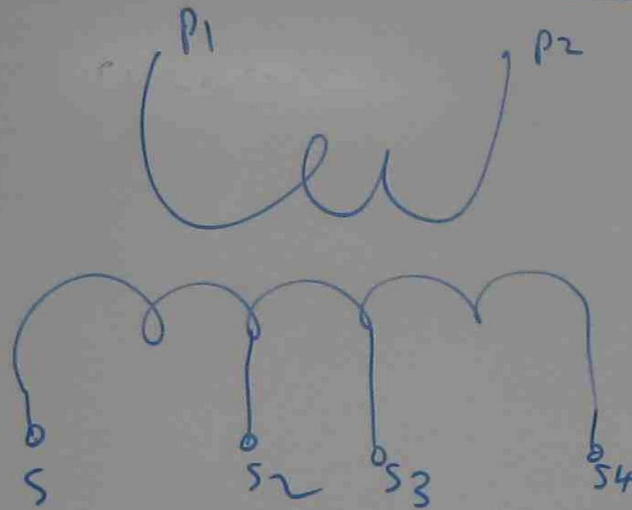


MULTI TAPPED CT



Pb

For 2000/1000/500/1 CT

10 P 250 IS CLASSIFIED AT 2000/1
WINDING.

WHAT WILL BE THE CLASSIFICATION FOR
1000/1 AND 500/1 WINDINGS

$$(1) n = \frac{\text{REQUIRED WINDING VOLTAGE} / \text{CURRENT}}{\text{RATED WINDING VOLTAGE} / \text{CURRENT}}$$

$$(2) n \times \text{ORIGINAL VALUE} \quad P \quad \frac{\text{ORIGINAL VALUE}}{n}$$

2000 / 1 TAPPING \rightarrow 10 P 250

\uparrow

RATED WIND
CURRENT

1000 / 1 TAPPING \rightarrow REQUIRED WINDING
CURRENT = 1000

$$n = \frac{1000}{2000} = \frac{1}{2}$$

$$\frac{1}{2} \times 10 \quad P \quad \frac{250}{\frac{1}{2}}$$

5 P 500 for 1000 / 1 TAPPING

500 / 1 WINDING

$$n = \frac{500}{2000} = \frac{1}{4}$$

$$\frac{1}{4} \times 10 \quad P \quad \frac{250}{\frac{1}{4}}$$

2.5 P 1000 for 500 / 1

TAPPING

TUTORIAL (10)

Q2 For 500/1 10P150 CT

SECONDARY DC RESISTANCE IS 1.6Ω

CALCULATE (i) BURDEN RESISTANCE (R_b)

(ii) EXCITATION CURRENT (I_{es})

(iii) SECONDARY VOLTAGE (V_s)

(iv) CLASS VOLTAGE (V_c)

(v) DECLARED MAXIMUM RATIO ERROR (γ)

(1) BURDEN RESISTANCE

$$V_s = I_{SR} (R_b + R_s) \quad (1)$$

Diagram illustrating the equation for secondary voltage V_s :

- V_s : GIVEN VOLTAGE
- I_{SR} : RATED SECONDARY CURRENT
- R_b : BURDEN RESISTANCE
- R_s : SECONDARY WINDING DC RESISTANCE

$V_s = ?$

$I_{SR} = 1 \text{ Amp}$

$R_b = ?$

$R_s = 1.6 \Omega$

500/1
PRIMARY CURRENT
SECONDARY CURRENT

(i) $R_3 = \frac{\text{SECONDARY REFERENCE VOLTAGE}}{20 I_{SR}}$ — (2)

$$= \frac{150}{20 \times 1} = 7.5 \Omega$$

(iii) $V_S = 20 I_{SR} (R_B + R_S)$
 $= 20 \times 1 (7.5 + 1.6) = 182 \text{ V}$

(ii) EXCITATION CURRENT = ?

