TECHNOLOGICAL UNIVERSITY (THANLYIN)

နည်းပညာတက္ကသိုလ် (သန်လျင်)

Exercise Book

Name : IQY TECHNICAL COLLEGE

Roll No : ELECTRICAL TRADES ROLL NO 1

Subject : FINANCE

Vision

To become internationally recognized, high - ranking university that educates highly qualified engineers and architects in building the nation towards the development of Myanmar.

Mission

To contribute to the development of our nation and society through the pursuit of engineering education with high international standing and training the human resource developments for local needs

Motto

"Our Technology to develop our Nation"

2016 Target

ASEAN University Network AUN -QA Program Level AUN Certified University

(MEngC) Engineering Education Accredited University

ISO 9001 : 2008 (Quality Management System) Certified University
ISO Standard (Continual Improvement)

IQY

Date: 6th August, 2018

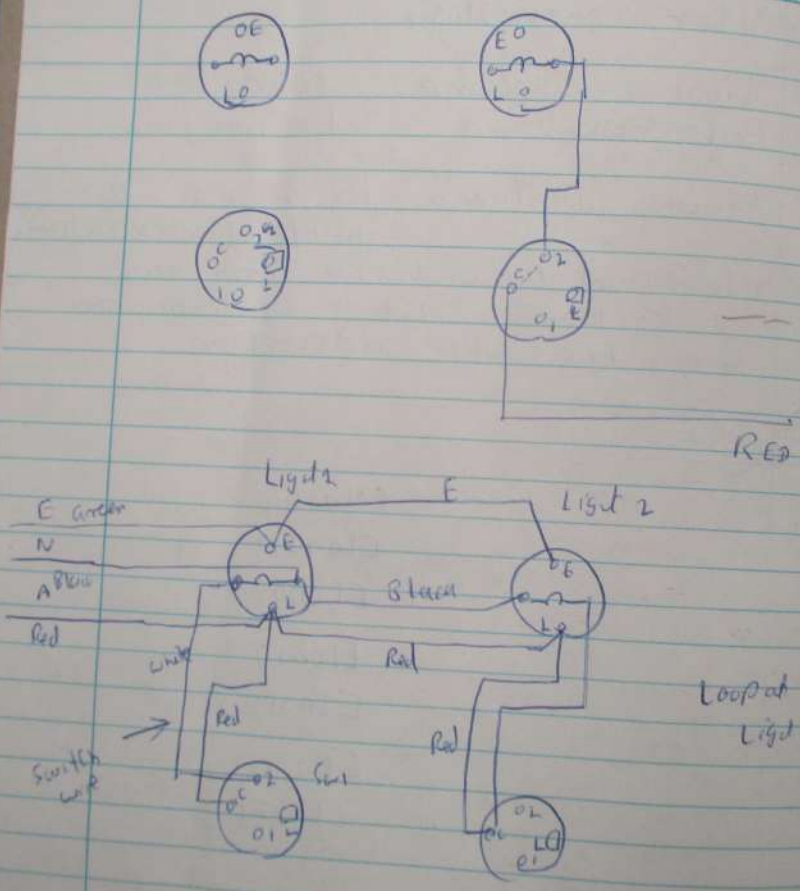
After renovation,

Advance Diploma Ks 500,000
Professional " Ks 600,000

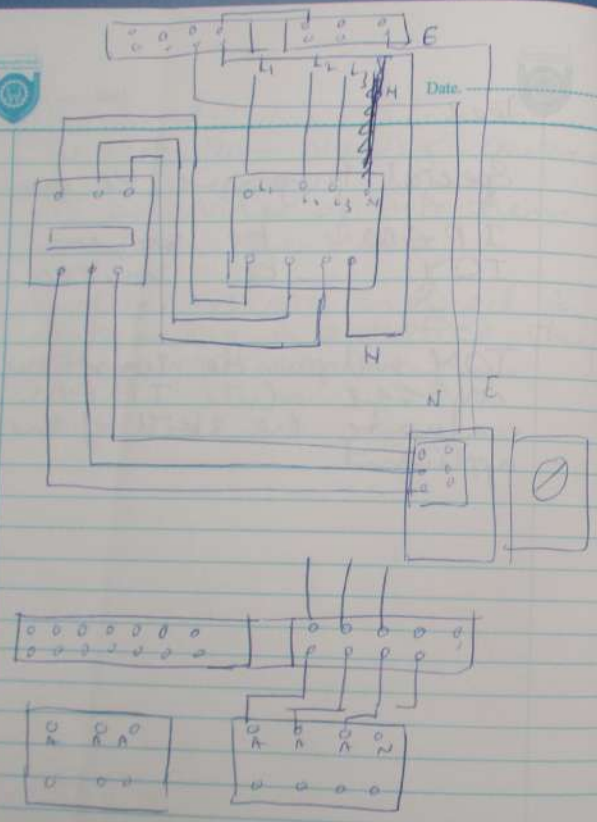
Advance Diploma Ks. 500,000 – 10% to A/c for renovation
Professional Diploma – Ks. 600,000
Ks 100,000 out of Ks. 600,000 to our A/c for renovation

CD0044 ✓
EL0020
EL0008 ✓
EL0009 –
EL0010 –
EL0019
CL0021 ✓

Date.



I P E M
Institution of Engineers
Managing Di
President
Secretary
& Executive
Treasurers
Board of Dir



CD0044+46

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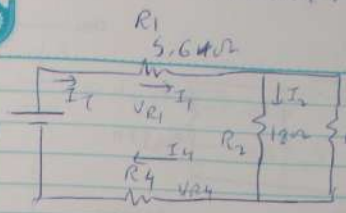


$R_{23} = \frac{12 \times 47}{12+47} = \frac{846}{65} = 13\Omega$

$R_T = R_1 + R_{23} + R_4 = 5.6 + 13 + 100 = 118.6\Omega$

$I_T = \frac{V}{R_L} = \frac{3}{118.6} = 0.028$ Amp

$I_T = 0.028$ Amp, $I_1 = 0.028$ Amp, $I_4 = 0.028$ Amp

$V_{R_1} = I_1 R_1 = 0.028 \times 5.6 = 0.157V$

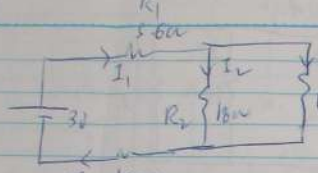
$V_{R_4} = I_4 R_4 = 0.028 \times 100 = 2.8V$

