

2017196

by Jack Rogers

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Name: Jack Rogers
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1. Executive Summary

No executive summary included

this is a work plan not a summary

In this assignment there will be a risk assessment completed on the system and experiments that will be carried out. There will be research done on three-phase AC supply to a factory and what voltage is most suitable for an application of induction motors. Also, there will be research done on the different methods of induction machine speed control and describing its applications.

During this assignment there will also be two experiments taken place as one will include testing on a single-phase transformer such as open and short circuit tests. The other will contain tests such as no-load, stator resistance, and blocked rotor on a three-phase induction motor. An analysis will then be carried out on each test and a table of results will be made followed by a written conclusion.

2. Work plan for Life-long Learning

Table 1 - Risk Assessment

A good risk assessment but this belongs in the appendix

What Hazards are present?	Who could this affect?	What actions are in place to help prevent the hazard?	Who maintains these actions?	Level of Risk
Electric Shock	Engineers or other maintenance people working on the system.	There are isolated machines and cables and earthing.	Coleg Sir Gar	High/ Low Probability
Slips and Trips	Engineers or other maintenance people working on the system.	A clear workspace and an isolated location to stop other people going near the system.	Coleg Sir Gar	Medium/ Low Probability
Emergency Injuries	Engineers or other maintenance people working on the system.	There is emergency stop buttons in place around the system.	Coleg Sir Gar	High/ Low Probability
Small objects going in your eyes.	Engineers or other maintenance people working on the system.	Safety goggles and PPE should be worn.	Coleg Sir Gar	High/ Low Probability

3. Research

With an induction motor the change of speed is relatively small as it is almost a constant speed motor. By reducing the speed in an induction motor this would then cause a poor power factor and a loss of efficiency. There are many ways and methods that are used in order to control the speed of an induction motor.

Changing The Applied Voltage – Phase angle Control

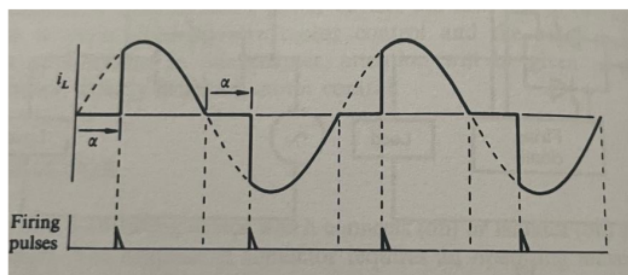
One method of speed control while using power electronic converters is a Phase angle control. This is a thyristor firing technique, which means that the conduction angle of an AC signal (in turn controls the AC voltage as an average across the load) is manipulated and controlled. An example of this is a soft starter. This is a type of voltage starter that can be used for an AC Induction Motor. This will contain solid state devices that will control the flow of current while also control the voltage that is given to the motor. (LTD, 2023) (Ltd, 2010)

LTD = limited company, there is something wrong with the way your are entering your sources

The Torque equation of an induction motor is shown below:

$$T = \frac{k_1 s E^2 R_2}{\sqrt{(R^2 + (sX_2)^2)}} = \frac{3}{2\pi N_s} \frac{s E^2 R_2}{\sqrt{(R^2 + (sX_2)^2)}}$$

This is good, but a better one would include the stator voltage instead of the rotor open circuit emf E.
Torque (T) is proportional to Voltage squared (V^2) therefore by decreasing the voltage then the value of torque would decrease. If the torque load was the same, then the voltage decreases while the slip increases which will then cause the speed to decrease.



(Lander, n.d.)

Figure 1 - Phase Angle Control Diagram

Above is an example of a diagram that shows the phase angle control by changing the applied voltage firing angle.

Changing The applied Frequency – Cycloconverter

The equation for synchronous speed of the rotating magnetic field of an induction motor is shown below:

$$N_s = \frac{120 f}{P} \quad (\text{RPM})$$

P is the number of stator poles that is used, while f is the frequency of the supply that is given.

By looking at the equation it is clear to see that by manipulating the value of 'f', then the synchronous speed will also vary. This method is not a very commonly used way to control then speed as it is usually used for an induction motor that is supplied by an allocated generator.

This makes it easier to vary the speed of the prime mover as the frequency is controlled. It also has its cons as if the frequency is lower the current for the motor might be too high of a demand, this is due to a decrease in reactance. Good explanation given *therefore, the voltage has to be lowered also*

Also, if the frequency is higher than the rated value then this will cause the maximum torque developed to decrease and the speed increases. (electicaleasy, 2014-2021)

You are already describing the cycloconverter, aren't you?

??????

Another method of speed control while using power electronic converters is a Cycloconverter. A cycloconverter is usually made up of two converters with a back-to-back connection.

