



Technical, Entrepreneurship and Vocational Education and Training Authority (TEVETA)

CRAFT CERTIFICATE IN ELECTRICAL ENGINEERING (YEAR 2)

Record of Practical Assessment

Learner`s name:_____

Learner`s NRC no.:_____

Learner`s TEVETA No.:_____

Institution Name:_____

Institution TVA No.:_____

Assessment Period:_____

PREFACE

The Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA) is an institution created under the Technical Education, Vocational and Entrepreneurship Training Act Number 13 of 1998, as amended by the Technical Education, Vocational and Entrepreneurship Training (Amendment) Act Number 11 of 2005.

The Act among other things provides that TEVETA shall:

- (a) regulate and conduct national examinations and assessments relating to technical education, vocational and entrepreneurship training;
- (b) charge and collect fees in respect of examinations, assessments and other services provided by the Authority;
- (c) award certificates to persons who succeed in examinations and assessments undertaken under this Act
- (d) do all such things connected with or incidental to the functions of the Authority under this Act.

Through this mandate, the Assessment and Qualifications Division of TEVETA has developed Practical Assessment Tool Kits to enable learners achieve the competences that are congruent with the demand of the workplace tasks. These tool kits in part are also intended to ensure that similar conditions under which all students in TEVET are assessed and examined apply wherever the course is undertaken in Zambia.

The Trainers shall work with the Learners to collect evidence of competence, using the benchmarks provided by the unit standards. During the year, the Learners shall be required to undertake a series of practical assessment tasks. It is the sum of all these assessments tasks that deems a Learner to be competent (or not).

This approach to assessment is not a one-off event but one that gives learners many opportunities to demonstrate skill and allow for the capturing and recording of these demonstrations.

For the Learner to be deemed competent, they must demonstrate competency in every aspect of the practical tasks being undertaken. It must however be understood by the Trainer that Competency does not mean expert. It means that the candidate has attained sufficient skill and knowledge to perform the activity or service to a degree and quality that is acceptable to the industry and the customer in a time within which a competent person at the level could reasonably be expected to perform the task.

While this will be undertaken at institutional level, it is therefore envisaged that the Assessment principles of VALIDITY, RELIABILITY, FAIRENESS and FLEXIBILITY shall at all times be adhered to.

Pre-Assessment

Assessment process explained to the Trainee (✓ if Yes).	☐
Any appeal relating to the outcome of the assessment or the way in which the assessment was conducted shall be made through the TEVETA <i><u>fair treatment policy</u></i> as explained to the Trainee (✓ if Yes).	☐

Learner/Trainee Learner/Trainee name: (Print) Learner/Trainee comments:	Assessor/Examiner Assessor/Examiner name: (Print) Assessor/Examiner comments:
I fully understand the assessment and appeals process.	Theory assessment sighted and checked as satisfactory. ☐
Signature: Date:	Signature: Date:

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Task 1: INSTALLATION OF AN AUTO TRANSFORMER STARTER

No	Activity	Satisfactory			Not Satisfactory		
		Attempts			Attempts		
	During observation of work activities, the candidate demonstrated that they can:	1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire an Auto transformer starter control circuit from the given specifications. This should include ▪ Mounting a contactor box ▪ Installing and terminating Conduit pipes using couplings and bushes ▪ Making 90° bends without kinks ▪ Making Offsets ▪ Mounting saddles ▪ Wiring a control circuit ▪ Terminating cables neatly	☐	☐	☐	☐	☐	☐
	b) Wire an Auto transformer starter power circuit from the given specifications. This should include ▪ Using the right cable size for a power circuit ▪ Terminating cables neatly ▪ Connecting the motor in star or delta	☐	☐	☐	☐	☐	☐

	c) Carry out tests on the auto transformer starter circuit using the right test instrument ▪ Continuity test on components, control and power circuits ▪ Polarity test on control circuit ▪ Insulation resistance test on the motor	☐	☐	☐	☐	☐	☐
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Examiner's comments:

Examiner Name:.....

Learner's Name:.....

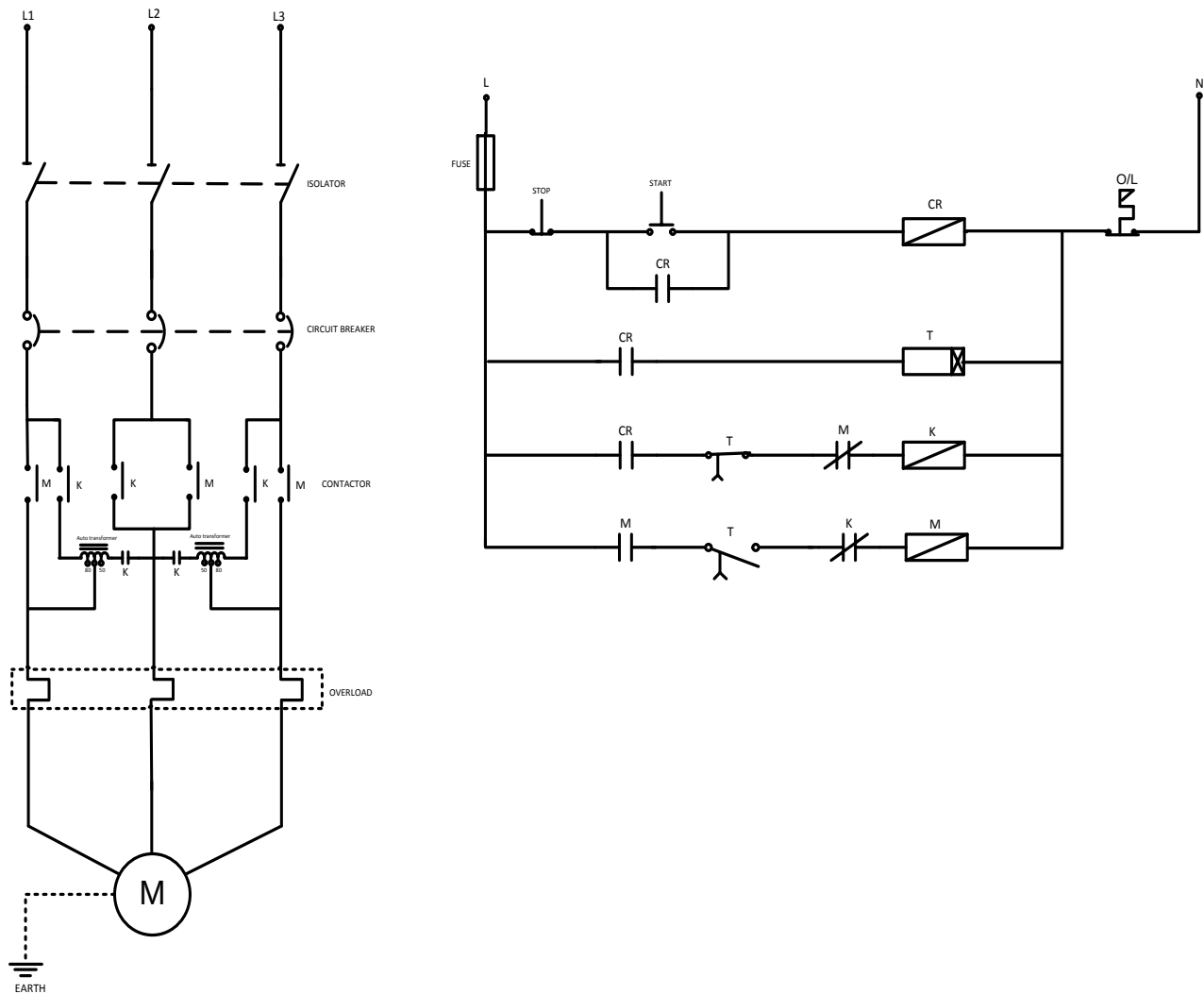
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Task 1: AUTO TRANSFORMER STARTER – CONTROL AND POWER CIRCUIT