$V_{R_2//R_3} = V_T - (V_{R_1} + V_{R_4}) = 3 - (0.157 + 2.8)$

$= 3 - 2.957 = 0.043V$

$I_2 = \frac{V_{R23}}{R_2} = \frac{0.043}{12} = 0.0038$ Amp

$I_3 = \frac{V_{R23}}{R_3} = \frac{0.043}{47} = 0.00914$ Amp



$$R_{23} = \frac{18 \times 47}{18+47} = \frac{846}{65} = 13.01\Omega$$

$$R_T = R_1 + R_{23} + R_4 = 5.6 + 13.01 + 100$$
$$= 118.6\Omega$$

$$I_T = I_1 = I_4 = \frac{3}{118.6} = 0.0252\ A$$

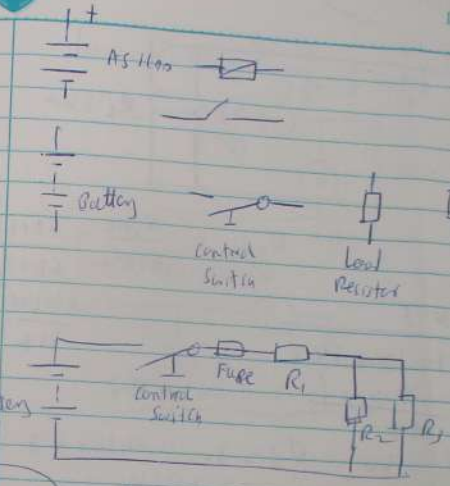
$I_2 = 0.252 \times \frac{47}{65}$

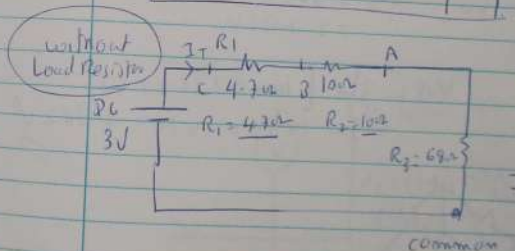
$$V_{R_1} = I_1 R_1 = 0.0252 \times 5.6 = 0.1416\ V$$
$$V_{R_4} = I_4 R_4 = 0.0252 \times 100 = 2.52\ V$$

$$V_{R_{23}} = V_T - (V_{R_1} + V_{R_4})$$
$$= 3 - (0.1416 + 2.52) = 3 - (2.66)$$
$$= 0.3384\ V$$

$$I_2 = \frac{V_{R_{23}}}{R_2} = \frac{0.3384}{18} = 0.0188\ A$$

$$I_3 = \frac{V_{R_{23}}}{R_3} = \frac{0.3384}{47} = 0.0072\ A$$





$$R_T = 4.7 + 10 + 68$$
$$= 82.7\Omega$$

$$I_T = \frac{V}{R_T} = \frac{3}{82.7}$$
$$= 0.0362\ Amp$$

Voltage at C = 3V

voltage at B = $3V - I_T [I_T \times R_1] = 3 - 0.0362 \times 4.7$
$= 2.8298\ V$

Voltage at A = $3 - I_T [R_1 + R_2] = 3 - 0.0362 [10 + 4.7]$
$= 3 - 0.0362 \times 14.7$
$= 2.467\ V$

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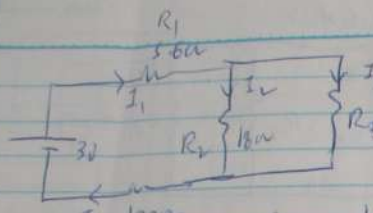


$R_{23} = \frac{18 \times 47}{18+47} = \frac{846}{65} = 13.01\Omega$

$R_T = R_1 + R_{23} + R_4 = 5.6 + 13.01 + 100$
$= 118.6\Omega$

$I_T = I_1 = I_4 = \frac{3}{118.6} = 0.0252$ Amp

$V_{R_1} = I_1 R_1 = 0.0252 \times 5.6 = 0.1416$ Amp V

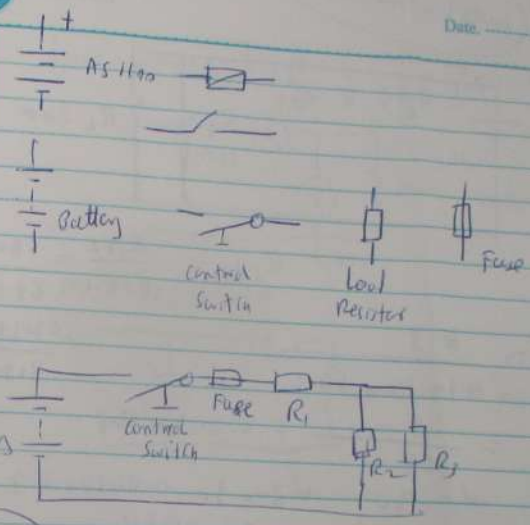
$V_{R_4} = I_4 R_4 = 0.0252 \times 100 = 2.52$ V

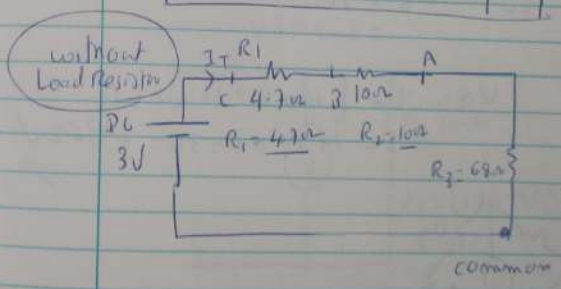
$V_{R_{23}} = V_t - (V_{R_1} + V_{R_4})$
$= 3 - (0.1416 + 2.52) = 3 - (2.66)$
$= 0.3384$ V

$I_2 = \frac{V_{R_{23}}}{R_2} = \frac{0.3384}{18} = 0.0188$ A

$I_3 = \frac{V_{R_{23}}}{R_3} = \frac{0.3384}{47} = 0.0072$ A

Date.





$R_T = 4.7 + 10 + 68$
$= 82.7\Omega$

$I_T = \frac{V}{R_T} = \frac{3}{82.7}$
$= 0.0362$ Amp

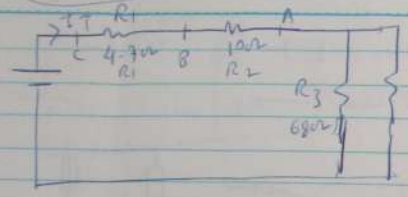
Voltage at C = 3V

voltage at B = $3V - I_T [I_T \times R_1] = 3 - 0.0362 \times 4.7$
$= 2.8298$ V

Voltage at A = $3 - I_T [R_1 + R_2] = 3 - 0.0362 [10 + 4.7]$
$= 3 - .0362 \times 14.7$
$= 2.467$ V