This is an example of a diagram showing that a full half cycle of the source and its peak period has been received by the load, while the firing delay increases as the load voltage is equal to 0.

(Lander, n.d.)

Correctly cited

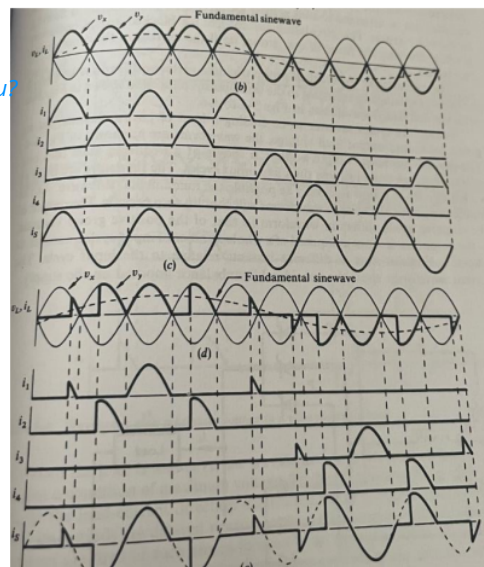


Figure 2 - Cycloconverter diagram

Constant V/F Control Of Induction Motor

Out of the many different types of methods for speed control of an induction motor this is known as the most popular. The air gap flux will tend to saturate if the supply frequency is decreased while maintaining the rated supply voltage, as in the method described above. As a result, the stator flux wave will be distorted, and the stator current will be high. In order to keep the air-gap flux constant, the stator voltage should likewise be decreased proportionally to the frequency.

The ratio of the stator voltage to the frequency determines the stator flux's size. Therefore, the flux stays constant if the voltage to frequency ratio is maintained. Additionally, the produced torque stays roughly constant while V/F is kept constant. (Electric, 2018) [Correctly cited](#)

This method results in greater run-time effectiveness. As a result, the vast majority of AC speed drives use the constant V/F method (also known as the variable voltage, variable frequency method) to manage speed. This technology provides a "soft start" capability in addition to a wide range of speed control. (electicaleasy, 2014-2021)

Quasi Square Inverter

One example of this method of speed control while using power electronic converters is a Quasi Square Inverter. (Lander, n.d.) [Correctly cited](#)

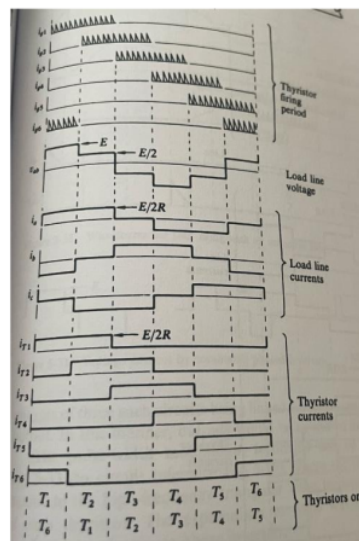
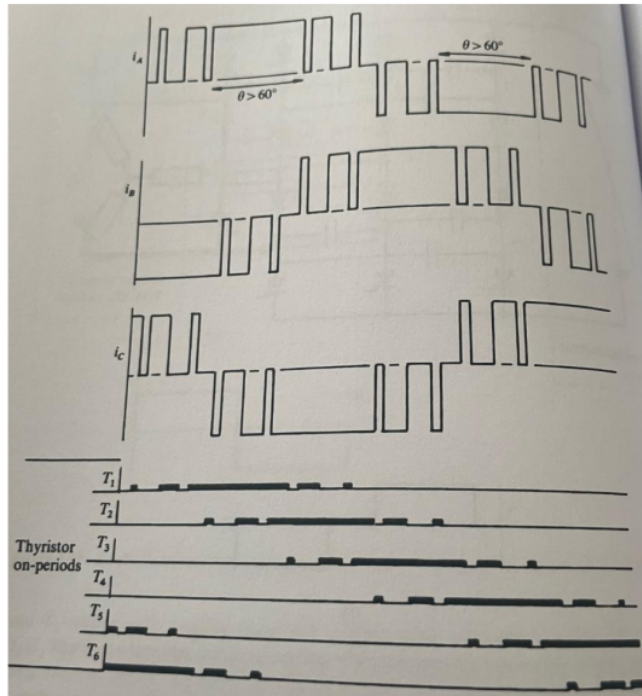


Figure 3 - Quasi Square Diagram

a clear but warped image

PWM Inverter

Also, another example of this method of speed control while using power electronic converters is a PWM inverter. (Lander, n.d.)



a good but warped image

Figure 4 - PWM Inverter Diagram

Three-Phase Transformers

The format of your text doesn't match the brief

In a basic transformer an electric current flowing through a wire produces a magnetic field, an unseen pattern of magnetism, or "magnetic flux," everywhere around it. The magnitude of the electric current is directly connected to the magnetism's strength, also known as "magnetic flux density." Therefore, the magnetic field is stronger the larger the current. Typically, the second wire's current is referred to as the secondary current and the first coil's current as the primary current. When the electrical current then passes through an empty space between the two coils this is then called an electromagnetic induction.