$$\% \text{ composite factor} = \frac{I_e \times 100}{I_{SR} \times k}$$

$$10 = \frac{I_e \times 100}{1 \times (k=1)} \rightarrow I_e = 0.1 \text{ Amp}$$

(iv) CLASS VOLTAGE

$$V_C = \text{SECONDARY REFERENCE VOLTAGE} = 150 \text{ V}$$

(v) DECLARED MAXIMUM RATIO ERROR = 10 P 150
 $= 10$

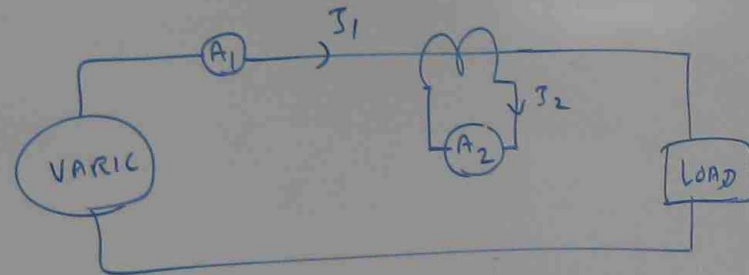
10 P 150 $\overline{\overline{F15}}$
 \swarrow
 $k=15$

10 P 150 $\overline{\overline{F1}}$
 \swarrow
 $k=1$

10 P 150
 \swarrow
 $k=1$

TESTING CTs

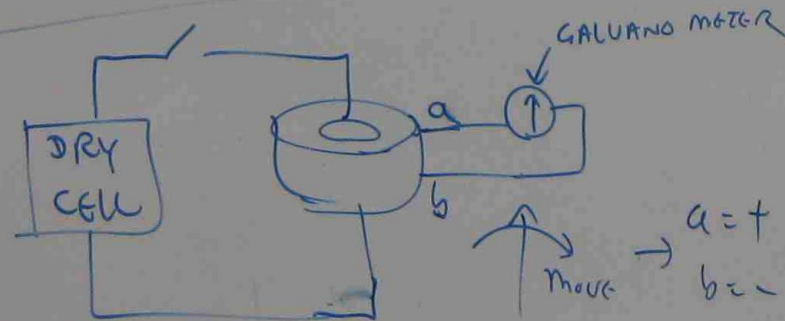
TEST (1) AC RATIO CHECK



$$\text{Ratio} = \frac{I_1}{I_2}$$

IF $I_1 = 300 \text{ A}$, $I_2 = 5 \text{ A}$ $\text{CTR Ratio} = \frac{I_1}{I_2} = \frac{300}{5} = \frac{60}{1}$

TEST (2) DC POLARITY CHECK



$a = +$
 $b = -$

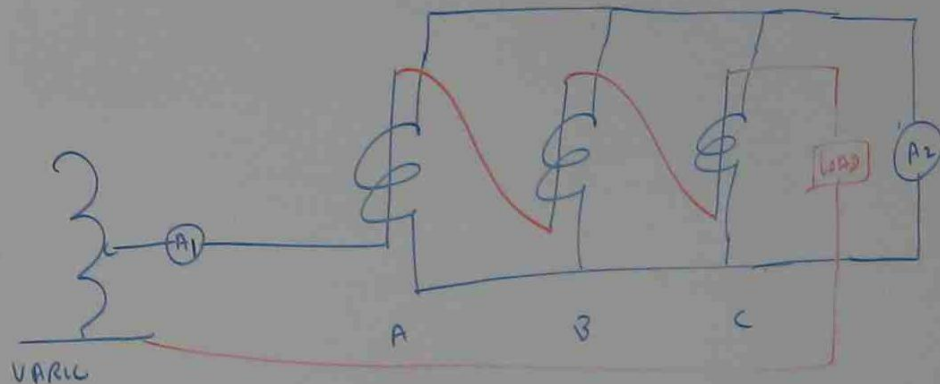
$a = -$
 $b = +$

TEST (3)

VARIC

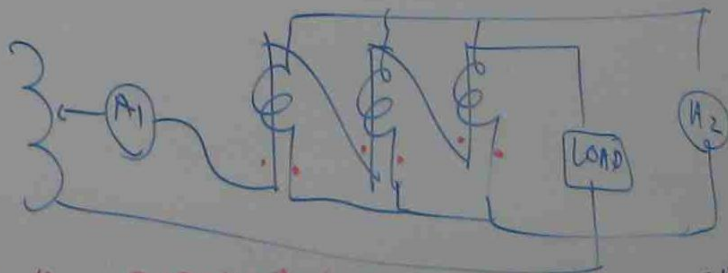
TEST (3)