MATERIAL LIST

1. 1 x contactor box
2. 1 x control fuse or 5A MCB
3. 1 x push button box to accommodate three push buttons
4. 3 x 220V – 240V Contactor with 5N/O and 1N/C
5. 1 x 380V 3 phase auto transformer
6. 1 x on delay timer (TDOE) with 1 N/O and 1N/C
7. 1 x start push button
8. 1 x stop push button

9. 1 x overload to suit size of motor
10. 1 x 380V 3 phase motor
11. 5 x 20mm saddles
12. 1.5m x 20mm² conduit pipe
13. 6 x 20mm² male bushes
14. 6 x 20mm² female bushes
15. 6m x 1.5mm² red cable
16. 3.5m x 1.5mm² black cable
17. 4m x 2.5mm² red cable
18. 1.5m x 2.5mm² earth cable
19. 20 x 3/4" self-tapping screws

Task 2: INSTALLATION OF A WOUND ROTOR INDUCTION STARTER

No	Activity	Satisfactory			Not Satisfactory		
		Attempts			Attempts		
		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	During observation of work activities, the candidate demonstrated that they can:						
	a) Wire a wound rotor induction motor control circuit from the given specifications. This should include ▪ Mounting a contactor box ▪ Installing and terminating Conduit pipes using couplings and bushes ▪ Making 90° bends without kinks ▪ Making Offsets ▪ Mounting saddles ▪ Wiring a control circuit ▪ Terminating cables neatly	☐	☐	☐	☐	☐	☐
	b) Wire a wound rotor induction motor starter power circuit from the given specifications. This should include ▪ Using the right cable size for a power circuit ▪ Terminating cables neatly ▪ Connecting the motor in star or delta	☐	☐	☐	☐	☐	☐

	c) Carry out tests on a wound rotor starter circuit using the right test instrument ▪ Continuity test on components, control and power circuits ▪ Polarity test on control circuit ▪ Insulation resistance test on the motor	☐	☐	☐	☐	☐	☐
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Examiner's comments:

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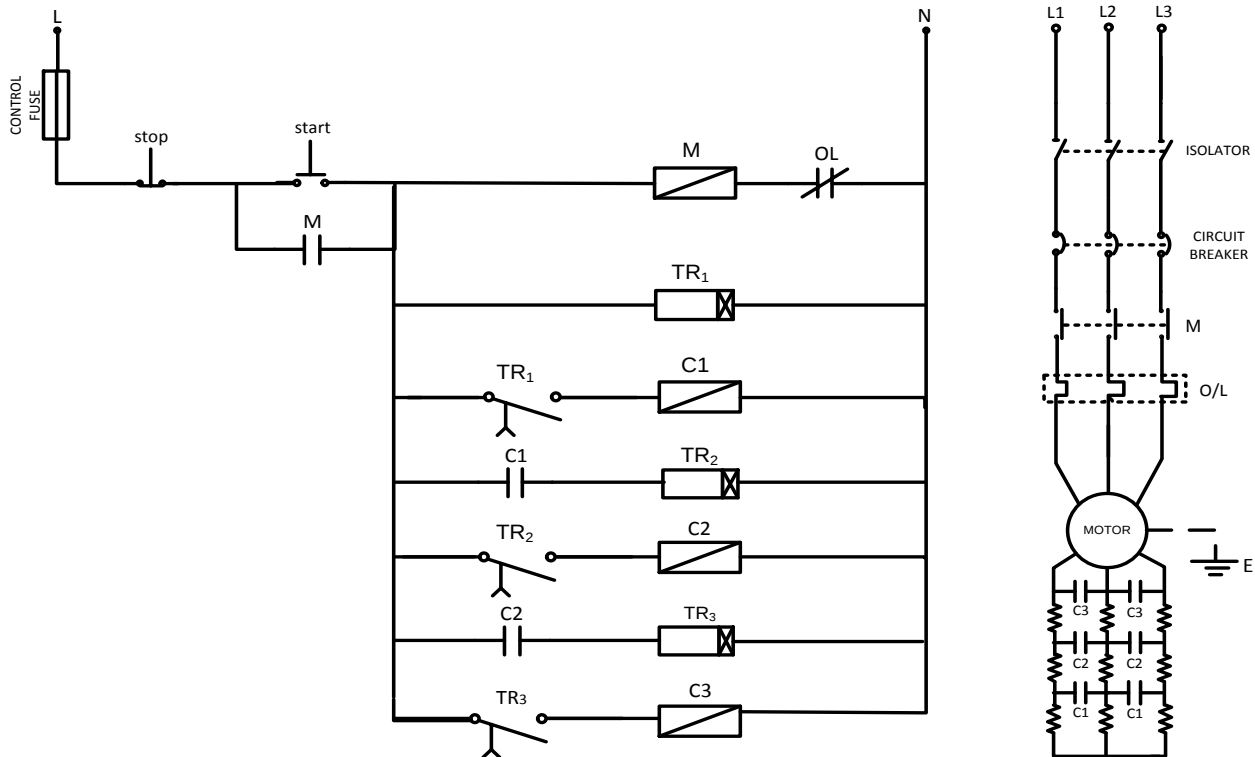
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Task 2: WOUND ROTOR INDUCTION MOTOR STARTER – CONTROL AND POWER CIRCUIT



MATERIAL LIST

1. 1 x contactor box
2. 1 x control fuse or 5A MCB
3. 1 x push button box to accommodate three push buttons
4. 4 x 220V – 240V Contactor with 5N/O and 1N/C
5. 3 x on delay timer (TDOE) with 1 N/O and 1N/C
6. 1 x start push button
7. 1 x stop push button
8. 1 x overload to suit size of motor
9. 1 x 380V 3 phase wound rotor induction motor
10. 5 x 20mm saddles
11. 1.5m x 20mm² conduit pipe
12. 6 x 20mm² male bushes
13. 6 x 20mm² female bushes

14. 6m x 1.5mm² red cable
15. 3.5m x 1.5mm² black cable
16. 4m x 2.5mm² red cable
17. 1.5m x 2.5mm² earth cable
18. 20 x 3/4" self-tapping screws