With load resistor

Date



$R_3 \| R_L = \frac{R_3 R_L}{R_3 + R_L} = \frac{68 \times 270}{68 + 270}$

$= \frac{68 \times 270}{338} = 54.3\Omega$

$I_T = \frac{3}{4.7 + 10 + 54.3}$

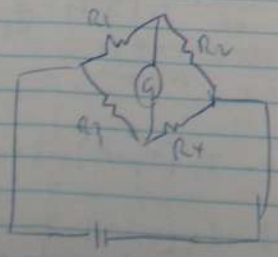
$= \frac{3}{69} = 0.0434$ A

$V_C = 3V$, $V_B = 3 - 0.0434 \times 4.7$

$= 2.796V$

$V_A = 3 - [10 + 4.7] \times 0.0434$

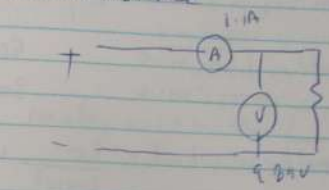
$= 3 - 14.7 \times 0.0434 = 2.362V$



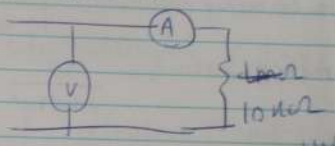
supply

$\frac{10.5 \times 1050}{1105}$ =

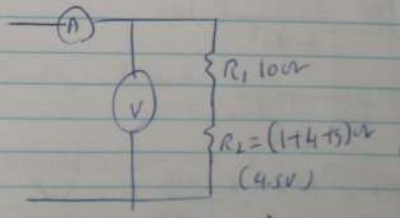
Low resistance



High Resistance



Above 1kΩ

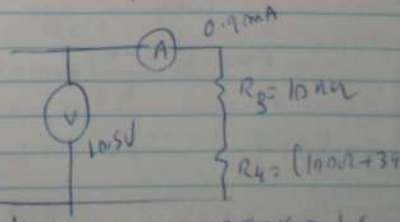


I = 4.5A

Analog volt (9V)

Analog volt 9V

Digital: 9.42V



Analog V = 10.5

Digital = 10V

Digital V = 10.13V

$\frac{1050}{1000 + 1050} \times 10.5 = 0.99V = 1V$

Date:

Sensitivity value of

Digital multimeter = 30 kΩ | 20V fsd

Analog multimeter = 1.005 MΩ 50V fsd

Analog meter = 0.055 MΩ 30V fsd

Digital multimeter sensitivity = $\frac{20}{30\times10^3}$ V/Ω

Analog multimeter sensitivity = $\frac{50}{1.005\times10^6}$ V/Ω

Analog meter sensitivity = $\frac{30}{0.055\times10^6}$ V/Ω

R_2 measured 4.5V

Sensitivity = $\frac{20}{30\times10^3}\times 10$

$I = \frac{10V}{20k\Omega} =$

$V_{R2} = 10k\Omega \times \frac{10V}{20k\Omega} = 5V$

Error = $\frac{5-4.5}{5}\times100 = \frac{0.5\times100}{5} = 10\%$

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$\frac{10.5}{10,000+1050}$ ~~A × (100 = 340 ...)~~ $= \frac{10.5}{11050}\times1050 = 0.997V$

$\frac{1-0.995}{1}\times100 = 0.5\%$

(1) Analog voltmeter = $\left(\frac{9}{10+10}\ \text{Amp}\right)\times10 = 4.5$

Analog multimeter = $\left(\frac{9}{10+10}\ \text{Amp}\right)\times10 = 4.5V$

Digital multimeter = $\left(\frac{9.43}{10+10}A\right)\times10 = 4.71V$

(2) Analog voltmeter = $\left(\frac{10.5}{10000+1050}\ A\right)\times1050$

$= \frac{10.5\times1050}{11050} = 1V$

Analog multimeter = $\frac{10}{11050}\times1050 = 0.95V$

Digital = $\frac{10.13}{11050}\times1050 = 0.962V$

(4) $C = \frac{A_{eff}\times\varepsilon_0\times\varepsilon_r}{d}$ Farad $\varepsilon_0 = 8.85\times10^{-12}$

$\varepsilon_r = 1$ Air

$C = 0.01\times10^{-6}F$ $A_{eff} = 30\times10^{-3}\times20\times10^{-3}$

$d = 0.08\times10^{-3}$ $\varepsilon_r = 7$

$A_{eff} = Cd/\varepsilon_0\varepsilon_r = \frac{0.01\times10^{-6}\times0.08\times10^{-3}}{8.85\times10^{-12}\times7}$

$A_{eff} = A(N-1)$

N = Total Number of Parallel Plate

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$$A_{eff} = \frac{0.01\times10^{-6}\times0.08\times10^{-3}\times10^{12}}{2.85\times7}$$

$$= \frac{0.01\times0.08\times10^{3}}{2.85\times7} = 0.0129$$

$A_{eff} = A(N-1)$

$0.0129 = 30\times10^{-3}\times20\times10^{-3}(N-1)$

$0.0129 = 600\times10^{-6}(N-1)$

$N = \frac{0.0129}{600\times10^{-6}} + 1 = 22+1 = 23$ ✱

(1) C_1 $Q = VC = 1.5\times6.8 = 10.2\,\mu C$

C_2 $= 1.3\times1 = 1.3\,\mu C$

C_3 $0.3\times47 = 14.1\,\mu C$

C_1 $Q = VC = 3.08\times6.8 = 20.94\,\mu C$

C_2 $Q = VC = 3.09\times47 = 145.23\,\mu C$

C_3 $Q = VC = 3.09\times1 = 3.09\,\mu C$

$\tau = RC = 2.3 = R\times47\times10^{-6}$

$R = \frac{2.3\times10^{6}}{47}$

$\tau = RC \rightarrow 202 = R\times47\times10^{-6}$

$R = \frac{202\times10^{6}}{47}$

Date.

Table 2 ~~A~~ current down curve

at 237 sec, 63% of supply voltage current 2.97A

$\therefore R = \frac{V}{I} = \frac{1.9}{2.97\,\mu A} = \frac{1.9}{2.97\times10^{-6}}$

$= 0.639\,m\Omega$

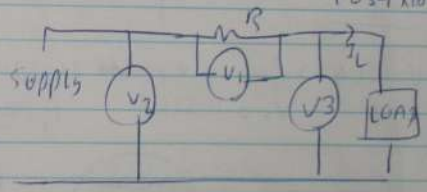
At voltage built up curve

at 337 sec 63% of supply voltage increased

Current value is $1.034\,\mu A$

$\therefore R = \frac{V}{I} = \frac{1.91}{1.034\times10^{-6}} = 1.83\,m\Omega$

EL0020



$P_L = V_3 I_L \cos\theta$

$V_1 = I_L \times R$

$V_2 = \sqrt{V_1^2 + V_3^2 + 2V_1V_3\cos\theta}$

$V_2 = \sqrt{V_1^2 + V_3^2 + 2(I_LR)V_3\cos\theta}$

$V_2^2 = V_1^2 + V_3^2 + 2R P_L$

$\therefore P_L = \frac{V_2^2 - V_1^2 - V_3^2}{2R}$

3Φ power

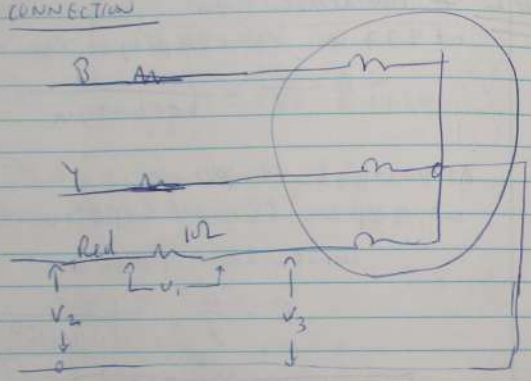
$3P_L$ (Real + Apparent)

$\sqrt{3}E_LI_L$

$P_f = \frac{\text{Real}}{\text{Apparent}}$

Date.