3 ϕ POLARITY TEST FOR 3 ϕ CT



IF ALL POLARITY ARE CORRECT, A_2 INDICATES
SOME READING

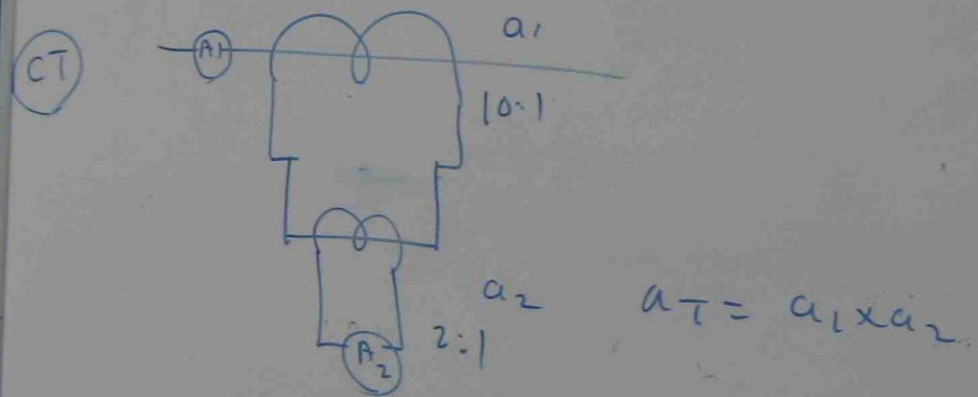
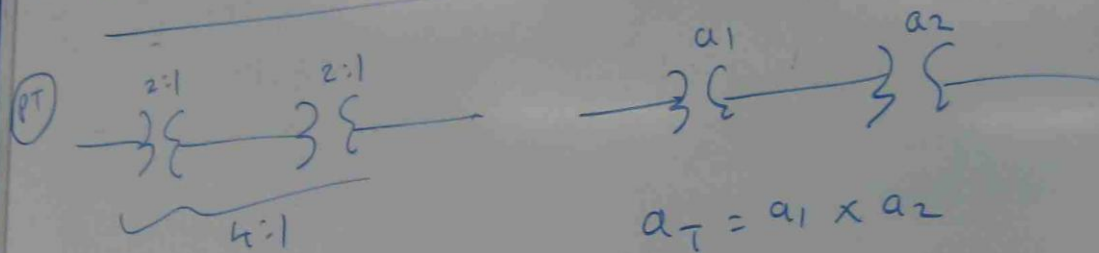
THEN MARK THE POLARITY AS FOLLOWS.



a = -
b = +

IF A_2 DOES NOT INDICATE THE READING CHANGE THE
CONNECTION & TEST AGAIN UNTIL A_2 INDICATES THE READING.

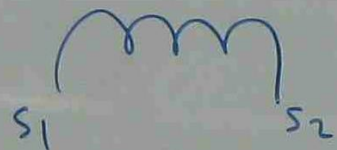
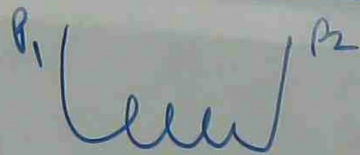
INTERPOSING & SUMMING OF CT & PT



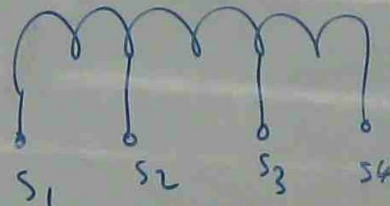
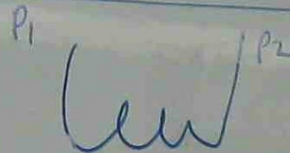
$$a_T = 10:1 \times 2:1$$

$$= 20:1$$

CLASSIFICATION OF MULTI TAPPED CURRENT TRANSFORMERS



WITHOUT TAPPING



MULTI TAPPING

TUTORIAL (a)

Q.2 For 2000/1000/500/1 CURRENT TRANSFORMER,
10 PS 250 IS CLASSIFIED FOR 2000/1 WINDING
WHAT ARE THE CLASSIFICATIONS FOR 1000/1 AND
500/1 WINDINGS.