Task 3: INSTALLATION OF A SYNCHRONOUS STARTER

No	Activity	Satisfactory			Not Satisfactory		
		Attempts			Attempts		
	During observation of work activities, the candidate demonstrated that they can:	1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire a synchronous motor starter control circuit from the given specifications. This should include ▪ Mounting a contactor box ▪ Installing and terminating Conduit pipes using couplings and bushes ▪ Making 90° bends without kinks ▪ Making Offsets ▪ Mounting saddles ▪ Wiring a control circuit ▪ Terminating cables neatly	☐	☐	☐	☐	☐	☐

	b) Wire a synchronous motor starter power circuit from the given specifications. This should include - Using the right cable size for a power circuit - Terminating cables neatly - Connecting the motor in star or delta	☐	☐	☐	☐	☐	☐
	c) Carry out tests on a synchronous motor starter circuit using the right test instrument - Continuity test on components, control and power circuits - Polarity test on control circuit - Insulation resistance test on the motor	☐	☐	☐	☐	☐	☐

Examiner's comments:

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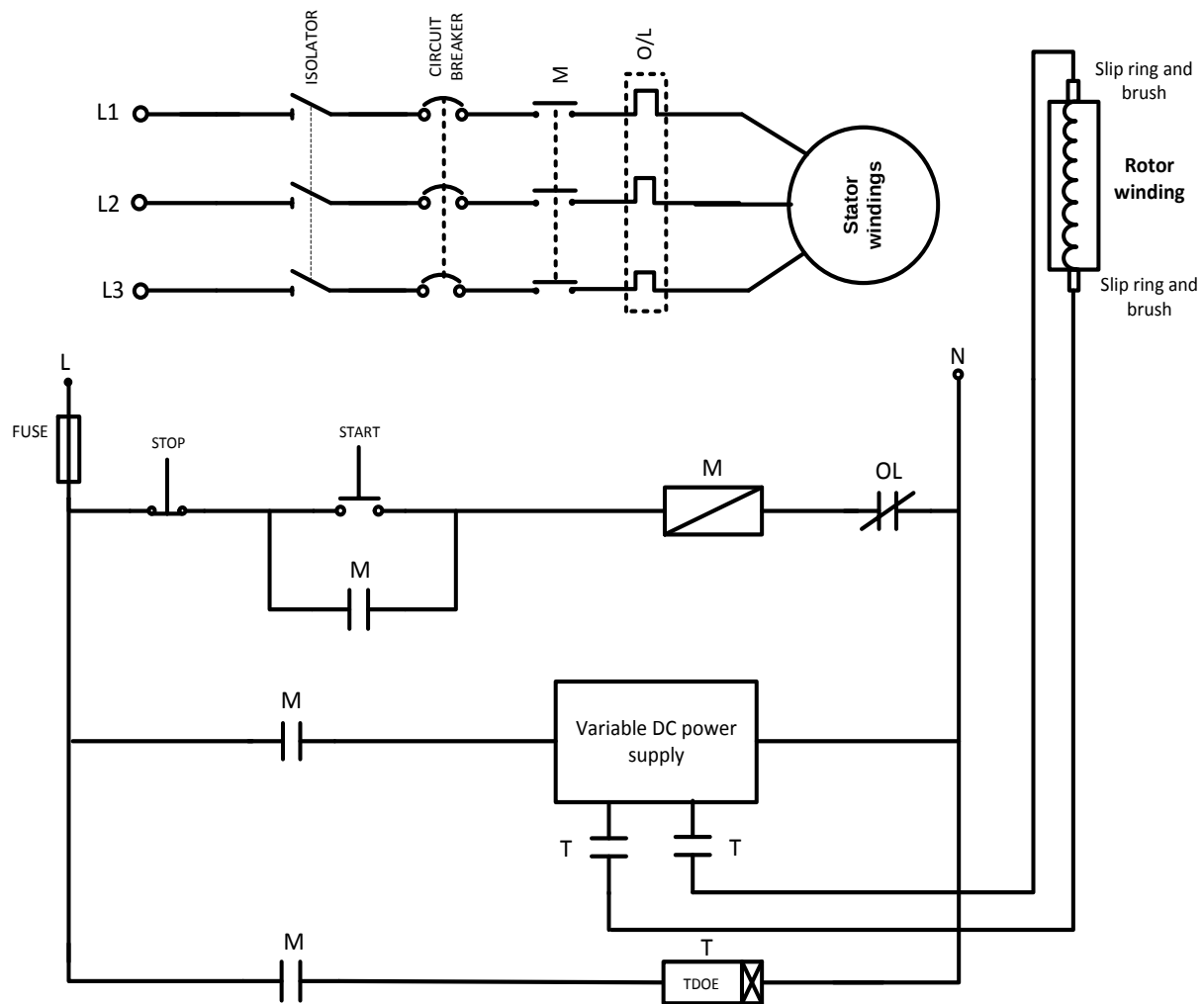
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Task 3: SYNCHRONOUS MOTOR STARTER – CONTROL AND POWER CIRCUIT



MATERIAL LIST

1. 1 x contactor box
2. 1 x control fuse or 5A MCB
3. 1 x push button box to accommodate three push buttons
4. 1 x 220V – 240V Contactor with 5N/O and 1N/C
5. 1 x on delay timer (TDOE) with 1 N/O and 1N/C
6. 1 x start push button
7. 1 x stop push button
8. 1 x overload to suit size of motor

9. 1 x 380V 3 phase synchronous motor and exciter
10. 5 x 20mm saddles
11. 1.5m x 20mm² conduit pipe
12. 6 x 20mm² male bushes
13. 6 x 20mm² female bushes
14. 6m x 1.5mm² red cable
15. 3.5m x 1.5mm² black cable
16. 4m x 2.5mm² red cable
17. 1.5m x 2.5mm² earth cable
18. 20 x ¾" self-tapping screws

Task 4: INSTALLATION OF MANUAL PLUGGING OF AC MOTOR

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire a Manual plugging of AC motor circuit from the given specifications. This should include ▪ Mounting a contactor box ▪ Installing and terminate Conduit pipes using couplings and bushes ▪ Making 90° bends without kinks ▪ Making Offsets ▪ Mounting saddles ▪ Wiring a control circuit ▪ Terminating cables neatly	☐	☐	☐	☐	☐	☐
	b) Wire a manual plugging of AC motor power circuit from the given specifications. This should include, ▪ Using the right cable size for a power circuit ▪ Terminating cables neatly ▪ Connecting the motor correctly in star or delta	☐	☐	☐	☐	☐	☐
	c) Carry out tests on a manual plugging of AC motor starter circuit using the right test instrument ▪ Continuity test on components, control and power circuits ▪ Polarity test on control circuit ▪ Insulation resistance test on the motor	☐	☐	☐	☐	☐	☐

Examiner's comments:

Examiner Name:.....

Learner's Name:.....

