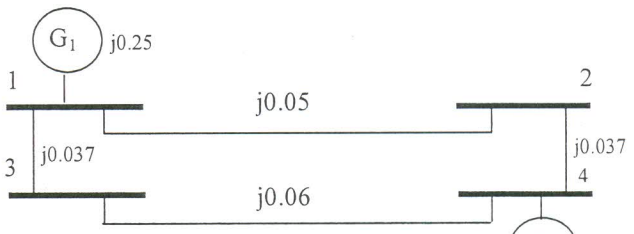

Figure 1

(7 marks)

Question 2: *(B2)*

a) Explain in details the symmetrical component method (3 marks)

b) A three-phase line feeding a balanced-Y load has one of its phases (phase b) open. The load neutral is grounded, and the unbalanced line currents are

$$I_p = \begin{bmatrix} I_a \\ I_b \\ I_c \end{bmatrix} = \begin{bmatrix} 10\angle 0^\circ \\ 0 \\ 10\angle 120^\circ \end{bmatrix} \quad A$$

i. Draw the circuit
ii. Calculate the sequence currents
iii. Calculate the neutral current.

(4 marks)

Question 3 :

a) For a three-phase system, a single line-to-ground fault occurs through a fault impedance Z_F, deduce the fault conditions in phase domain and sequence domain and draw the interconnected sequence networks. *(A18)*(4 marks)

b) A single-line diagram of a power system is shown in Figure 2. The negative- and zero-sequence reactances are also given. The neutrals of the generator and Δ–Y transformers are solidly grounded. The motor neutral is grounded through a reactance $X_n = 0.05$ pu on the motor base.

i. Draw the per-unit zero-, positive-, and negativesequence networks on a 100-MVA, 13.8-kV base in the zone of the generator.
ii. Reduce the sequence networks to their Thevenin equivalents, as viewed from bus 2. Prefault voltage is $V_F = 1.05\ 0^\circ$ pu. Prefault load current and Δ–Y transformer phase shift are neglected.

Members of course Examination Committee:		Signature:	Date:
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