STEP (1)

$$n = \frac{\text{REQUIRED WINDING VOLTAGE}}{\text{RATED WINDING VOLTAGE}}$$

STEP (2)

$$n \times \text{ORIGINAL VALUE} \quad P_s \quad \frac{\text{ORIGINAL VALUE}}{n}$$

1000 / 1 WINDING

$$n = \frac{1000}{2000} = \frac{1}{2}$$

$$\frac{1}{2} \times 10 P_s \frac{250}{\frac{1}{2}} = 5 P_s 500$$

500/1 WINDING

$$m = \frac{500}{2000} = \frac{1}{4}$$

$$\frac{1}{4} \times 10 \text{ Ps } \frac{250}{\frac{1}{4}}$$

$$2.5 \text{ Ps } 1000$$

$$④ V_c = 20 \times I_{SR} (R_b + R_s)$$

V_c = CLASS VOLTAGE

I_{SR} = RATED SECONDARY CURRENT

CURRENT TRANSFORMER TEST | CALCULATION

$$① \text{ BURDEN RESISTANCE } (R_b) = \frac{\text{REFERENCE VOLTAGE}}{20 \times \text{RATED SECONDARY CURRENT}}$$

$$② \text{ COMPOSITE ERROR} = \frac{I_e \times 100}{I_s \times K}$$

I_e = SECONDARY EXCITING CURRENT

I_s = 20 X RATED SECONDARY CURRENT

K = RATED ACCURACY LIMIT FACTOR

10 P 150 F 15

③

$$\text{CLASS VOLTAGE} = \text{TEST VOLTAGE} - 20 \times I_{SR} \times R_s$$

RATED SECONDARY CURRENT

I_{SR} = RATED SECONDARY CURRENT

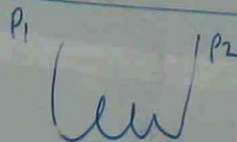
R_s = SECONDARY DC RESISTANCE

SECONDARY
DC
RESISTANCE

CLASSIFICATION OF MULTI TAPPED CURRENT TRANSFORMERS



WITHOUT TAPPING



MULTI TAPPING

TUTORIAL (9)

Q.2 For 2000/1000/500/1 CURRENT TRANSFORMER,
10 PS 250 IS CLASSIFIED FOR 2000/1 WINDING
WHAT ARE THE CLASSIFICATIONS FOR 1000/1 AND
500/1 WINDINGS.

STEP (1)

$$n = \frac{\text{REQUIRED WINDING VOLTAGE}}{\text{RATED WINDING VOLTAGE}}$$

STEP (2)

$$n \times \text{ORIGINAL VALUE} \quad \text{PS} \quad \frac{\text{ORIGINAL VALUE}}{n}$$

$$\frac{1000/1 \text{ WINDING}}{2000}$$

$$n = \frac{1000}{2000} = \frac{1}{2}$$

$$\frac{1}{2} \times 10 \text{ PS } 250 = 5 \text{ PS } 500$$

500 / WINDING

$$n = \frac{500}{2000} = \frac{1}{4}$$

$$\frac{1}{4} \times 10 \text{ P } 250$$

$$2.5 \text{ P } 1000$$

$$V_s = 20 \times I_{SR} (R_b + R_s)$$

V_s = SECONDARY VOLTAGE

I_{SR} = RATED SECONDARY CURRENT

CURRENT TRANSFORMER TEST / CALCULATION

$$\textcircled{1} \text{ BURDEN RESISTANCE } (R_b) = \frac{\text{REFERENCE VOLTAGE}}{20 \times \text{RATED SECONDARY CURRENT}}$$

$$\textcircled{2} \text{ COMPOSITE ERROR} = \frac{I_e \times 100}{I_s \times K}$$

