

Kafrelsheikh University  
Faculty of Engineering  
Department: Electrical Power and Machines  
Year: 3<sup>rd</sup> (2007) / 2017-2018  
Subject: Elective Course (1)  
Power System Protection



Date: 3-6-2018  
Time Allowed: 3 hrs  
Full Mark: 90 Marks  
Final Term Exam: 2<sup>nd</sup> Term.

- 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.

This course must cover the following ILOs: a.15,b.3,b.6,b.9, c.10 ,c.17, d.1 & d.9

Important instructions for all students please read carefully:

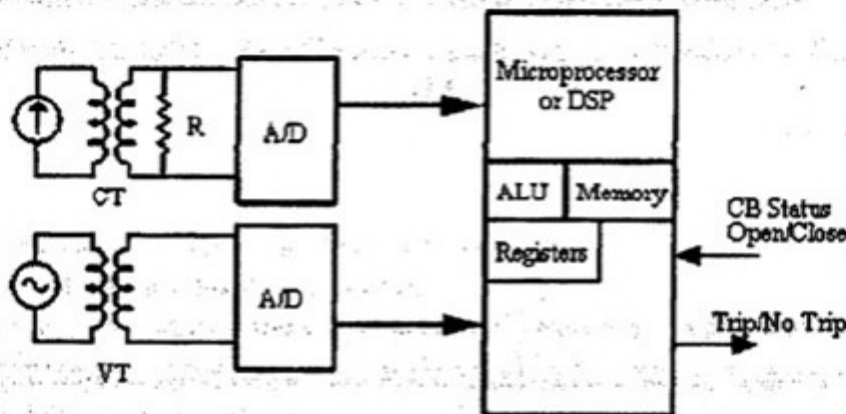
- The examination consists of 4 questions in 2 papers (4 pages)
- Read the questions carefully before answering.
- Your answer should be short and precise.
- Remember to mark your answers with ordered numbers corresponding to questions.

Answer the Following Questions:

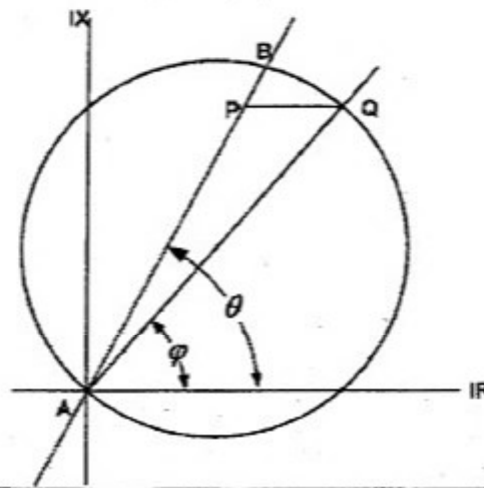
Question (1):

(25 Marks)

- a) Describe various generation of relays? (8 Marks)
- b) In the following figure Why is a resistor connected across CT secondary?  
What describes this figure? (7 Marks)



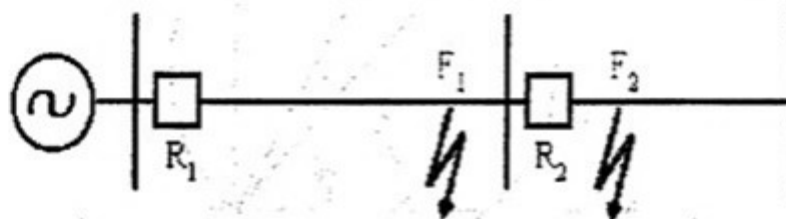
- c) In the following figure, **Discuss** the basic principle of distance relay, **What** are the name of characteristics of the relay is shown in the figure and **What** are the problems that characteristics have dealt? **Place** a name for each statement on the drawing, whether it is a angle or a line. (10 Marks).



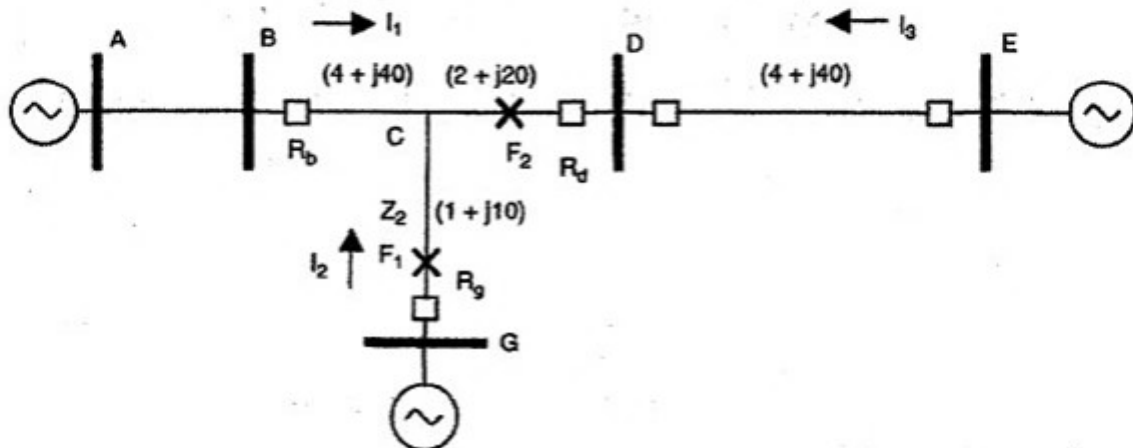
**Question (2):**

(20 Marks)