If the second coil in a step-down transformer has half as many turns as the first coil, the secondary voltage will be half as large as the primary voltage. In a step-up transformer the principle is the same as the step-down but in reverse. (Ltd, 2015)

These transformers are used as a power system that supplies factories as they require a high demand due to the number of induction machines that are used. In most factories the electrical equipment that is usually used are air conditioning units, heavy machinery, heating systems, motors and pump, etc. The reason that transformers are a good and useful power system to supply these applications is because they require three-phase power. (Woodford, 2007/2021)

one date please

You could have written about generation, transmission and distribution with switch gear and protection

4. Transformer Investigation

Introduction

Fully justify your text

In this task a series of tests are carried out on a single-phase transformer. During these tests the correct PPE is worn and the safety regulations are followed. The electricity was secured and separated before and after the practical, thus there was no risk or opportunity for an electric shock. The key needed to unlock the isolator was only accessible to knowledgeable individuals. A 230V, 50Hz single-phase transformer with a 1:2 turns ratio was employed in this practical. Testing was pursued after a short period for a fair test to take place since temperature increases the electrical resistance in copper as the transformer gradually heats up when it is powered on. A Chauvin ranoux power & quality analyser was utilised as the tester to record the outcomes of the practical. Calculations were done after the values were acquired to calculate the approximate equivalent circuit characteristics that would be drawn and commented. Every test was conducted in groups where everyone collaborated on setting up the experiment, changing the wiring and values, and calling out or noting the values.

Open Circuit

This test is conducted to determine R_C and X_m (core reactance) (open circuit resistance). To accomplish this, the secondary circuit must be open, meaning there must be no secondary current and all current must come from the primary circuit. To gather the transformer's values for comparison and calculation purposes, a practical test was set up.

The open circuit calculations and results can be shown in Figure 10 in the appendix.

Short Circuit

Now that the open test has been used to calculate the previous values. A short circuit test can be used to determine R_1 , R_2 , X_1 , and X_2 . P_{in} and the current have to be measured in order to do the test. To do this, the primary transformer is given a 9-volt addition, which will provide the values required to calculate the parameters mentioned above.

The short circuit calculations and results can be shown in Figure 10 & 11 in the appendix.

Load tests

Depending on the loads, transformers have variable regulatory percentages. These percentages were computed in this task under various loads. The appendix contains a breakdown of these calculations in Figure 12 & 13.

R Load test

From this test the results gathered are put into a table to compare the similarities.

Table 2 - R Load Test

	I	V	P.F.	True power	Regulation (%)
Simulated	3.501A	110.3V	1	386W	2.45%
Practical	3.5A	110.3V	1	385.2W	2.63%

Good results, clearly presented

RL Load test

From this test the results gathered are put into a table to compare the similarities.

Table 3 - RL Load Test

	I	V	P.F.	True power	Regulation (%)
Simulated	3.4A	108.56V	1	216.8W	3.955%
Practical	3.24A	108.6V	1	210W	3.683%

Good results, clearly presented

RC Load test

From this test the results gathered are put into a table to compare the similarities.

Table 4 - RC Load Test

	I	V	P.F.	True power	Regulation (%)
Simulated	1.657A	114.17V	1	80W	-1.166%
Practical	1.65A	114V	1	60W	-1.22%

Good results, clearly presented

Line spacing should be 1.5

By comparing each of the tests and the practical and calculated results in a comparison table, its clear to see that majority of the tests were a success. However, by looking at the differences these could be rounding up errors in the calculations or even simulation errors.

Paragraphs should be fully justified text as required in the brief

You could have commented on the fact that an RC load causes the terminal voltage to rise giving negative voltage regulation as expected.

5. Three-phase Induction Motor Investigation

Introduction

was subjected to

In order to complete this assignment, a three-phase induction motor underwent a number of tests. Stator resistance, no-load, and blocked-rotor tests were conducted to ascertain the predicted per-phase equivalent circuit parameters. Safety precautions were performed during each test, and the proper PPE was always worn. A tachometer was used to measure the motor's rpm, and a gauge mounted to the motor was used to measure the torque.

Calculated Results

Stator Resistance Test

The calculations for this test are shown in Figure 15 in the appendix.