I_e = SECONDARY EXCITING CURRENT

I_s = 20 X RATED SECONDARY CURRENT

K = RATED ACCURACY LIMIT FACTOR

10 P 150 F 15

③

$$\text{CLASS VOLTAGE} = \text{TEST VOLTAGE} - 20 I_{SR} \times R_s$$

I_{SR} = RATED SECONDARY CURRENT

R_s = SECONDARY DC RESISTANCE

SECONDARY DC RESISTANCE

TUTORIAL (10)

Q2 FOR 500 / 1 → 10 P 150 F 1 C.T
SECONDARY DC RESISTANCE IS 1.6 Ω.

- CALCULATE
- (a) BURDEN RESISTANCE (R_b)
 - (b) EXCITATION CURRENT (I_e)
 - (c) SECONDARY VOLTAGE (V_s)
 - (d) CLASS VOLTAGE (V_c)
 - (e) DECLARED MAXIMUM RATIO ERROR (%)

RATED PRIMARY CURRENT

RATED SECONDARY CURRENT

V_{ref} CLASS VOLTAGE

$$(a) R_b = \frac{\text{REFERENCE VOLTAGE}}{20 \times \text{RATED SECONDARY CURRENT}} = \frac{150}{20 \times 1} = 7.5 \Omega$$

$$(b) \text{ COMPOSITE ERROR} = \frac{I_e \times 100}{I_s \times K} = \frac{I_e \times 100}{20 \times 1 \times 1} = 10\%$$

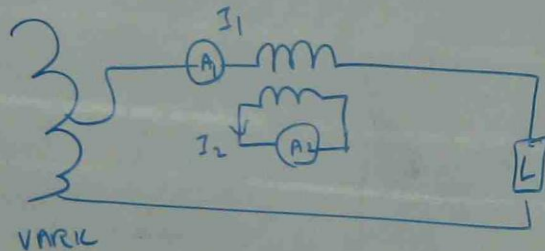
$$I_e = \frac{10 \times 20}{100} = 2 \text{ Amp}$$

$$(c) V_s = 20 I_{SR} (R_b + R_s) = 20 \times 1 (7.5 + 1.6)$$

$$(d) V_c = 150 \text{ V}, (e) r = 10\%$$

TESTING CTs

TEST (1) AC RATIO CHECK

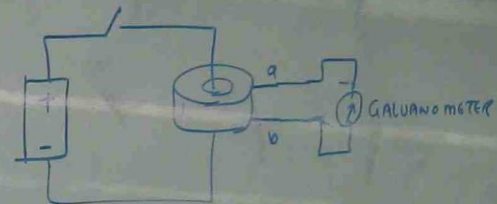


$$CT \text{ RATIO} = \frac{I_1}{I_2} = \frac{\text{AMMETER READING (A}_1\text{)}}{\text{AMMETER READING (A}_2\text{)}}$$