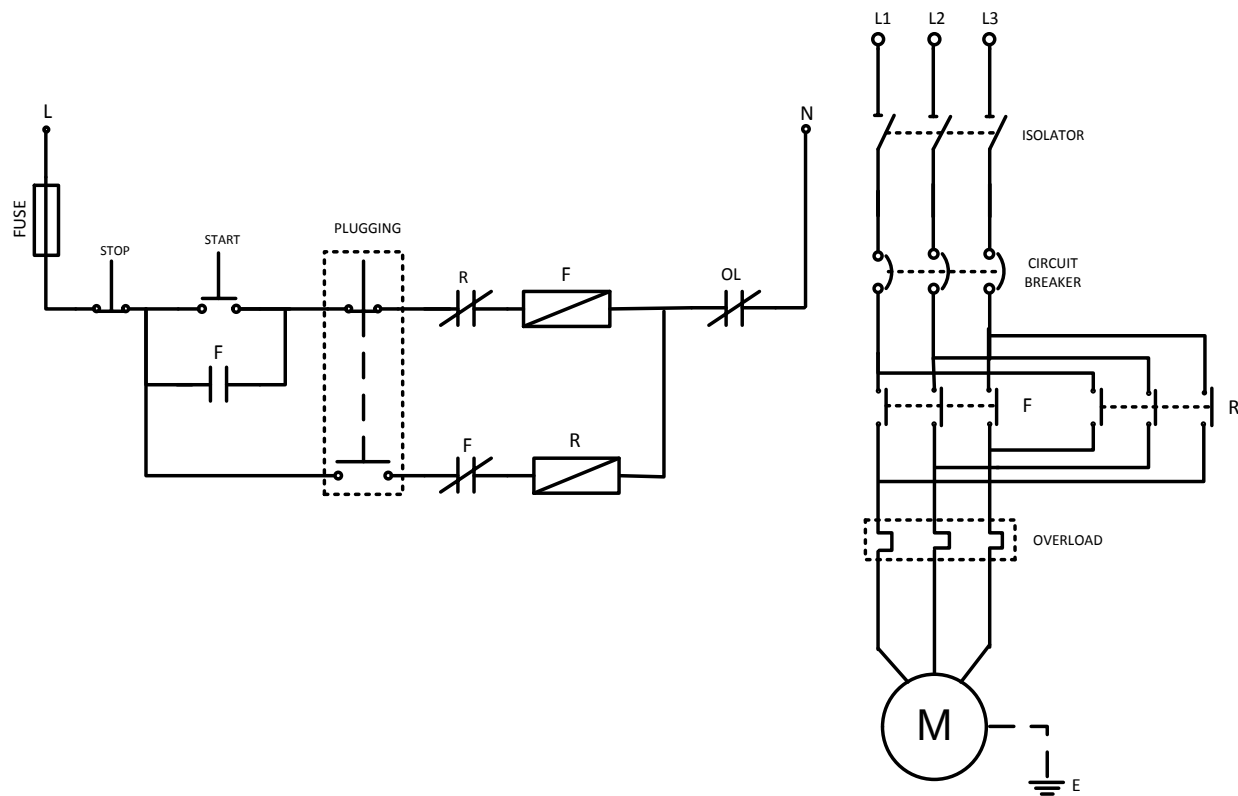
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Task 4: MANUAL PLUGGING OF AC MOTORS – CONTROL AND POWER CIRCUIT



MATERIAL LIST

1. 1 x contactor box
2. 1 x control fuse or 5A MCB
3. 1 x push button box to accommodate three push buttons
4. 2 x 220V – 240V Contactor with 5N/O and 1N/C
5. 1 x start push button
6. 1 x start-stop push button mechanically linked
7. 1 x stop push button
8. 1 x overload to suit size of motor
9. 1 x 380V 3 phase induction motor
10. 5 x 20mm saddles
11. 1.5m x 20mm² conduit pipe
12. 6 x 20mm² male bushes

13. 6 x 20mm² female bushes
14. 6m x 1.5mm² red cable
15. 3.5m x 1.5mm² black cable
16. 4m x 2.5mm² red cable
17. 1.5m x 2.5mm² earth cable
18. 20 x 3/4" self-tapping screws

Task 5: INSTALLATION OF A DYNAMIC BRAKING CIRCUIT OF AC MOTORS

No	Activity	Satisfactory			Not Satisfactory		
		Attempts			Attempts		
	During observation of work activities, the candidate demonstrated that they can:	1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire a dynamic braking circuit of an AC motor from the given specifications. This should include ▪ Mounting a contactor box ▪ Installing and terminate Conduit pipes using couplings and bushes ▪ Making 90° bends without kinks ▪ Making Offsets ▪ Mounting saddles ▪ Wiring a control circuit ▪ Terminating cables neatly	☐	☐	☐	☐	☐	☐

	b) Wiring a dynamic braking circuit of AC motor power circuit from the given specifications. This should include - Using the right cable size for a power circuit - Terminating cables neatly - Connecting the motor in star or delta	☐	☐	☐	☐	☐	☐
	c) Carry out tests on a dynamic braking of AC motor circuit using the right test instrument - Continuity test on components, control and power circuits - Polarity test on control circuit - Insulation resistance test on the motor	☐	☐	☐	☐	☐	☐

Examiner's comments:

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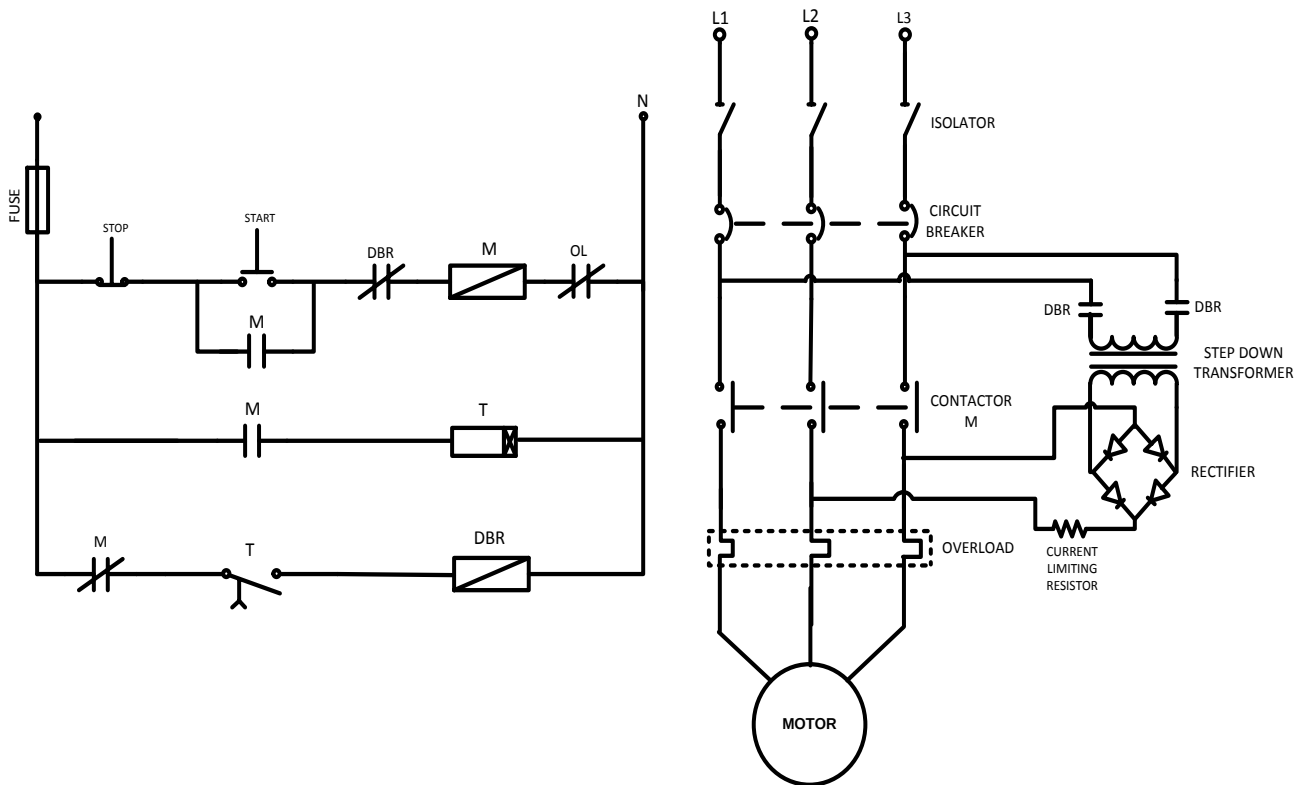
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Task 5: DYNAMIC BRAKING OF AC MOTOR