CONNECTION



P_1

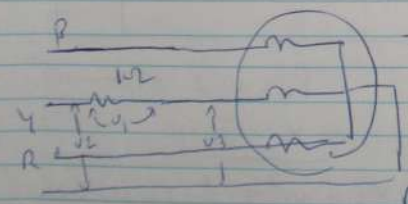
$V_2 = 24.55V$ $V_3 = 24.37V$

$V_1 = 0.335V$

$P_1 = \frac{24.55^2 - 0.335^2 - 24.37^2}{2 \times 1}$

$= 4.34W$

P_2



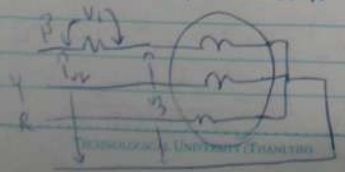
$V_2 = 24.3V$ $V_3 = 24.12V$

$V_1 = 0.304V$

$P_2 = \frac{24.3^2 - 0.304^2 - 24.12^2}{2 \times 1}$

$= 2.86W$

P_3



$V_2 = 24.4V$

$V_3 = 24.32V$

$V_1 = 0.322V$

$P_3 = \frac{24.4^2 - 0.322^2 - 24.32^2}{2 \times 1} = 1.79W$

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Date.

Total Power = $P_1 + P_2 + P_3 = 4.34 + 2.86 + 1.79$

$= 6.645W$

$I_1 = \frac{0.335}{1\Omega} = 0.335A$

$I_3 = \frac{0.322}{1\Omega} = 0.322A$

$I_2 = \frac{0.304}{1\Omega} = 0.304$

$I_L \text{ avg} = \frac{0.335 + 0.322 + 0.304}{3} = 0.322A$

$\sqrt{3} E_L I_L \cos\phi = 3\phi \text{ Power}$

$1.7321 \times 42.5 \cos\phi = 6.645$

$\cos\phi = pf = \frac{6.645}{1.7321 \times 42.5 \times 0.322} = 0.28$ Lagging

$\frac{42.3}{\sqrt{3}} \times 0.335$

$+ \frac{42.3}{\sqrt{3}} \times 0.304$

$+ \frac{42.3}{\sqrt{3}} \times 0.322$

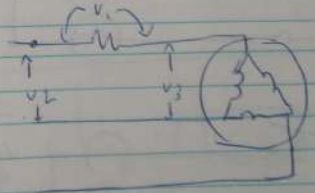
$VA = 23.92 VA$

$PT = 4.34 + 2.86 + 1.79$

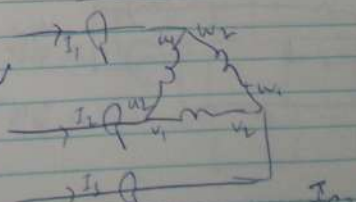
$= 6.645$

$pf = \frac{6.645}{23.92}$

$= 0.28$



meter pf corrected



42V - Y-B

42V R-Y

42.3V B-R

$I_R = 1.83A$ | $I_R = 0.8$

$I_Y = 1.09A$

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Apparent power $= \sqrt{3} E_L I_L = 1.732 \times 42.3 \times 0.8 \times$
$= 58.6$

True $= 16.37$

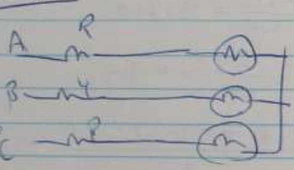
$PF = \frac{16.37}{58.6} = 0.28$

$\left(\frac{42.3}{\sqrt{3}} \times \frac{42.3}{\sqrt{3}} + \frac{42}{\sqrt{3}}\right) 0.8$

Power $= \sqrt{3} E_L I_L \cos\phi$
$= 1.732 \times 42.3 \times 0.8 \times 0.28$
$= 16.4 W$

Normal

Δ / λ



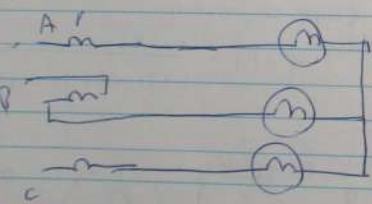
VA RATIO $= \frac{58.6}{23.4D}$
$= 2.44$

VAN (R-N) = 24V   VAB (R-Y) 41.3
VBN (Y-N) 23.67V   VBC (Y-B) 41.4
VCN (B-N) 24.35   VCA (B-R) 41.7

$Z = \frac{0.8}{0.322}$
$= 2.48$

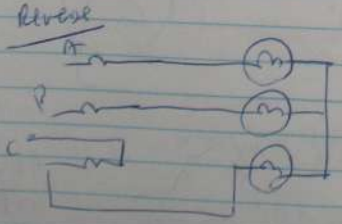
$PF = \frac{16.37}{6.645}$
$= 2.46$

Reverse



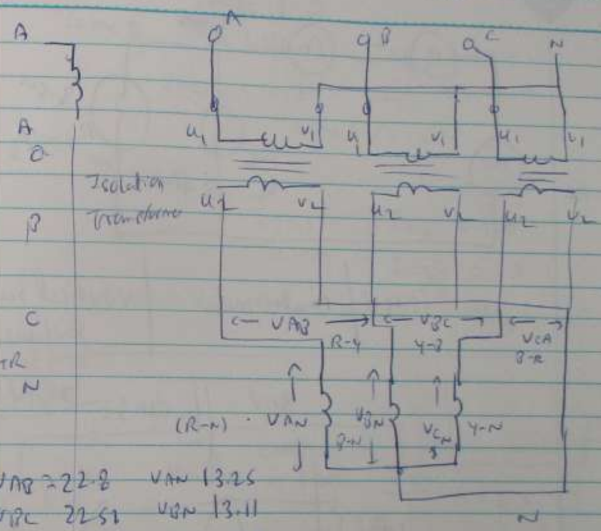
VAN (R-N) =   VAB (R-Y) =
VBN (Y-N) =   VBC (Y-B) =
VCN (B-N) =   VCA (B-R) =