- a) **Choose** the correct answer : **What** is the cut off current in the fuse?  
 (Maximum value actually reached- R.m.s value actually reached- Average value actually reached- None of the above). (3 Marks)
- b) In the following figure, **Can** R1 **discriminate** between F1 & F2 accurately? If no **discuss** the reason and **explain** the solution. (7 Marks)



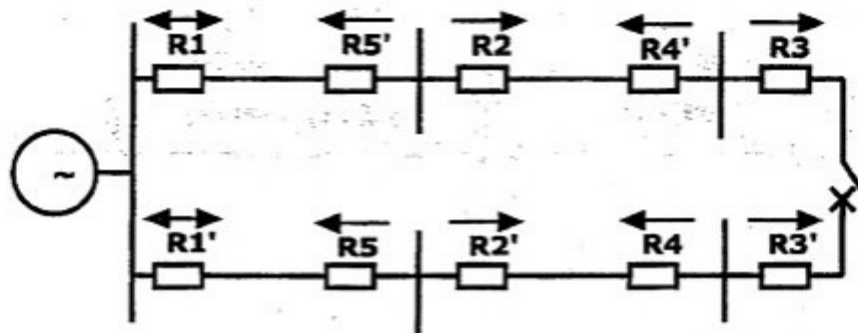
- c) For the system shown in the following figure. **Design** the three zone step for the distance relay  $R_b$ . Given From short-circuit study that  $I_2/I_1 = 0.5$ . (10 Marks).



**Question (3):**

(25 Marks)

- a) **Show how** coordination may be done for ring main system shown in the following. Use coordination time margin of 0.3sec. (8 Marks).



- b) **How** is selectivity criteria provided in : (8 Marks)

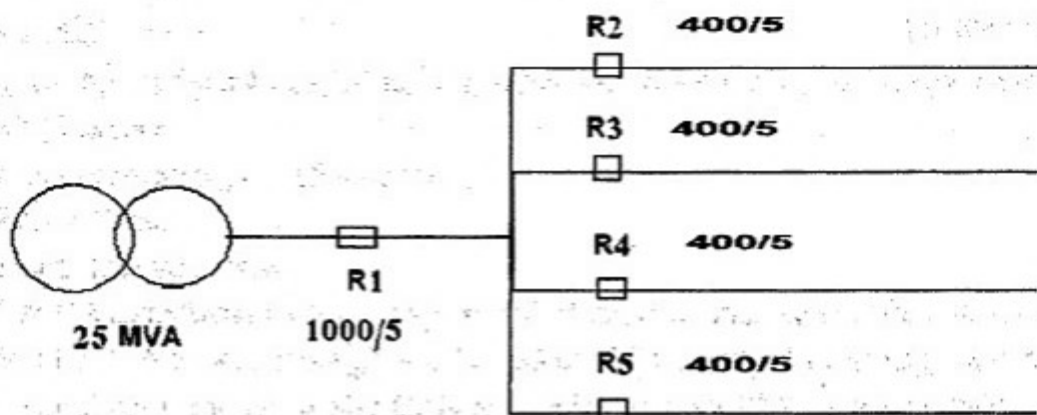
- Over current protection scheme.
- Differential protection scheme.

- c) A 50 mile, 138 KV transmission line is equipped with a distance relay with 600/5 C.T and V.T ratio 138000/115 V. **Find** the secondary impedance if the line impedance of  $0.8 \Omega/\text{mile}$ . (9 Marks)

**Question (4):**

**(20 Marks)**

- a) **What** are the different relays that employed for protection of and transmission lines? (5 Marks)
- b) **What** is the meaning of : (5 Marks)
- Relay Time.
  - Fault clearance time
- c) A 25 MVA transformer which may be called upon to operate at 30% overload, feeds 11 KV bus bars through a C.B , other C.Bs supply 4 outgoing feeders. The transformer and the feeder C.Bs are equipped with 1000/ 5 A and 400/5 A current transformers respectively. All sets of C.Ts feed induction type O.C relays . The relay on the feeder has 125% PS and 0.3 TMS. If a 3-phase fault current of 5000 A flows from the transformer to one of the feeders. **Find** the operating time of the feeder relay, the min. PS of the transformer relay and its TMS assuming a discriminative time margin of 0.5 sec. (10 Marks)



End of Exam Questions, Good Luck

DREMAN SAAD  
Associated prof., Hany Abdelsalam  
Dr. Amlak Abaza