MATERIAL LIST

1. 1 x contactor box
2. 1 x control fuse or 5A MCB
3. 1 x push button box to accommodate two push buttons
4. 2 x 220V – 240V Contactor with 5N/O and 1N/C
5. 1 x on delay timer (TDOE) with 1 N/O and 1N/C
6. 1 x start push button
7. 1 x stop push button
8. 1 x step down transformer
9. 1 x current limiting resistor
10. 1 x overload to suit size of motor
11. 1 x 380V 3 phase induction motor

12. 5 x 20mm saddles
13. 1.5m x 20mm² conduit pipe
14. 6 x 20mm² male bushes
15. 6 x 20mm² female bushes
16. 6m x 1.5mm² red cable
17. 3.5m x 1.5mm² black cable
18. 4m x 2.5mm² red cable
19. 1.5m x 2.5mm² earth cable
20. 20 x 3/4" self-tapping screws
21. 1 x bridge rectifier

Task 6: INSTALLATION OF A TIMED CONTROLLED PLUGGING CIRCUIT

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire a timed controlled plugging circuit of an AC motor from the given specifications. This should include ▪ Mounting a contactor box ▪ Installing and terminate Conduit pipes using couplings and bushes ▪ Making 90° bends without kinks ▪ Making Offsets ▪ Mounting saddles ▪ Wiring a control circuit ▪ Terminating cables neatly	☐	☐	☐	☐	☐	☐
	b) Wiring a timed controlled plugging of an AC motor power circuit from the given specifications. This should include ▪ Using the right cable size for a power circuit ▪ Terminating cables neatly ▪ Connecting the motor in star or delta	☐	☐	☐	☐	☐	☐
	c) Carry out tests on a timed plugging circuit of an AC motor using the right test instrument ▪ Continuity test on components, control and power circuits ▪ Polarity test on control circuit ▪ Insulation resistance test on the motor	☐	☐	☐	☐	☐	☐

Examiner's comments:

Examiner Name:.....

Learner's Name:.....

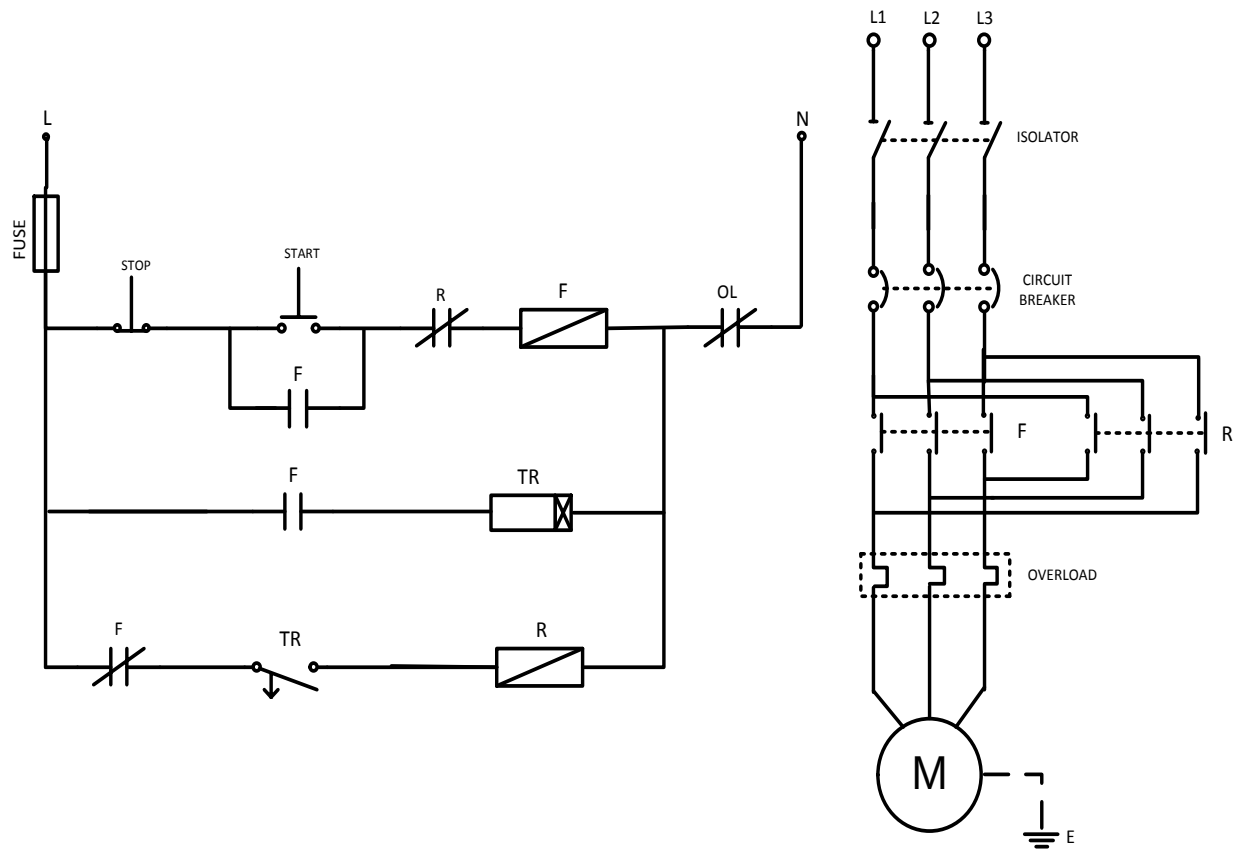
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Task 6: TIMED CONTROLLED PLUGGING CIRCUIT – CONTROL AND POWER CIRCUIT



MATERIAL LIST

1. 1 x contactor box
2. 1 x control fuse or 5A MCB
3. 1 x push button box to accommodate two push buttons
4. 2 x 220V – 240V Contactor with 5N/O and 1N/C
5. 1 x off delay timer (TDOD) with 1 N/O and 1N/C
6. 1 x start push button
7. 1 x stop push button
8. 1 x overload to suit size of motor
9. 1 x 380V 3 phase induction
10. 5 x 20mm saddles
11. 1.5m x 20mm² conduit pipe
12. 6 x 20mm² male bushes
13. 6 x 20mm² female bushes

14. 6m x 1.5mm² red cable
15. 3.5m x 1.5mm² black cable
16. 4m x 2.5mm² red cable
17. 1.5m x 2.5mm² earth cable
18. 20 x 3/4" self-tapping screws

