UNIVERSITY OF THE WITWATERSRAND
SCHOOL OF ELECTRICAL AND INFORMATION ENGINEERING
ELEN4018: POWER SYSTEMS
TUTORIAL 3: INSTRUMENT TRANSFORMERS

Question 1

What is the rated secondary accuracy limit current of the following current transformers

Ratio	Rated Burden	Accuracy class	Accuracy limit factor
300/1	10 VA	10P	15
1000/5	30 VA	5P	15

Question 2

What is the minimum secondary saturation voltage that can be expected from the following current transformers?

300/1 with designation 15VA-5P15
1000/5 with designation 10VA-10P15

Question 3

Three current transformers with ratios 200/1 supply three overcurrent relays and one earth fault relay. Each current transformer has negligible internal impedance and the magnetization characteristic below

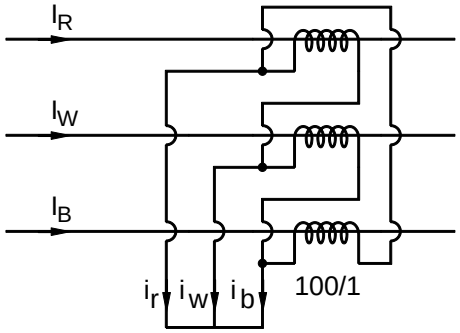
Secondary voltage	Secondary magnetizing current
5 V	25 mA
10 V	75 mA
15 V	90 mA
20 V	100 mA
25 V	110 mA
30 V	130 mA
35 V	150 mA
40 V	180 mA
45 V	500 mA

The earth fault relay has a burden of 3 VA and has been set at 0,2 A.

Calculate the nominal primary earth fault current setting of the protection.

Question 4

A set of current transformers is connected in delta as indicated in the following sketch



What are the secondary currents i_r, i_w and i_b for the primary currents I_R, I_W and I_B shown below (answers in the form of sketches)?

(a) $150\angle 0°$, $150\angle -120°$ and $150\angle -240°$
(b) 0, $1000\angle 0°$ and $1000\angle -180°$ (typical phase-phase fault)
(c) $500\angle 0°$, $250\angle -180°$ and $250\angle -180°$ (common 2/1/1 distribution)

Question 5

A set of voltage transformers (each voltage transformer rated at 132 kV/110 V) is connected with secondaries connected open delta to a 132 kV system.

What will be the output voltage for the following conditions?

(a) Normal balanced condition
(b) Single-phase-to-ground fault on a solidly earthed system (neutral solidly earthed)
(c) Single-phase-to-ground fault on a system that is unearthed (neutral unearthed)

Dr JM Van Coller, 2017