300/5 CT \rightarrow 60/1 RATIO

400/5 CT \rightarrow 80/1 RATIO

TEST (2) DC POLARITY CHECK

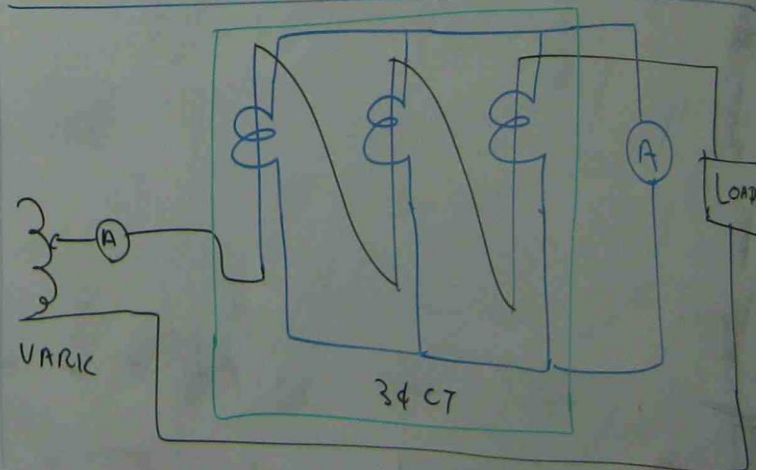


\uparrow
pointer

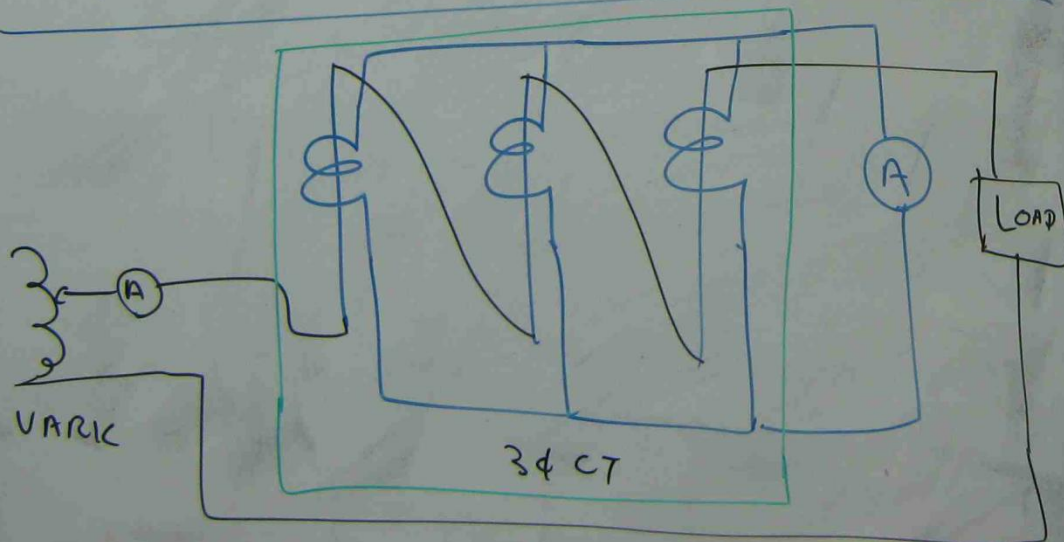
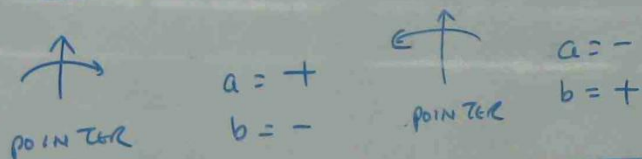
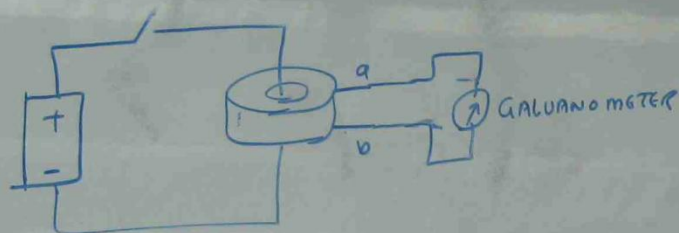
a = +
b = -

\leftarrow
pointer

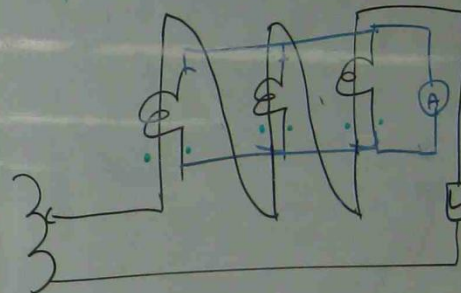
a = -
b = +



TEST (2) DC POLARITY CHECK



IF AMMETER INDICATES THE READING, NOTE POLARITY AS FOLLOWS



IF AMMETER DOES NOT INDICATE THE READING, CHANGE THE CONNECTION AND TEST AGAIN UNTIL IT INDICATES THE READING AND NOTE POLARITY AS ABOVE

CURRENT TO

① BURDEN (R_b)