Task 7: INSTALLATION OF AN OPERATOR CONTROLLED PLUGGING STOP CIRCUIT

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire an operator controlled plugging stop circuit from the given specifications. This should include ▪ Mounting a contactor box ▪ Installing and terminate Conduit pipes using couplings and bushes ▪ Making 90° bends without kinks ▪ Making Offsets ▪ Mounting saddles ▪ Wiring a control circuit ▪ Terminating cables neatly	☐	☐	☐	☐	☐	☐
	b) Wiring an operator controlled plugging stop circuit from the given specifications. This should include ▪ Using the right cable size for a power circuit ▪ Terminating cables neatly ▪ Connecting the motor in star or delta	☐	☐	☐	☐	☐	☐
	c) Carry out tests on an operator controlled plugging stop circuit using the right test instrument ▪ Continuity test on components, control and power circuits ▪ Polarity test on control circuit ▪ Insulation resistance test on the motor	☐	☐	☐	☐	☐	☐

Examiner's comments:

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Learner's Name:.....

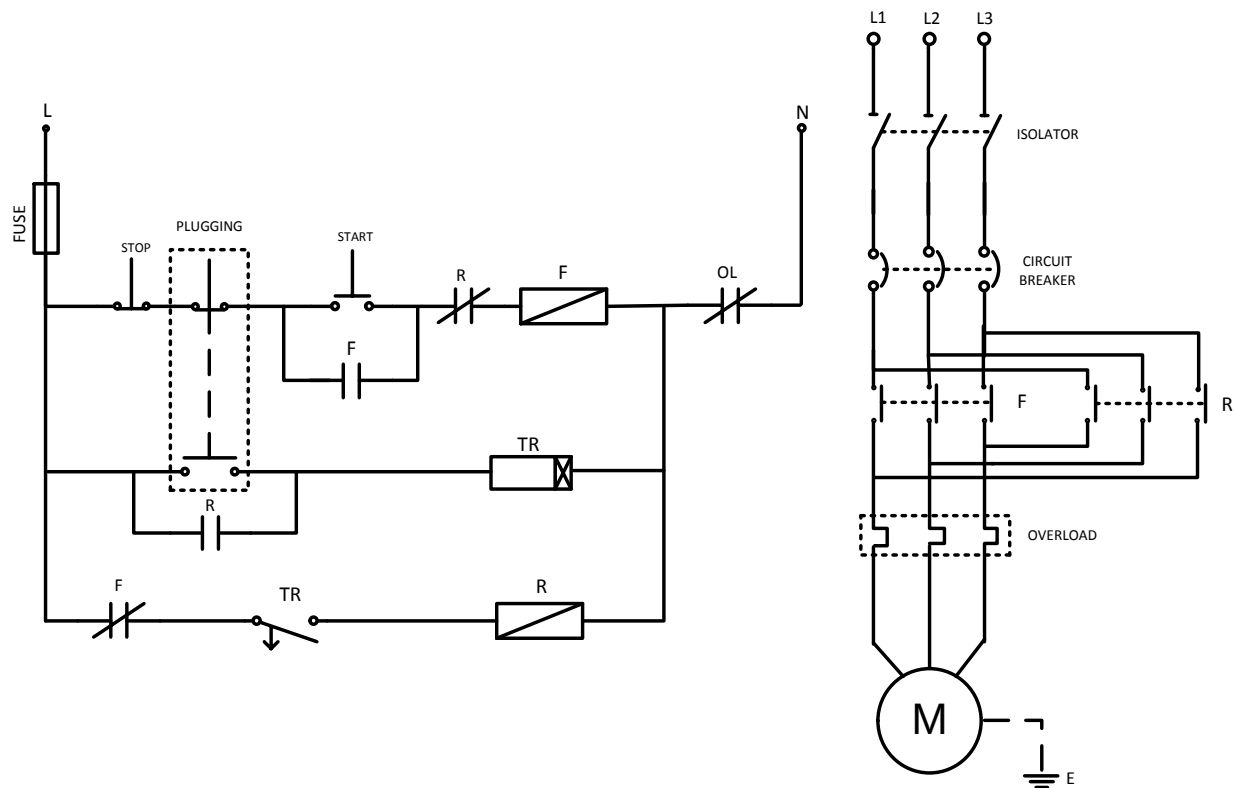
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Task 7: OPERATOR CONTROLLED PLUGGING STOP – CONTROL AND POWER CIRCUIT



MATERIAL LIST

1. 1 x contactor box
2. 1 x control fuse or 5A MCB
3. 1 x push button box to accommodate two push buttons
4. 2 x 220V – 240V Contactor with 5N/O and 1N/C
5. 1 x off delay timer (TDOD) with 1 N/O and 1N/C
6. 1 x start push button
7. 1 x stop push button
8. 1 x start-stop push button mechanically linked
9. 1 x overload to suit size of motor
10. 1 x 380V 3 phase induction
11. 5 x 20mm saddles
12. 1.5m x 20mm² conduit pipe
13. 6 x 20mm² male bushes

14. 6 x 20mm² female bushes
15. 6m x 1.5mm² red cable
16. 3.5m x 1.5mm² black cable
17. 4m x 2.5mm² red cable
18. 1.5m x 2.5mm² earth cable
19. 20 x 3/4" self-tapping screws

Task 8: INSTALLATION OF A SOLID STATE/THYRISTOR STARTER

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire a solid state or thyristor starter control circuit from the given specifications. This should include ▪ Mounting a contactor box ▪ Installing and terminate Conduit pipes using couplings and bushes ▪ Making 90° bends without kinks ▪ Making Offsets ▪ Mounting saddles ▪ Wiring a control circuit ▪ Terminating cables neatly	☐	☐	☐	☐	☐	☐
	b) Wiring a solid state or thyristor starter circuit from the given specifications. This should include ▪ Using the right cable size for a power circuit ▪ Terminating cables neatly ▪ Connecting the motor correctly in star or delta	☐	☐	☐	☐	☐	☐
	c) Carry out tests on a solid state or thyristor starter circuit using the right test instrument ▪ Continuity test on components, control and power circuits ▪ Polarity test on control circuit ▪ Insulation resistance test on the motor	☐	☐	☐	☐	☐	☐

Examiner's comments:

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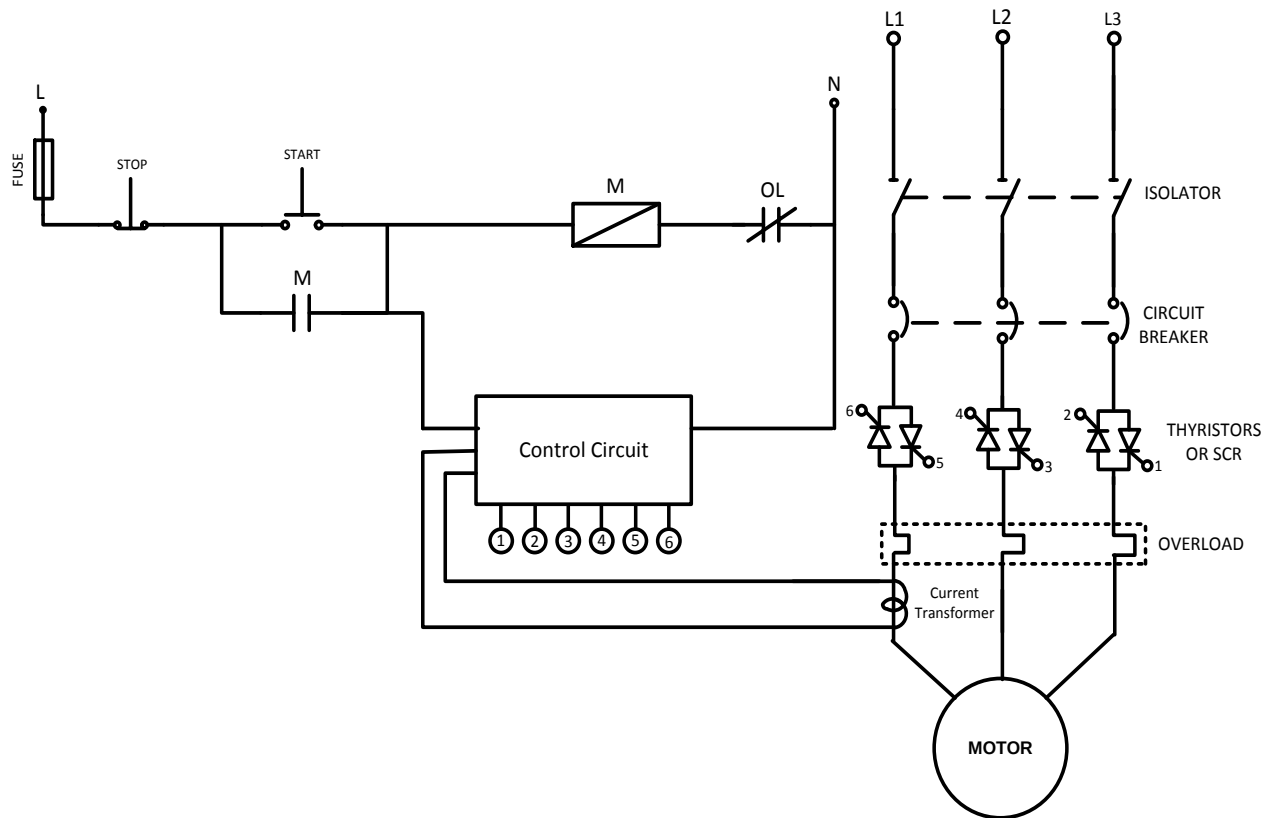
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Task 8: SOLID STATE/THYRISTOR STARTER – CONTROL AND POWER CIRCUIT



MATERIAL LIST

1. 1 x contactor box
2. 1 x control fuse or 5A MCB
3. 1 x push button box to accommodate two push buttons
4. 1 x 220V – 240V Contactor with 5N/O and 1N/C
5. 1 x thyristor starter
6. 1 x start push button
7. 1 x stop push button
8. 1 x overload to suit size of motor
9. 1 x 380V 3 phase induction motor
10. 5 x 20mm saddles
11. 1.5m x 20mm² conduit pipe
12. 6 x 20mm² male bushes
13. 6 x 20mm² female bushes

14. 6m x 1.5mm² red cable
15. 3.5m x 1.5mm² black cable
16. 4m x 2.5mm² red cable
17. 1.5m x 2.5mm² earth cable
18. 20 x $\frac{3}{4}$ " self-tapping screws

Task 9: INSTALLATION OF A RESISTOR STARTER OF AN A.C MOTOR

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire a resistor starter control circuit of an AC motor from the given specifications. This should include ▪ Mounting a contactor box ▪ Installing and terminate Conduit pipes using couplings and bushes ▪ Making 90° bends without kinks ▪ Making Offsets ▪ Mounting saddles ▪ Wiring a control circuit ▪ Terminating cables neatly	☐	☐	☐	☐	☐	☐
	b) Wiring a resistor starter power circuit of an AC motor from the given specifications. This should include ▪ Using the right cable size for a power circuit ▪ Terminating cables neatly ▪ Connecting the motor in star or delta	☐	☐	☐	☐	☐	☐
	c) Carry out tests a resistor starter circuit of an AC motor using the right test instrument ▪ Continuity test on components, control and power circuits ▪ Polarity test on control circuit ▪ Insulation resistance test on the motor	☐	☐	☐	☐	☐	☐

Examiner's comments:

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Learner's Name:.....

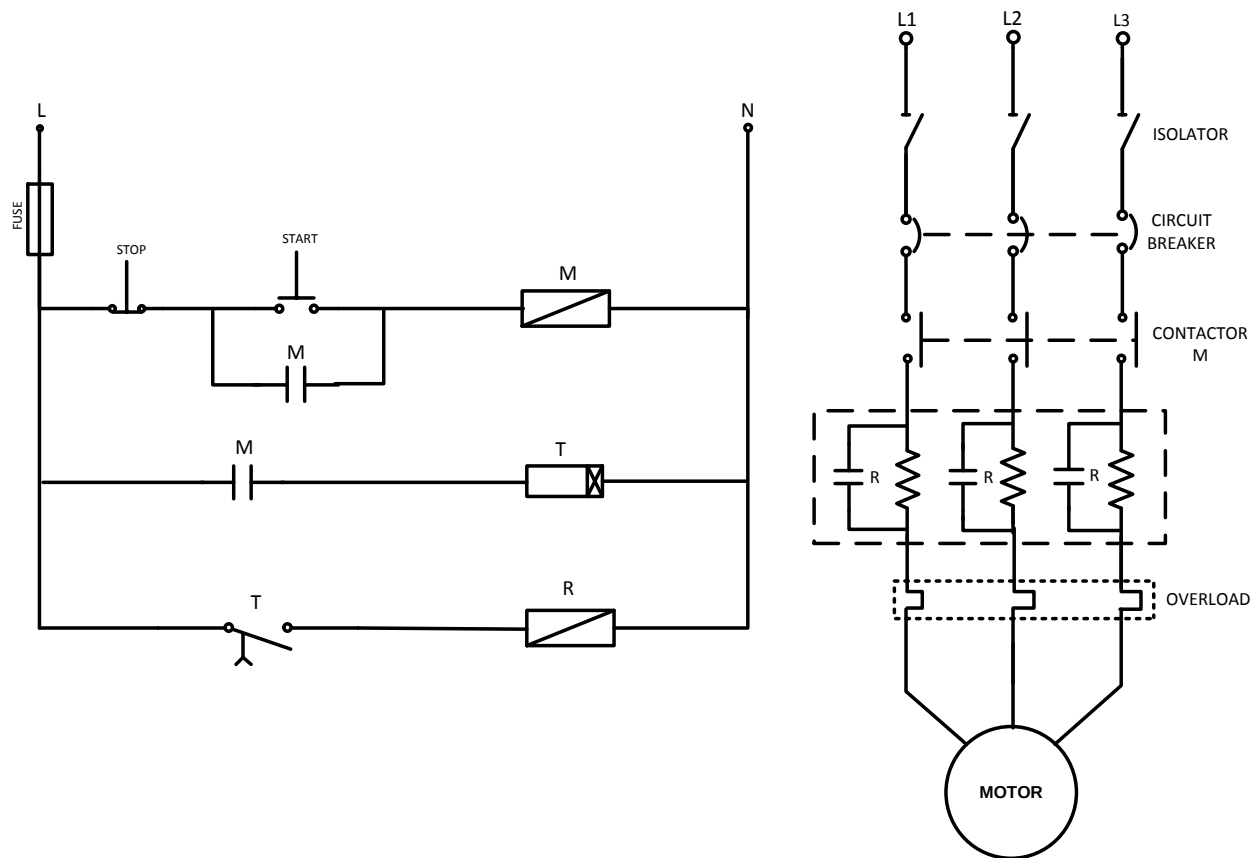
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Task 9: RESISTOR STARTER OF AN A.C MOTOR – CONTROL AND POWER CIRCUIT



