Kafrelsheikh University Faculty of Engineering Electrical Engineering Programme. Department: Electrical Power and Machines Course Title: Elective Course (1). Power System Protection	جامعة كفر الشيخ Kafrelsheikh University	Date: Sun., 5 - 6- 2016 Time Allowed:3 hrs Full Mark: 90 Marks Final term Exam: 2nd Term. Course Code: EPM 3213. Year:3rd (2007) /2015-2016

- **Trust in God ----Be confident -----Be calm**
- **Exam is not a punishment or a curse .**
- **It is a chance to show your knowledge**
- **It is the time to get the prize of your effort**

Important instructions for all students: please read carefully

- **The examination consists of 5 questions in 2 papers (4 pages)**
- **Read the questions carefully before answering.**
- **Your answer should be short and precise.**
- **Remember to mark your answers with ordered numbers corresponding to questions.**

Answer the Following Question:

Question (1): **(15 Marks)**

a) ***Give an account on:*** Short transmission line protection challenges and SIR source impedance ratio margin. [6]

b) ***Describe*** the behavior of protective devices used for distribution system shown in Fig. 1 for different faults at points A, B, C.[9]

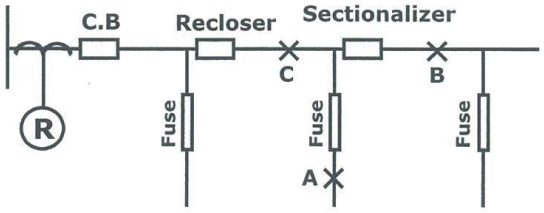

Fig. 1

Question (2): **(20 Marks)**

a) ***Explain how*** to use the directional over-current relay to parallel feeders application shown in Fig. 2. ***And how to make*** coordination for parallel feeders. Assuming the worst conditions.[8]

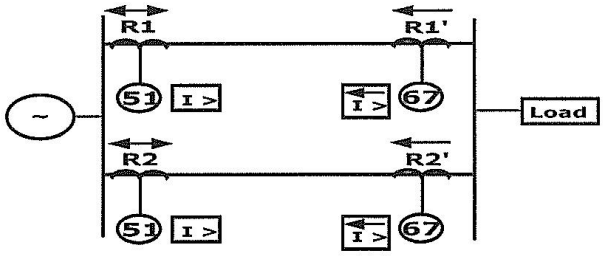

Fig.2

b) Think of yourself as a design protection engineer for the two arrangements of two feeders are in the Fig.3a&3b, which is to be protected by distance relay. Clearly, the continuous current *and voltage rating* of the design will be important, and the maximum fault current that can be interrupted must be determined. ***What other features*** should be considered in the second zone setting design, if it is to meet the requirements of the distribution protection engineer?[12]

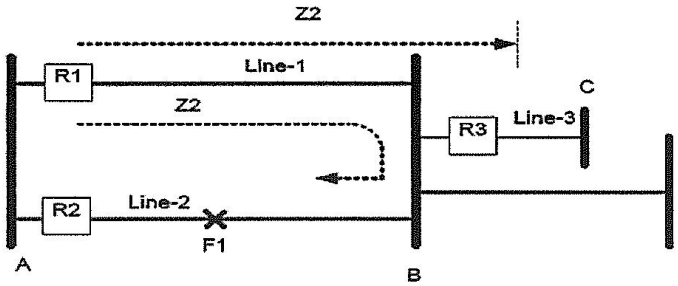

Fig.3a

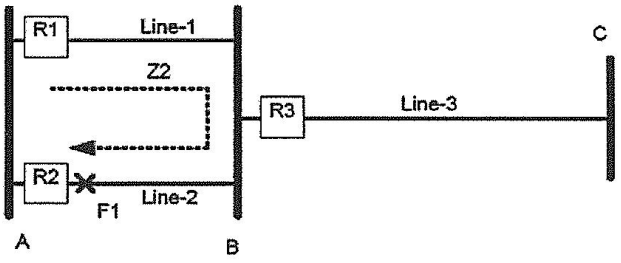

Fig.3b

Question (3): **(20 Marks)**

a) ***Put True or False***:

- Speed of protection so important (***Discuss*** your answer).[5]
- A distance relay is said to over-reach when the apparent impedance presented to it is less than the impedance to the fault.[3]

b) Consider the feeder shown in Fig. 4 with earth fault relays R1 and R2. Relay R1 is used for providing protection against earth fault at the secondary side of 2.5 MVA, 11/3.3 kV transformer, whereas, relay R2 has to provide protection at bus B. A 200:5 CT is connected to inverse over-current relay R2 and 500:5 CT ratio is connected to R1.

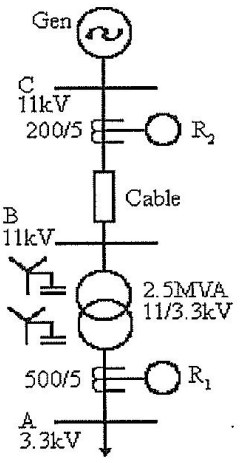

Fig.4

- ***Compute*** the setting of standard inverse unit at relay R1. Assume that maximum system unbalance is 20% and SLG fault current at bus A is 480 A and at bus B it is 650A? [6]
- ***Compute*** the time required by relay R2 to clear SLG fault at bus B? [6]
  - Use coordination time margin of 0.3sec.

Question (4): **(20 Marks)**

a) ***Define***: Fuse coordination, Characteristic quantities and Energizing quantities.[9]
b) For the system shown in Fig. 5. ***Design*** the three zone step for the distance relay R_b. ***Given*** From short-circuit study that $I_2/I_1 = 0.5$.[11]

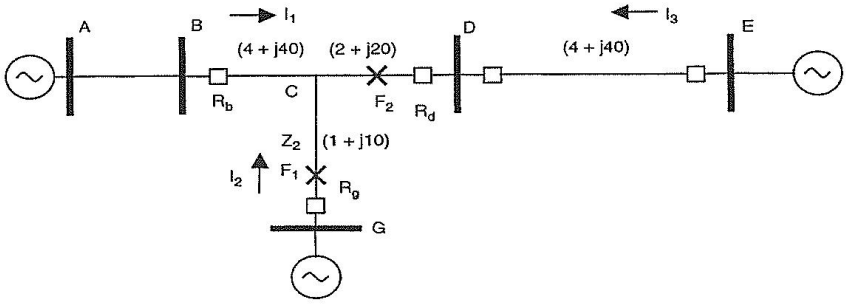

Fig.5

Question (5): **(15 Marks)**

a) ***What*** are boucholz relay and the significance of it in to the transformer? [9]

b) ***When*** voltage increases then current also increases then ***what*** is the need of over voltage relay and over current relay? ***Can*** we measure over voltage and over current by measuring current only? [6]

With my best wishes
Dr. Eman Saad