No Load Test

The calculations for this test are shown in Figure 16 in the appendix.

Blocked Rotor Test

The calculations for this test are shown in Figure 17 in the appendix.

an excellent graph showing the 3 regions of operation

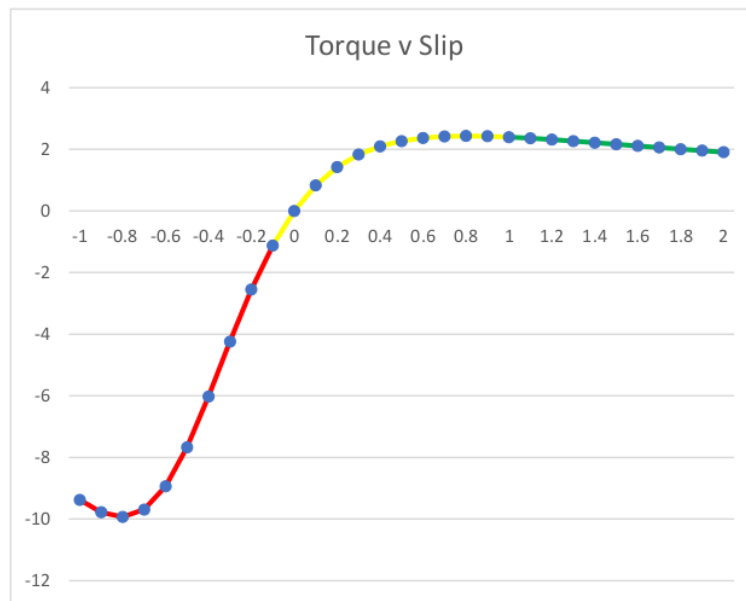


Figure 5 - Torque vs Slip Graph

generating, motoring and braking

The simulation of motor performance in the reversing, driving, and braking regions is shown in the graphic above. Red is for generating, yellow is for moving, and green is for braking. The regions have been divided into distinct colours. *braking occurs when field rotates in the opposite direction to the rotor*

The torque curve peaked at -10Nm at about a slip of -0.7/-0.8 and subsequently decreased significantly, indicating that the generated numbers are accurate. The motoring section's curve was predicted to be similar, but there isn't really a peak there, and the torque flatlines at little over 2Nm. Although there is a slight fall in the braking zone, which is to be expected, the braking torque should be considerably lower than the motoring torque peak.

Table 5 - Load Test

Load Test			Predicted		
Nr	T	S	Nr	T	S
2850	0.1	0.05	2850	0.45	0.05
2800	0.2	0.067	2800	0.61	0.07
2750	0.4	0.083	2750	0.69	0.08
2700	0.5	0.1	2700	0.83	0.1
2650	0.6	0.12	2650	0.97	0.12
2600	0.7	0.13	2600	1.03	0.13
2550	0.8	0.15	2550	1.16	0.15
2500	0.9	0.17	2500	1.27	0.17

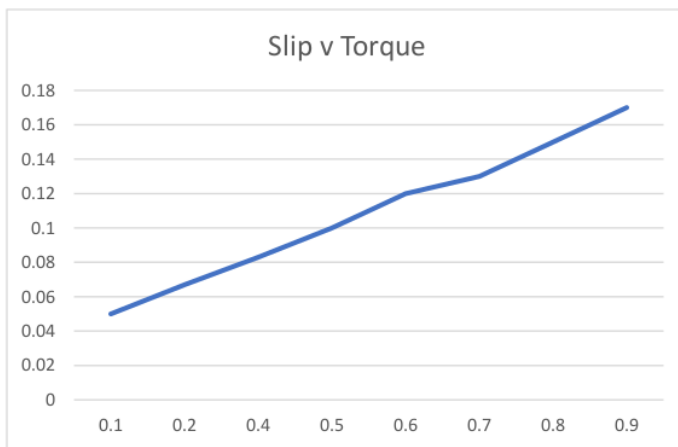


Figure 6 - Slip vs Torque Graph

According to the previous table, the slip speed and fractional slip for the actual and anticipated values are the same, however the torque varies very slightly as the speed changes. The difference between the initial torque values and the end torque values is roughly 0.3, demonstrating that despite the differences in the torque values, they rise similarly.

Table 6 - Generating Results

Nr	P	PF
3000	7.5	0.03
3050	-25	0.113
3100	-71.5	0.298
3150	-135	0.476
3200	-193	0.587
3250	-248	0.655
3300	-313	0.708

Above is a table of results from the generating test.

