COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Electrical and Control Engineering
Lecturer : Dr. Mostafa Saad
Course : Power System II
Course Code : EE441 — **Marks** : 40
Date : 2 /6/2015 — **Time** : 2 hour

Final Exam

Answer the following questions:-

Question 1 : (B2)

a) A bolted short circuit occurs in the series R–L circuit of Fig.1 with V = 20 kV, X = 8 Ω, R = 0.8 Ω, and with maximum dc offset. The circuit breaker opens 3 cycles after fault inception. Determine:

i. The rms ac fault current
ii. The rms momentary current at τ = 0.5 cycle, which passes through the breaker before it opens.
iii. The rms asymmetrical fault current that the breaker interrupts.

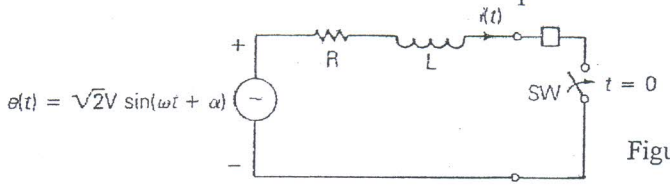

Figure 1 (3 Marks)

b) The network shown in Fig.2 shows single line diagram of a single power network, the bus impedance matrix is given below. Each generator 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, from 4 to 3, and from 2 to 1.

$$Z_{bus} = \begin{bmatrix} j0.13 & j0.12 & j0.12 & j0.11 \\ j0.12 & j0.14 & j0.12 & j0.12 \\ j0.12 & j0.12 & j0.14 & j0.12 \\ j0.11 & j0.12 & j0.12 & j0.13 \end{bmatrix}$$

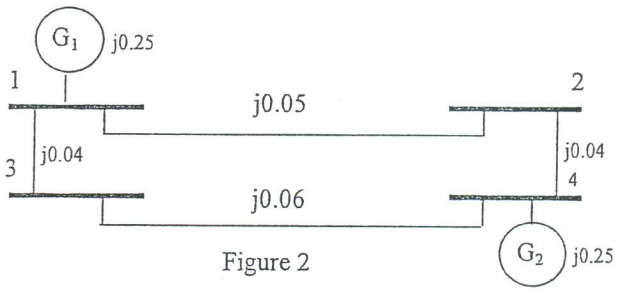

Figure 2

(7 marks)

Question 2: (B2)

a) One line of a three-phase generator is open circuited, while the other two are short-circuited to ground. The line currents are $I_a = 0$, $I_b = 1000\angle 150°$, and $I_c = 1000\angle 30°$ A.

i. Find the symmetrical components of these currents.
ii. Find the current into the ground.

(2 marks)

b) A balanced-Y load is in parallel with a balanced-Δ-connected capacitor bank. The Y load has an impedance $Z_Y = (3 + j4)\ \Omega$ per phase, and its neutral is grounded through an inductive reactance $X_n = 2\ \Omega$. The capacitor bank has a reactance $X_c = 30\ \Omega$ per phase.

i. Draw the sequence networks for this load
ii. Calculate the load-sequence impedances

(3 marks)

Members of course Examination Committee:	Signature:	Date:
Lecturer: Dr. Mostafa Saad		18/5/2015
Course Coordinator : Prof. Amany Ahmed		18/5/2015
Head of Department: Prof. Hamdy Ashour	Hamdy	18/5/2015

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