


Kafrelsheikh University Faculty of Engineering Electrical Engineering Department Electrical Power and Machines Programme. Course Title: Elective Course (1). Power System Protection		Date: Sun., 2- 6- 2019 Time Allowed: 3 hrs Full Mark: 90 Marks Final term Exam: 2 nd Term. Course Code: EPM 3213. Year: 3 rd 2018-2019
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This course must cover the following ILOs: a.15,b.3,b.6,b.9, c.10 ,c.17, d.1 &d.9

- *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 4 questions in 2 papers (3 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) 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]
- ***What*** are boucholz relay and the significance of it in to the transformer? [7]

Question (2):

(25 Marks)

a) Define in details: 1. Fusing ratio, 2. Characteristic quantities and Energizing quantities. 3. Relying time, 4. Unit and non-unit protection, 5. Main and backup protection scheme. [10]

b) For the system shown in Fig. 1. Design the three zone step for the distance relay R_b. Given from short-circuit study that $I_2/I_1 = 0.5$. [15]

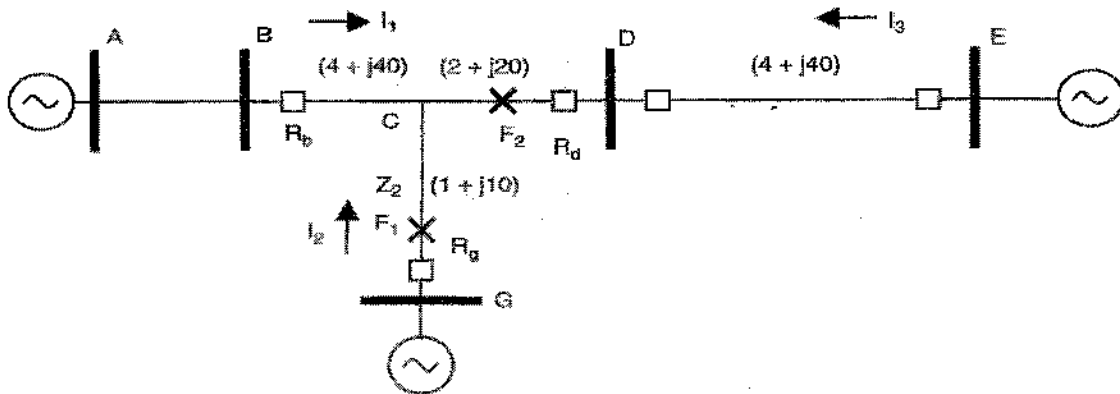


Fig.1

Question (3):

(25 Marks)

- a) **What** is the need of relay coordination, demonstrate your answer for: Radial feeder protected by fuse scheme, parallel feeder protected by relay scheme (naming the relay types) and ring feeder protected by relay? [15]
- b) **Fill in the blanks by inserting appropriate words/figures:** Consider the fault F on the transmission line shown in Fig.2. In normal operation, this fault should be cleared by the two relaysandthrough the and If does not operate for this fault, it has become through a loss of dependability. If relay operates through breaker for the same fault, and before breakerclears the fault, it has become through a loss of security. Thus, although a single relay belonging to a protection system may lose security, its effect is to render the complete relaying system insecure, and hence unreliable. [10]

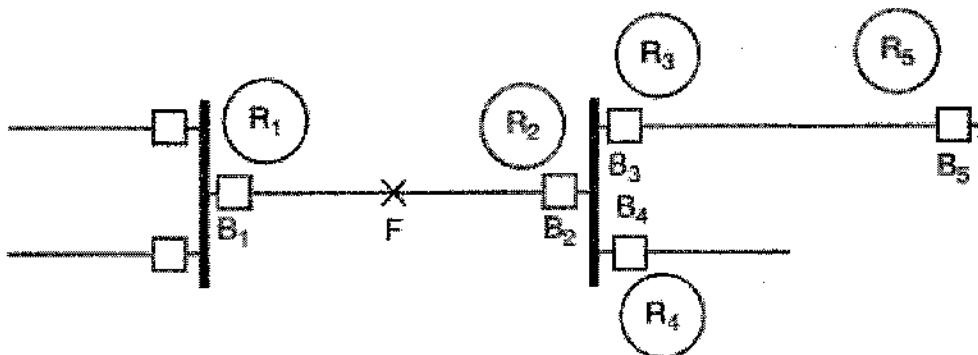


Fig.2

Question (4):

(25 Marks)

- a) **Explain** with block diagram and output signal at each step the static over current relay and list its advantages over Electromagnetic relay. [7]
- b) Referring to Fig.3, there is a current in the relays at circuit breaker (CB) 5 with all lines in service and when the feeder 3–4 out of service (during any fault conditions occurred on it) there is another value of current. This is the critical case for coordination. **Determine** the values of current during each case using the parameters are shown on the figure and **Demonstrate** how can you solve this problem. [8]

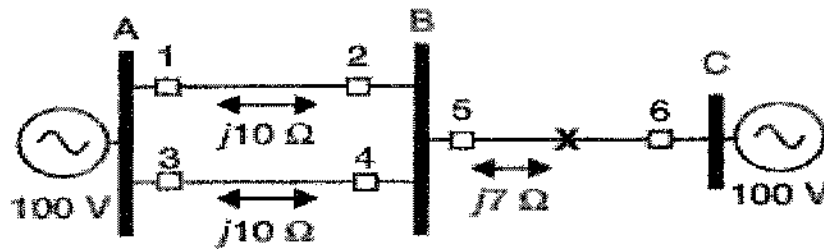
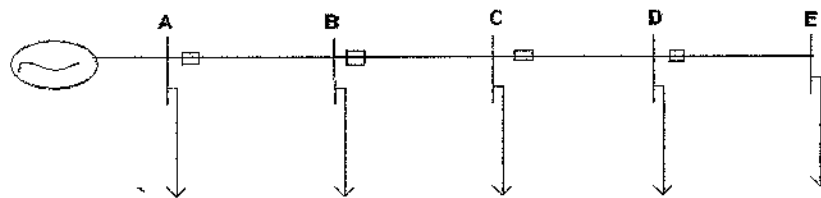


Fig.3

- c) For the system shown below, design the complete OC protection using the IDMT relays. Thus, decide the CT ratios, the plug settings and the TMS at all locations. [10]



Load	115 A	80 A	100 A	77 A	70 A
Min.Fault current	1500 A	1000 A	780 A	585 A	390 A
Max.Fault current	6000 A	5000 A	3000 A	2000 A	1000 A

With my best wishes
Dr.Eman Saad and committee