Table 7 - Fractional Slip Graph

Hz	Nr	VLine	Ns	S
5	102.5	111	150	0.32
10	256	117	300	0.15
15	418.5	121	450	0.07
20	568	125	600	0.05
25	721.1	129	750	0.039
30	871.1	133	900	0.032
35	1018	137	1050	0.031
40	1171	140	1200	0.024
45	1322	144	1350	0.021
50	1473	150	1500	0.018

You could have plotted a graph of V against f , to see if the ratio was constant. Is it constant?

The voltage and frequency are rising proportionally, as seen in the results table above, whereas the V/F ratio stays constant as the frequency rises. The speed improves as they are increased separately even if the V/F ratio stays the same.

Additionally, we can observe that when speed rises, fractional slip error also decreases. At base speed, the fractional slip drops from 0.32 at the lowest speed to 0.018.

6. Conclusions and Recommendations

Many things have been learned throughout this assignment, including how to measure a transformer's parameters, how to perform various tests on the transformer, such as open and short circuit tests, and the value of using multiple methods of investigation, such as calculations and practical, to demonstrate the validity of the work and determine whether it is accurate and in line with previous research and theory on the subject. Using the estimated and measured circuit parameters to determine other data, such as the regulation and efficiency of a transformer, was another learning lesson. Additionally, multisim abilities were acquired for designing circuits and comparing circuit characteristics to other values. Working as a team to set up experiments and collect data safely is an example of teamwork that has been learned. Induction motors are now better understood in terms of how to conduct various tests and how different power electronic converters affect the induction motor's performance. As a result of the jobs completed, it has been demonstrated that placing various loads on a transformer would result in a variety of metrics, including varying current readings, power factors, and regulation percentages. It has been demonstrated how to extract certain characteristics from various tests, how to utilise those data to analyse an induction motor's performance, and how an induction motor's performance can vary when power electronic converters are used.

Paragraphs should be fully justified text as required in the brief

7. Team Working

To complete the testing of the transformer and motor, a group of three people was assembled. The team was divided into various roles for these duties. An attachment linked to the motor shaft was the target of the operator's laser tachometer, which provided a reading in revs per minute. One team member was reading the speed of the driving motor via a revs/min gauge and had to collaborate with the tachometer operator to make sure the speeds lined up for the task when the motor was run faster than its base speed by another motor. The tachometer operator also had to communicate the speed to a team member who would subsequently measure the torque. Another challenge required the team to use the tachometer to measure speed, and another team member to use the oscilloscope attached to the motor to measure power and power factor. The same team member continued to work on the same tasks, and this arrangement worked well because everyone was familiar with their responsibilities and the group was able to complete the tasks quickly.

8. Citation List

Bibliography

Good range of sources

Correct method of listing.

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LTD = limited company and should npt be part of the citation as you have 3 of the same name