Reverse



VAN (R-N) =   VAB
VBN (Y-N) =
VCN (B-N) =

NORMAL   42/24V

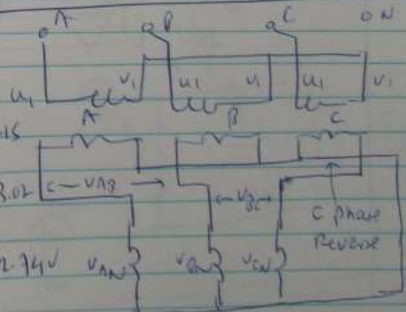


WITH STEP DOWN ISOLATION TR

$V_L = 24V$

PK = 13.25 V   VAB = 22.8   VAN 13.25
VBC 22.57   VBN 13.11
VCA 22.58   VCN 12.9

REVERSE

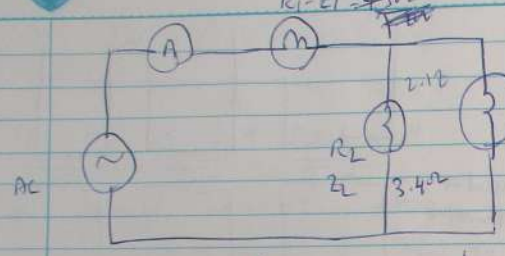


$V_L = 24V$	VAB 22.93 (23V)	VAN 13.15
	VBC 13.16	VBN 13.02
	VCA 13.2	VCN 12.74V

CONCLUSION | If supply polarity reverse | it can affect on line voltage

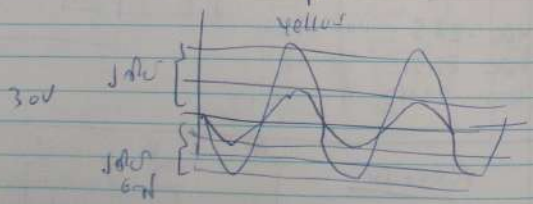
9.134V

Date.



34V | main menu | vertical Scale 5ov/div

30V || CH1 = Digital U: ~~30V~~ 30.4V



CH1 = 50.032 Hz
M = 10.0 ms

24V

$\frac{12}{5v} \times 360 = 864$

3.1

Date.

Table 1 DC

$I_T = 1.25A$ $I_{R_3} = 0.5A$

$I_{R_1} = 1.25A$ $I_{R_2} = 0.6A$

$V = 24V = 12V$

Table 2 DC

$V_T = 12V$

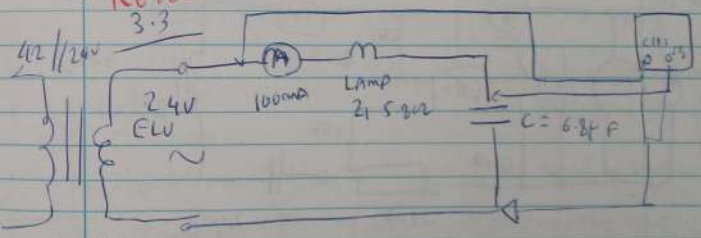
$I_T = 1A$ | $I_{R_2} = 0.5A$

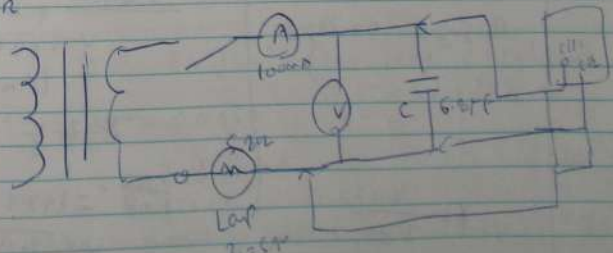
$I_{R_1} = 1A$ | $I_{R_3} = 0.6A$

V_{R_1} 6V V_{R_2} 3V V_{R_3} = 3V

RETEST

3.3





$f \rightarrow 100Hz$ $X_C = \frac{1}{2\pi fC} = \frac{1}{2\times3.1416\times100 \times 6.8\times10^{-6}}$

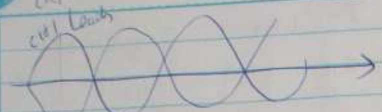
Date.

$= 234\Omega$

5ms2

capacitor V

CH1 Leads



CH2 Lag

Resistor V

$CH_1 = 10V/div$

$CH_2 = 10V/div$

5ms

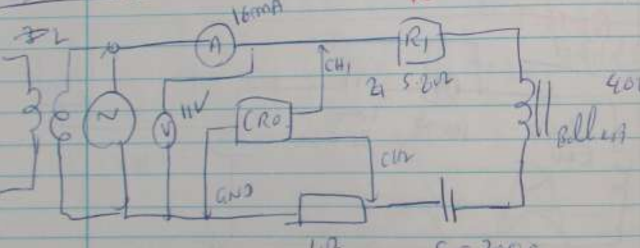
$X_C = \frac{1}{2\pi fC} = \frac{10^6}{2\times3.14\times6.8\times50}$

$V = 12V$

$X = Z = \frac{V}{I} = \frac{12}{34\times10^{-3}} = 352\Omega$ $I = 34mA$

S.2

~~S.2~~ RLC series AC circuit RETEST



Table

R=5.8Ω C=20pF

Vc=

Inductor 9Ω-R

V=5.49V

I=16mA

~~X~~ $Z = \frac{V}{I}$ $X = \sqrt{Z^2 - R^2}$

$Z = \frac{5.49}{16\times10^{-3}} = 343\Omega$

$X = \sqrt{343^2 - 9^2}$

$= 342.88\Omega$

$L = \frac{342.88}{2\pi\times50} = 1.09H$

$X_C = \frac{1}{2\pi fC_1} = \frac{1}{2\times3.1416\times50\times20\times10^{-6}} = 159\Omega$

$V_{dc} = \frac{V_c L Z}{1000}$ = Table 4

$= \frac{2.55\times75\times60}{1000} = 11.475V$

Table (2)

$X_L =$ $V = 5.46V$ $Z = \frac{V}{I}$ $X = \sqrt{Z^2 - R^2}$

$R = 9\Omega$ $I = 16mA$

$X_C =$ $V = 10.85V$ ~~Z=~~ $X_C = \frac{V}{I}$ $X_C = \frac{1}{2\pi fC}$

$f = 50.2Hz$ $I = 16mA$ $C = \frac{}{X_C}$

$\phi_L =$

Circuit $Z = \frac{12V}{16mA}$ $\phi =$

Table Supply V = 14V

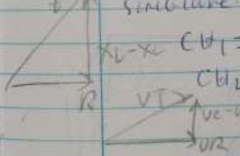
I = 16m

measured

$V_R = 0.32V$ 5.8Ω

$V_C = 10.92V$ (capacitor)

$V_L = 5.51V$ (Inductor)



Sine curve

$CH_1 = 5V/div$ — Total supply voltage curve

$CH_2 = 200mV/div$ — Resistor voltage curve

$V = 12V$ $Z = \sqrt{5.8^2 + (343 - 159)^2} = \sqrt{5.8^2 + 184^2}$

$= 184\Omega$

$I = \frac{12}{184} = 0.065A$

$= 65.2mA$

$\phi = \tan^{-1}\frac{184}{5.8}$

$= 88.19$

Table 34

$X_{90} = 9\Omega$

$16mm^2 \rightarrow 1.47\Omega/km \rightarrow 1.47x$

$V_R = 0.0652\times8.5 = 0.554V$

$V_C = $ ~~0.051~~ $0.0652\times159 = 10.3V$

$V_L = 0.0652\times343 = 22.36V$

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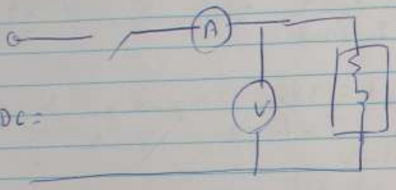
Date.