② COMPOS

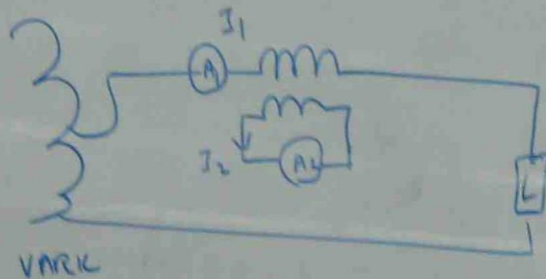
③ CLASS VO

$$I_{SR} = R_A$$

$$R_S = R_G$$

TESTING CTs

TEST (1) AC RATIO CHECK



$$CT \text{ RATIO} = \frac{I_1}{I_2} = \frac{\text{AMMETER READING } (A_1)}{\text{AMMETER READING } (A_2)}$$

300/5 CT \rightarrow 60/1, RATIO

400/5 CT \rightarrow 80/1, RATIO

TUTORIAL (10)

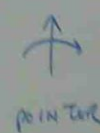
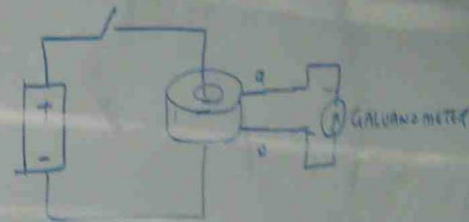
Q2 - WITH THE HELP OF DIAGRAM, EXPLAIN HOW TO PERFORM THE FOLLOWING TESTS ON CT

(a) AC RATIO CHECK

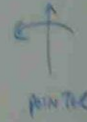
(b) DC POLARITY CHECK

(c) AC RATIO & POLARITY CHECK ON 3φ CT

TEST (2) DC POLARITY CHECK

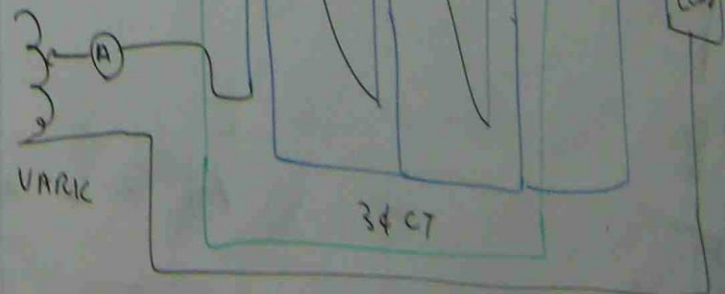


a = +
b = -

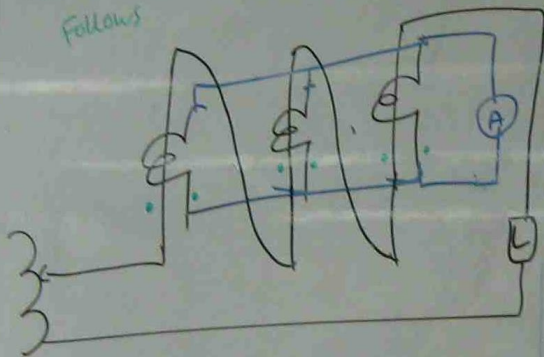


a = -
b = +

AC RATIO &
POLARITY TEST
ON 3φ CT



IF AMMETER INDICATES THE READING, NOTE POLARITY AS FOLLOWS



IF AMMETER DOES NOT INDICATE THE READING, CHANGE THE CONNECTION AND TEST AGAIN UNTIL IT INDICATES THE READING AND NOTE POLARITY AS ABOVE

CURRENT TRANSFORMER TEST | CALCULATION

① BURDEN RESISTANCE = $\frac{\text{REFERENCE VOLTAGE}}{20 \times \text{RATED SECONDARY}}$

(R_b)

② COMPOSITE ERROR = $\frac{I_e \times 100}{I_s \times K}$

I_e = SECONDARY EXCITING CUR

I_s = 20 X RATED SECONDARY CUR

K = RATED ACCURACY LIMIT FA

10 P 150 F 15

③ CLASS VOLTAGE = TEST VOLTAGE - $20 I_{SR}$

RATED SEC

I_{SR} = RATED SECONDARY CURRENT

R_s = SECONDARY DC RESISTANCE