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9. Appendix

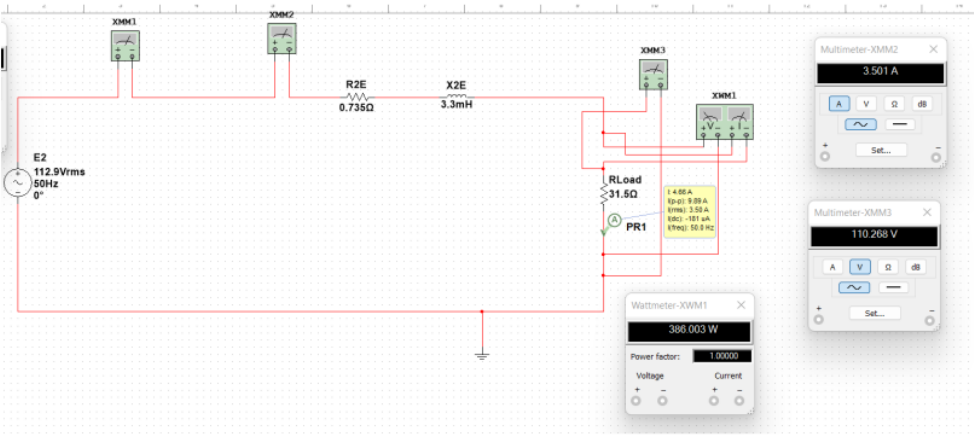


Figure 7 - R Load Circuit

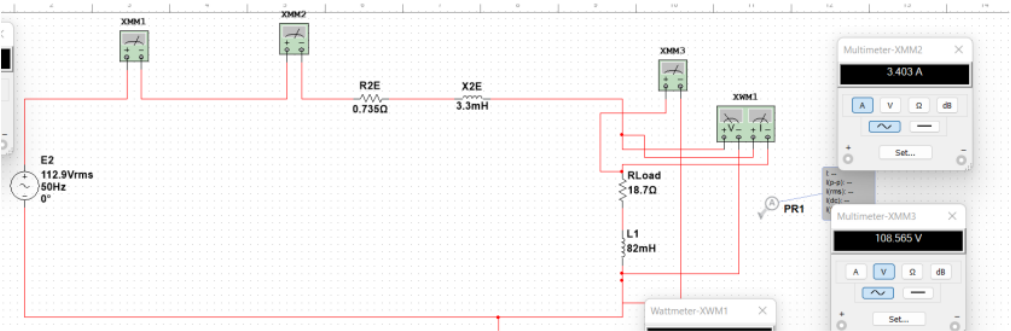


Figure 8 - RL Circuit

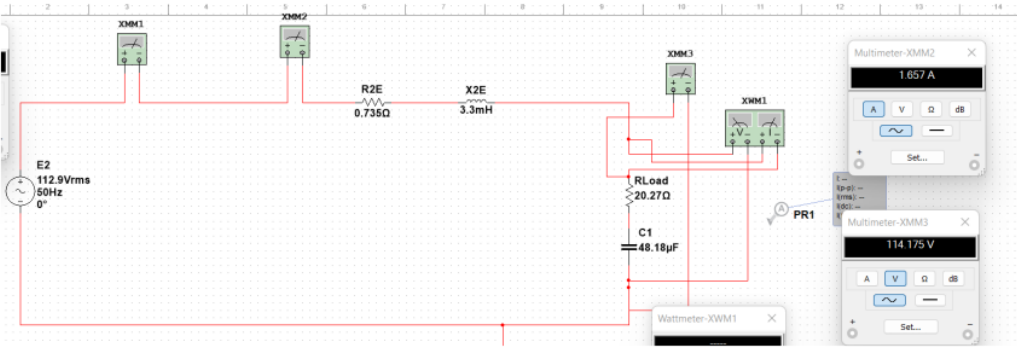


Figure 9 - RC Circuit

Power and Machines

$$V_1 = 230.8 \text{ V}$$

$$I_1 = 0.55 \text{ A}$$

$$P_{in} = 28.8 \text{ W}$$

$$\text{Power loss} = \frac{(V_1)^2}{R_c} = 28.8 = \frac{230.8^2}{R_c}$$

$$R_c = \frac{53268.64}{28.8} = 1849.61 \Omega$$

$$I_c = \frac{V_1}{R_c} = \frac{230.8}{1849.61} = 124.78 \text{ mA}$$

$$I_o^2 = I_c^2 + I_m^2$$

$$0.55^2 = (124 \times 10^{-3})^2 + I_m^2$$

$$0.3025 = 0.01537 + I_m^2$$

$$I_m^2 = \sqrt{0.28693} = 0.5356$$

$$X_m = \frac{V_1}{I_m} = \frac{230.8}{0.5356} = 430.918$$

$$\text{Rated Current output} = \frac{375}{110} = 3.41 \text{ A}$$

$$V_1 = 9.4 \text{ V}, I_2 = 3.48 \text{ A}, I_1 = 1.69 \text{ A}, P_{in} = 9.18$$

$$Z_{le} = \frac{V_1}{I_1} = \frac{9.4}{1.69} = 5.562$$

$$R_{le} = \frac{P_{in}}{I_1^2} = \frac{9.18}{1.69^2} = 3.214$$

~~Leakage Reactance~~
*

Figure 10 - Task 3 Calculations

Leakage Reactance

$$X_{1E} = \sqrt{Z_{1E}^2 - R_{1E}^2}$$

$$= \sqrt{5.562^2 - 3.214^2} = 4.539 \Omega$$

$$Z_{2E} = \left(\frac{N_2}{N_1}\right)^2 (Z_{1E}) = \left(\frac{110}{230}\right)^2 (5.562) = 1.272$$

$$R_{2E} = \left(\frac{110}{230}\right)^2 \times R_{1E} = \left(\frac{110}{230}\right)^2 \times 3.214 = 0.734$$

$$X_{2E} = \left(\frac{110}{230}\right)^2 \times X_{1E} = \left(\frac{110}{230}\right)^2 \times 4.539 = 1.038$$

Figure 11 - Task 3 Calculations

Power and Machines

Task 3
Practical

Load test 1

$$\begin{aligned} V_1 &= 230\text{V} & V_2 &= 111.5\text{V} & \text{P.F.} &= 1 \\ I_1 &= 1.39\text{A} & I_2 &= 2.31\text{A} \\ P_{in} &= 292.1\text{W} & P_{out} &= \cancel{292.1\text{W}} 256.1\text{W} \end{aligned}$$

$$R = \frac{V}{I} = \frac{111.5}{2.31} = 48.26 \Omega$$

Load test 2

$$\begin{aligned} V_1 &= 230.1\text{V} & V_2 &= 110.3 & \text{P.F.} &= 1 \\ I_1 &= 1.91\text{A} & I_2 &= 3.5\text{A} \\ P_{in} &= 415.8\text{W} & P_{out} &= 385.2\text{W} \\ R &= \frac{V}{I} = \frac{110.3}{3.5} = 31.5 \Omega \end{aligned}$$