3.2

~~Ballo~~ Ballast for
32(40)W
1200x26 (32)mm)
0.43A



DC =

EL 36/40
240V 50Hz
$\cos\phi = 0.45$

DC = 12.3V Supply

Pro-zure 3μF

A = ~~33~~ 0.33A $R = \frac{12.3}{0.33} = 37.2\Omega$ pf 0.9 use 3.7μF

V = 12V

AC: V = 24V Supply = 24.6V $Z = \frac{24.6}{0.062} = 396$ $L = \frac{394}{2\pi f} = 1.25H$

I = 62mA $X = \sqrt{396^2 - 37.2^2} = 394\Omega$

6.2

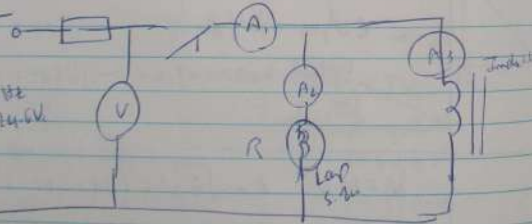
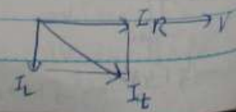


Table 2 A1 = 1.5A ~~A2~~ A2 = ~~1.25A~~ 1.42 Resistor

24V ~~A1~~ A3 = Ind 50mA



$Z_t = \frac{1}{\frac{1}{5.8} + \frac{1}{j420} + \frac{1}{j159.23}}$

$= \frac{1}{0.172 ... 02 \times 10^{-3} + 6.28}$

$= 5.01\,\Omega$

$Z_L = \frac{24}{50 \times 10^{-3}} = 480\Omega$ $X_L = \sqrt{480^2 - 9^2} = 479.9\Omega$

Date. $\phi = \tan^{-1}\frac{479.9}{9} = 88.92$

$X_C = \frac{24}{30 \times 10^{-6}}$ → $X_C = \frac{1}{2 \times 3.1416 \times 50 \times 20 \times 10^{-6}} = 159.23\Omega$

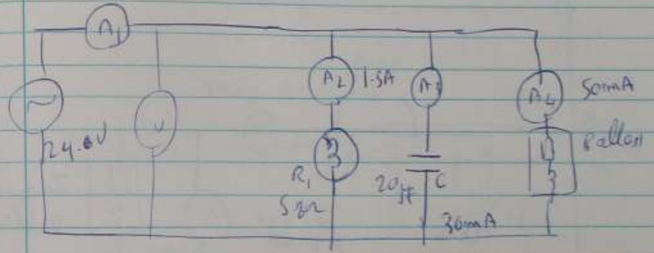
6.5

RETEST

R = 5.8Ω C = 20μF

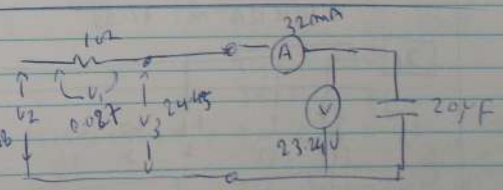
Ballast 9Ω R V 5.49V I = 16mA

$Z = \frac{V}{I}$ → $X = \sqrt{Z^2 - R^2}$



A1 = 1.58A

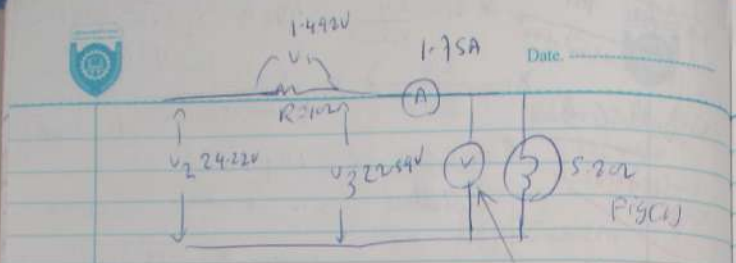
7.3

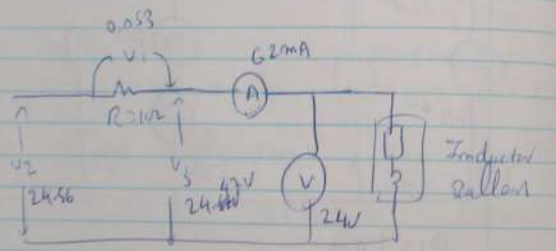


Fig(2)

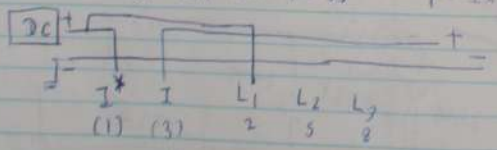
$\frac{1}{Z} = \frac{1}{R} + \frac{1}{jX_C} + \frac{1}{jX_L}$

= 5.~~Ω~~

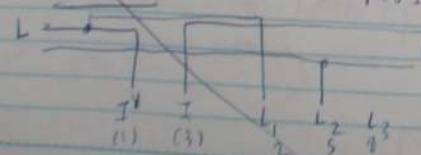




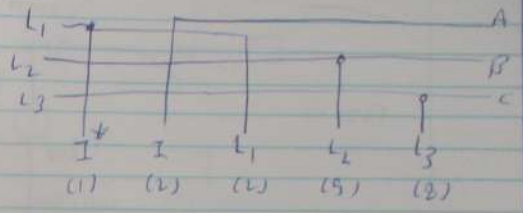
ISKRA MI 7033 P = I x V



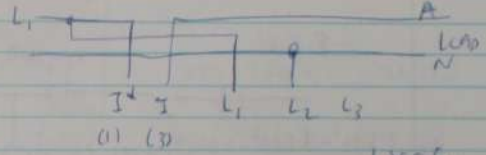
AC 1φ P = V I cosφ



3φ AC P = √3 V I cosφ



AC 1φ



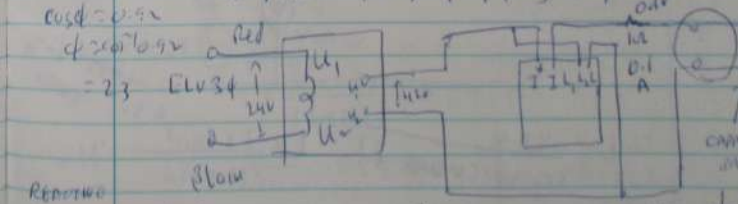
MI 7033 | V = 50, A = 1, cosφ

cosφ = 0.04

16μF → 0.55
32μF → 0.5
30μF → 0.5

16 + 32 + 30 + 10 → 92μF → 0.92 capacitor

cosφ = 0.92
φ = cos⁻¹ 0.92
= 23



Reactive Power VI sinφ
= 24 × 01 tan 23 = 1.66VAR

$P_T = (60\times10^{-3})^2 \times 5.8 + \frac{(24.16^2 - 24^2 - 1.5^2)}{2\times 5.8}$