Load test RL

$$\begin{aligned} V_1 &= 230\text{V} & V_2 &= 108.6\text{V} & R &= 20 \Omega \\ I_1 &= 2.09\text{A} & I_2 &= 3.24 & L &= 25\text{mH} \\ P_{in} &= 210\text{W} & P_{out} &= 175.3\text{W} & \text{P.F.} &= 0.699 \end{aligned}$$

Load test RC

$$\begin{aligned} V_1 &= 229.8\text{V} & V_2 &= 114\text{V} & R &= 20.72 \\ I_1 &= 0.47\text{A} & I_2 &= 1.65\text{A} & C &= 48.18\mu\text{F} \\ P_{in} &= 80\text{W} & P_{out} &= 60\text{W} & \text{P.F.} &= 0.757 \\ E_2 &= 112.6\text{V} & & & \text{P.F. 2} &= 0.3 \end{aligned}$$

Figure 12 - Load Tests (Practical)

Load Test 1

Measured

$$\% \text{reg} = \frac{(E_2 - V_2)}{V_2} \times 100$$

$$= \frac{(112.6 - 111.5)}{111.5} \times 100 = 0.98\%$$

Calculated

$$\% \text{reg} = \frac{I_2 (R_2 \cos \phi_2 - X_2 \sin \phi_2)}{V_2} \times 100$$

$$= \frac{2.31 (0.7703 \times 1)}{111.5} \times 100 = 1.595\%$$

Load Test 2

Measured

$$\% \text{reg} = \frac{(112.6 \times 110)}{110} \times 100 = 2.63\%$$

Calculated

$$\% \text{reg} = \frac{3.35 (0.7703 \times 1)}{110} \times 100 = 2.45\%$$

Figure 13 - Load tests Regulation Percentages

Load test RL

Measured

$$\text{reg\%} = \frac{(112.6 - 108.6) \times 100}{108.6} = 3.683$$

Calculated

$$\text{reg\%} = \frac{3.24 (0.7703 \times 0.699 + 1.087 \times 0.866) \times 100}{108.6}$$

$$= 3.955$$

Load test RC

Measured

$$\text{reg\%} = \frac{(112.6 - 114) \times 100}{114} = -1.22$$

Calculated

$$\text{reg\%} = \frac{1.65 (0.7703 \times 0.3 - 1.087 \times 0.9539) \times 100}{114}$$

$$= -1.66$$

Figure 14 - Load tests Regulation Percentage

Stator Resistance Test

$$I = \frac{10V}{R_t} \quad \therefore R_t = \frac{10}{I} = \frac{2R_1}{3}$$

$$\therefore R_1 = \frac{3 \times 10}{2I} = \frac{15}{0.438} = 34.25 \Omega$$

Figure 15 - Stator Resistance test

No Load test

$$V_0 = 124.4V \text{ per phase}$$
$$124.4 \times \sqrt{3} = 215.5V$$

$$I_0 = 0.56A \text{ Line current}$$

$$I_0 = 0.56 \div \sqrt{3} = 0.32A \text{ per phase}$$

$$P_0 = 25W$$

$$P_0 = 25 \div 3 = 8.3W \text{ per phase}$$

$$\cos \theta_0 = 0.11$$

$$\therefore \theta_0 = \cos^{-1}(0.11) = 83.68^\circ$$

$$\therefore \sin \theta_0 = \sin(83.68) = 0.99$$

$$R_c = \frac{V_0}{I_0 \cos \theta_0} = \frac{215.5}{0.32 \times 0.11} = 6122.6 \Omega$$

$$X_m = \frac{V_0}{I_0 \sin \theta_0} = \frac{215.5}{0.32 \times 0.99} = 680.24 \Omega$$