$= 0.02 + 0.47 = 0.49\,W$

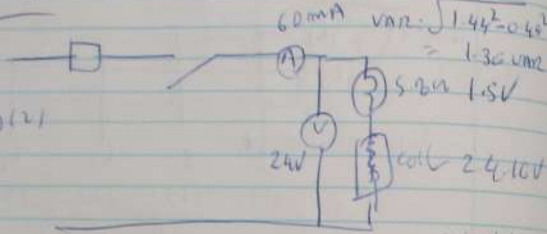
Date. ----------

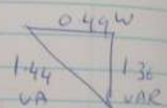
2-5-2

$VA = 24.16 \times 60\times10^{-3} = 1.44\,VA$

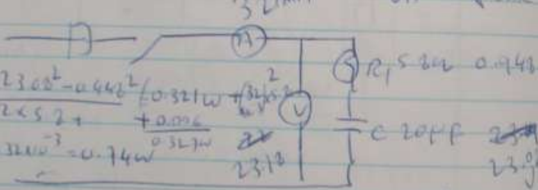
$VAR = \sqrt{1.44^2 - 0.49^2} = 1.36\,VAR$

Fig(2)





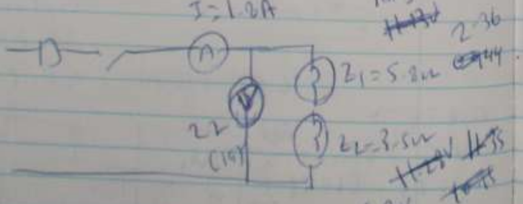
Fig(3)



$P = \frac{23.18^2 - 23.08^2 - 0.448^2}{2\times 5.8} + (32\times10^{-3})^2 \times 5.8 = 0.321\,W + 0.006 = 0.327\,W$

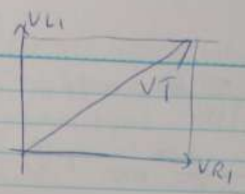
$P = VI = 23.18 \times 32\times10^{-3} = 0.74\,W$

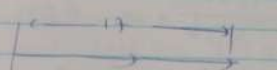
Fig 3

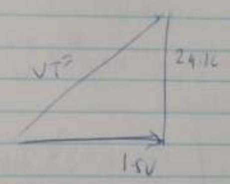


$L = \frac{22.5}{2\times3.1416\times50\times60\times10^{-3}}$; $L = \frac{22.5\times10^{-3}}{2\times3.14\times50} = 71.6\,H$

Date. ----------







$V_T = \sqrt{24.16^2 + 1.5^2} = 24.17\,V$

Risk

overvoltage supply	2	m	use only 42/240 supply
CRO ground and ckt ground conflict	m	3	use Isolation TR
overvoltage damaging ckt component	m	2	check voltage and power rating of ckt ~~different ... supply~~ print ones
electrolytic capacitor can be damaged by wrong polarity	m	2	check capacitor

$R_T = 5.8 + \frac{3.4\times3.5}{3.4+3.5} = 5.8 + 1.72 = 7.52$

$I_T = \frac{12}{7.52} = 1.59\,A$

$V_{R_1} = 1.59\times5.8 = 9.256\,V$

$V_{R_2} = 12 - 9.256 = 2.74$

$V_{R_3} = 2.74$

$I_{R_2} = \frac{2.74}{3.4} = 0.8$

$I_{R_3} = 2.74/3.5 = 0.78$

Date.

$I_T = \frac{1.59 + 1.23}{1.55} \times 100 = 27.4A$

$I_{R2} = \frac{0.8 - 0.82}{0.8} \times 100 = 2.5\%$

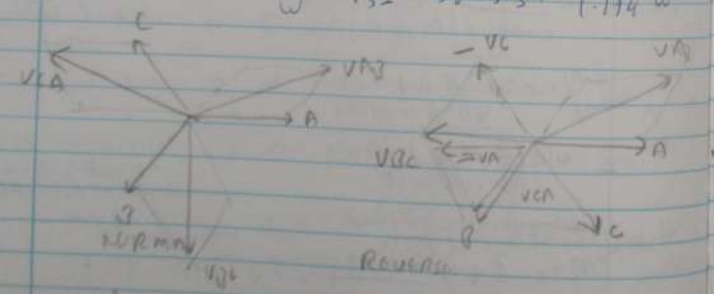
$I_{R3} = \frac{0.78 - 0.73}{0.78} \times 100 = 6.4\%$

V_{RT} $V_{R1} = \frac{9.255 - 9.234}{9.255} \times 100 = 0.227$

$V_{R2} = \frac{2.74 - 2.74}{2.74} \times 100 = 0\%$

$5.8 \times 123^2 = P_1$ | $P_2 = 0.62^2 \times 3.4 = 1.305_W$

$0.877 = 8.77$ W $P_3 = 0.58^2 \times 3.5 = 1.174$ W

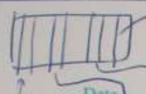


Date.

Ca Electric motor Education
CME (Aust) Pty Ltd
Serial no 1904 - 3548
model 71-3-L004
415 VAC 44watt 1.6A 1360 RPM
3ϕ 50Hz
Insulation class F connection External Y/Δ
Italy made Type Asm 712 BM
IEC 60034 Smot no 1494 4202
Insul Cl (F) IP56 S1 TCTC 1 Amb 40C

Hz	kW	V	A	min	cosϕ
50	0.37	Δ 115	4.4	1370	0.67
		Y 200	2.5		

Colour	Significant figure	multiply	Tolerance %
BLACK	0	x1	
BROWN	1	x10	1 (F)
RED	2	x100	2 (G)
ORANGE	3	x1K	
YELLOW	4	x10K	
GREEN	5	x 100K	0.5 (D)
BLUE	6	x1M	0.25 (C)
VIOLET	7	x10M	0.1 (B)
GREY	8	x 100M	0.05 (A)
WHITE	9	x1G (10^9)	0.05 (A)
GOLD		x0.1	5
Silver		x0.01	



	1st	Black	Blue	
R1	Brown ×10 1×10	0×1	×1M	10×1m = 10m
R2	Brown 1×10	Black 0×1	Brown 1×10	10×10 = 100 (100Ω)
R3	Red 2	Red 2	orange ×1(1000)	22×1000 = 22k
R4	Brown 1	Black 0	orange ×1(1000)	10×1000 = 10k
R5	Yellow 4	Blue 6	Red 100	46×100 = 4.6k
R6	Brown 1	Black 0	Yellow ×10k	10×10k = 100k
R7	RED 2	RED 2	Gold ×0.1	22×0.1 = 2.2Ω
R8	RED 2	RED 2	Brown ×10	22×10 = 220Ω
R9	orange 3	orange 3	Brown ×10	33×10 = 330Ω
R10	Green 5	Blue 6	Brown 10	56×10 = 560Ω
R11	Blue 6	Grey 8	Brown 10	68×10 = 680Ω
R12	Brown 1	Black 0	Black ×1	10×1 = 10Ω

Resistor	Resistance	calculated Tolerance	Resistance Range Ω	measured Resistance Ω	within Tolerance
R1	10MΩ	10M×±5% ±0.5M	10.5M 9.5M	12.5Ω	NO
R2	100Ω	±5% ±5Ω	105Ω 95Ω	99.2	Yes
R3	22kΩ	±5% ±1.1k	23.1k 20.9k	21.6K	Yes
R4	10K	±5% ±0.5k	10.5k 9.5k	9.8k	Yes
R5	4.6K	±5% ±0.23Ω	4.83Ω	4.66k	Yes

Date

Resistor	Resistance	calculated Tolerance	Resistance Range	measured Resistance	within Tolerance
R6	100kΩ	±5% ±5kΩ	105kΩ 95kΩ	99.5 kΩ	Yes
R7	2.2Ω	±5% ±0.11Ω	2.31Ω 2.09Ω	2.3Ω	Yes
R8	220Ω	±5% ±11Ω	231Ω 209Ω	216Ω	Yes
R9	330Ω	±5% ±16.5Ω	346.5Ω 313.5Ω	332 Ω	Yes
R10	560Ω	±5% ±28Ω	588Ω 532Ω	557	Yes
R11	680Ω	±5% ±34Ω	714Ω 646Ω	674	Yes
R12	10Ω	±5% ±0.5Ω	10.5Ω 9.5Ω	10.2	Yes

7.3 NTC

https://www.thinksrs.com/downloads/programs/therm calc

NTC ntccalibrator/ntccalculator.htm

Table 7.3 model calculator

	Room Temp	Temp setting 1	Temp setting 2
	25°C	36°C	50°C
NTC	10kΩ	0.64 kΩ	3.54kΩ
PTC	109.73 Ω	113.6 Ω	119.34 Ω

https://www.[illegible].com/ntc-thermistor-calculator/

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PTC

https://us.flukecal.com/pt100-calculator

Date

LDR Resistance measurement

https://dcaclab.com/experiments/53771-ldr-simulation

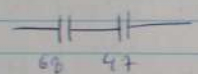
light	dark
10Ω	1000Ω
1.5V	4.5V
15mA	4.5mA

$5.6 = \frac{6.8 \times C}{6.8 + C} \rightarrow 38.08 + 5.6C = 6.8C$

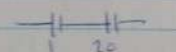
$(6.8 - 5.6)C = 38.08$

$C = \frac{38.08}{1.2} = 31.7\,pF$

To achieve 5.6pF ?

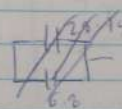


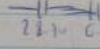
$\frac{68 \times 47}{68 + 47} = \frac{3196}{115} = 27.79\,pF$



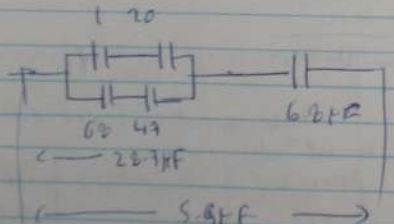
$\frac{1 \times 20}{1 + 20} = \rightarrow 0.95\,pF$

28.74pF



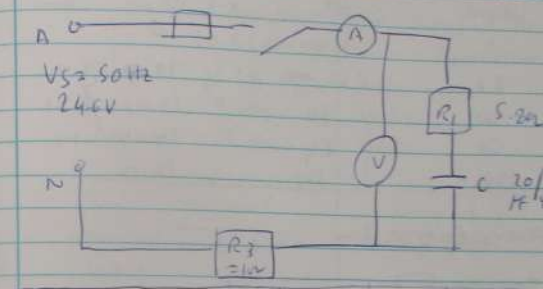


$\frac{195.4}{35.54} = 5.5\,pF$



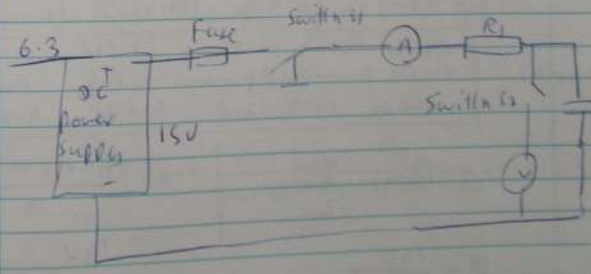
Date

2.3.2 Fig(3)



C	Current	VT	VR	VC	ϕ
20μF	32mA	23.13V	0.95	23.02	87c
5.5nF	46mA	24.6V	0.105	24.41	89.6
5.6 pF					

6.3



VSupply = 15V

Voltmeter disconnect, Close capacitor ___ discharge capacitor

Voltmeter Connected Charge capacitor

Date.

Time (second)	Current (μA)	Voltage (volt)
0	26	0
20	66	13.97
40	76	13.97
60	64	14.04
120	54	14.12

Averse Charging Line

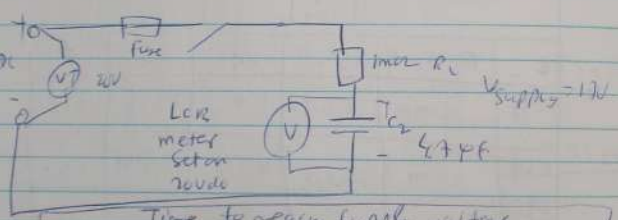


Table 6.2 — Time to reach supply voltage

Trial 1	Trial 2	Trial 3	Average
12-14 sec	12-14 sec	12-14 sec	12-14

Table 6.3 — 63.7% of supply voltage = 12.6V

Trial 1	Trial 2	Trial 3	Average
4-6 sec	4-6 sec	4-6 sec	4-6 sec

$$R_{avg} = \frac{V_{avg}}{I_{avg}}$$

$$V_{avg} = \frac{13.97 + 13.97 + 14.04 + 14.12}{4}$$

$$= 14V$$

$$R = \frac{14V}{65 \times 10^{-6}}$$

$$I_{avg} = \frac{66 + 76 + 64 + 54}{4}$$

$$= 215384 = 215.38$$

$$= 65 \mu A$$

Date

NTC	PTC
→ Original Resistance 10.35 kΩ	← Original Resistance 0.429 kΩ
Heat 1 10.28	Heat 1
Heat 2 7.67Ω	Heat 2
Heat 3 3.99	Heat 3

	original 10.72kΩ	original 0.403kΩ
original		
Heat 1		422
Heat 2		405
Heat 3		

AS 3000 Insulation Resistance Test 8.3.6.2

The integrity of insulation is stressed by applying a dc current at 500V for low voltage circuits

S32V
S35V

$$R = \frac{\rho L}{A}$$

$$R_t = R_0 + \alpha \quad R_2 = R_1(1 + \alpha \Delta L)$$

$$\frac{1}{R_t} = \frac{1}{R_{12}} + \frac{1}{R_{34}} + \frac{1}{R_5}$$

$$R_t = \frac{R_{12} \times R_{34} R_5}{R_{12}R_{34} + R_{34}R_5 + R_{12}R_5}$$