Figure 16 - No load test

$$\begin{aligned}
 &\text{Blocked Rotor Test} \\
 &V_{sc} = 103 \text{ V Line} \\
 &I_{sc} = 1.95 \text{ A Line} \\
 &I_{sc} = 1.95 \div \sqrt{3} = 1.13 \text{ A} \\
 &P_{sc} = 303 \text{ W} \\
 &P_{sc \text{ per phase}} = 303 \div 3 = 101 \text{ W} \\
 &\cos \theta_{sc} = \frac{P_{sc}}{V_{sc} \times I_{sc}} = \frac{101}{103 \times 1.13} = 0.87 \\
 &\therefore \theta_{sc} = \cos^{-1}(0.87) = 29.54^\circ \\
 &\therefore \sin \theta_{sc} = \sin(29.54) = 0.49 \\
 &Z_{sc} = \frac{V_{sc}}{I_{sc}} = \frac{103}{1.13} = 91.15 \Omega \\
 &\therefore R_1 + R_2' = Z_{sc} \times \cos \theta \\
 &R_1 + R_2' = 91.15 \times 0.87 \\
 &R_2' = 79.3 - 34.25 \\
 &R_2' = 45.05 \Omega \\
 &X_1 + X_2' = Z_{sc} \times \sin \theta_{sc} \\
 &= 91.15 \times 0.49 \\
 &= 44.66 \Omega
 \end{aligned}$$

Figure 17 - Blocked rotor test

FINAL GRADE

GENERAL COMMENTS

Instructor

61

/100

PAGE 1

PAGE 2

PAGE 3

Text Comment. No executive summary included

Text Comment. this is a work plan not a summary

Text Comment. A good risk assessment but this belongs in the appendix

PAGE 4

Text Comment. not always

Text Comment. RMS

QM

Separate your citations

Cite your source next to the information being used. Don't combine citations as your reader will not know which information is from which source.

Text Comment. LTD = limited company, there is something wrong with the way your are entering your sources

Text Comment. This is good, but a better one would include the stator voltage instead of the rotor open circuit emf E.

Text Comment. one date needed

QM

Good explanation given

You have clearly put much effort into this explanation, well done.

Text Comment. firing angle

Text Comment. voltage

PAGE 5

Text Comment. too

Text Comment. Therefore, the voltage has to be lowered also

QM

Good explanation given

You have clearly put much effort into this explanation, well done.

Text Comment. You are already describing the cycloconverter, aren't you?

Text Comment. ??????

QM

Correctly cited

Citation method conforms to Harvard standard, well done.

PAGE 6

QM

Correctly cited

Citation method conforms to Harvard standard, well done.

QM

Correctly cited

Citation method conforms to Harvard standard, well done.

Text Comment. a clear but warped image

PAGE 7

Text Comment. a good but warped image

PAGE 8

Text Comment. The format of your text doesn't match the brief

Text Comment. one date please

Text Comment. You could have written about generation, transmission and distribution with switch gear and protection

PAGE 9

QM

Fully justify your text

The brief asked for fully justified text with parallel edges.

PAGE 10

QM

Good results, clearly presented

QM

Good results, clearly presented

QM

Good results, clearly presented

QM

Line spacing should be 1.5

This allows the marker to put comments in between your lines

QM

Paragraphs should be fully justified text as required in the brief

Text Comment. You could have commented on the fact that an RC load causes the terminal voltage to rise giving negative voltage regulation as expected.

PAGE 11

QM

Paragraphs should be fully justified text as required in the brief

Text Comment. was subjected to

Text Comment. an excellent graph showing the 3 regions of operation

PAGE 12

Text Comment. generating, motoring and braking

Text Comment. braking occurs when field rotates in the opposite direction to the rotor

Text Comment. You could have plotted a graph of V against f, to see if the ratio was constant. Is it constant?



Paragraphs should be fully justified text as required in the brief



Good range of sources

You have demonstrated reading from a good range of sources shown by your list below



Correct method of listing.

You have listed your sources correctly according to the Harvard method.

Text Comment. LTD = limited company and should not be part of the citation as you have 3 of the same name

GRADING FORM: NEW CSG-RUBRIC

JACK ROGERS

1. ENGAGEMENT WITH LITERATURE

-  A good research section with evidence of reading from a wide range of sources cited and listed mostly correctly using the Harvard method. Some of your citations are listed as LTD which means limited company. You needed to put the name of the company instead. 12/20

12

2. KNOWLEDGE AND UNDERSTANDING

-  Good knowledge and understanding demonstrated in your research findings, transformer and motor investigation explanations. 12/20

12

3. COGNITIVE AND INTELLECTUAL

-  Good analysis of transformer and motor investigation results analysis and conclusions/recommendations. 13/20

13

4. PRACTICAL APPLICATION

-  Good use of equipment for transformer and motor experiments and presentation of results . 14/20

14

5. TRANSFERABLE SKILLS



A good work plan (placed in the executive summary section), risk assessment (which should be in the appendix) and explanation of team working. Report is generally well structured, written and presented with some clear diagrams. Word count not exceeded. However, there is no executive summary and you have not always followed the brief - 1.5 line spacing, fully justified paragraphs. 10/20

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