MATERIAL LIST

1. 1 x contactor box
2. 1 x control fuse or 5A MCB
3. 1 x push button box to accommodate two push buttons
4. 2 x 220V – 240V Contactor with 5N/O and 1N/C
5. 1 x on delay timer (TDOE) with 1 N/O and 1N/O
6. 1 x start push button
7. 1 x stop push button
8. 1 x overload to suit size of motor
9. 1 x 380V 3 phase induction motor
10. 5 x 20mm saddles

11. 1.5m x 20mm² conduit pipe
12. 6 x 20mm² male bushes
13. 6 x 20mm² female bushes
14. 6m x 1.5mm² red cable
15. 3.5m x 1.5mm² black cable
16. 4m x 2.5mm² red cable
17. 1.5m x 2.5mm² earth cable
18. 20 x 3/4" self-tapping screws
19. 3 x Resistors

Task 10: INSTALLATION OF A REACTOR (CHOKE) STARTER OF AN AC MOTOR

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire a reactor starter control circuit of an AC motor from the given specifications. This should include ▪ Mounting a contactor box ▪ Installing and terminate Conduit pipes using couplings and bushes ▪ Making 90° bends without kinks ▪ Making Offsets ▪ Mounting saddles ▪ Wiring a control circuit ▪ Terminating cables neatly	☐	☐	☐	☐	☐	☐
	b) Wiring a reactor starter power circuit of an AC motor from the given specifications. This should include ▪ Using the right cable size for a power circuit ▪ Terminating cables neatly ▪ Connecting the motor in star or delta	☐	☐	☐	☐	☐	☐
	c) Carry out tests a reactor starter circuit of an AC motor using the right test instrument ▪ Continuity test on components, control and power circuits ▪ Polarity test on control circuit ▪ Insulation resistance test on the motor	☐	☐	☐	☐	☐	☐

Examiner's comments:

Examiner Name:.....

Learner's Name:.....

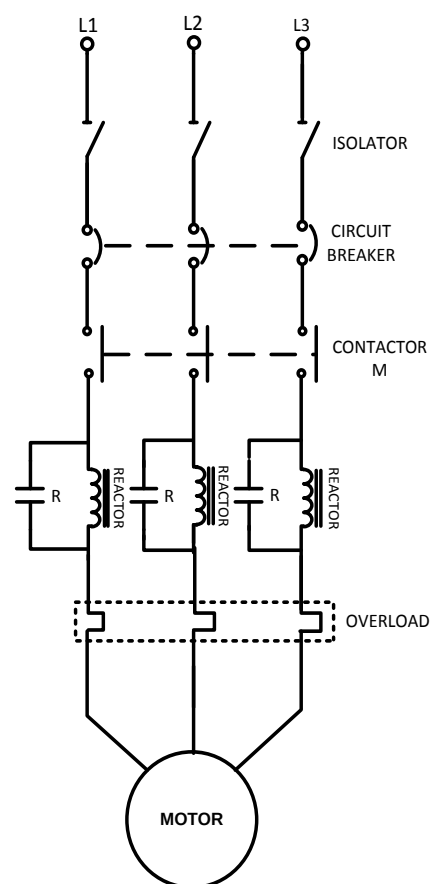
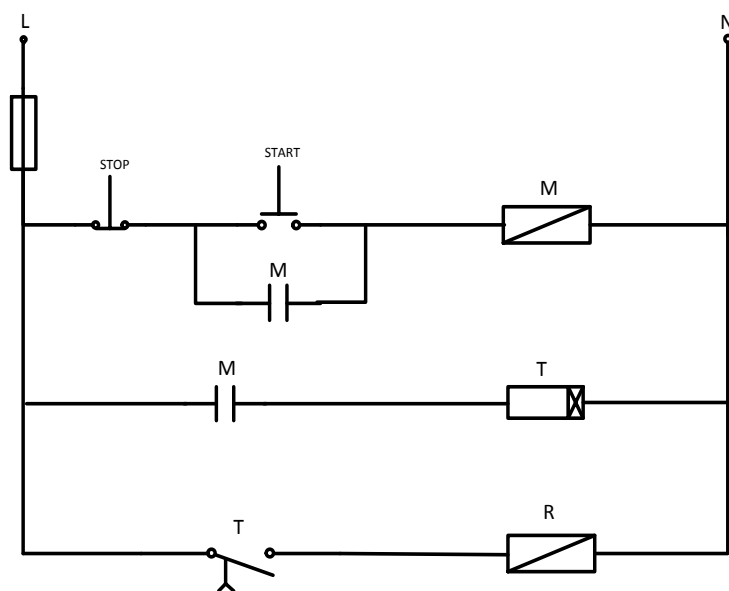
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Task 10: REACTOR (CHOKE) STARTER OF AN A.C MOTOR – CONTROL AND POWER CIRCUIT



MATERIAL LIST

1. 1 x contactor box
2. 1 x control fuse or 5A MCB
3. 1 x push button box to accommodate two push buttons
4. 2 x 220V – 240V Contactor with 5N/O and 1N/C
5. 1 x on delay timer (TDOE) with 1 N/O and 1N/C
6. 1 x start push button
7. 1 x stop push button
8. 1 x overload to suit size of motor
9. 1 x 380V 3 phase induction
10. 5 x 20mm saddles

11. 1.5m x 20mm² conduit pipe
12. 6 x 20mm² male bushes
13. 6 x 20mm² female bushes
14. 6m x 1.5mm² red cable
15. 3.5m x 1.5mm² black cable
16. 4m x 2.5mm² red cable
17. 1.5m x 2.5mm² earth cable
18. 20 x ¾" self-tapping screws
19. 3 x reactors (choke)

Task 11: INSTALLATION OF A FLOAT SWITCH CONTROL OF A PUMP

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire a float switch control circuit of a pump from the given specifications. This should include ▪ Mounting a contactor box ▪ Installing and terminate Conduit pipes using couplings and bushes ▪ Making 90° bends without kinks ▪ Making Offsets ▪ Mounting saddles ▪ Wiring a control circuit ▪ Terminating cables neatly	☐	☐	☐	☐	☐	☐
	b) Wiring a float switch power circuit of a pump from the given specifications. This should include ▪ Using the right cable size for a power circuit ▪ Terminating cables neatly ▪ Connecting the motor in star or delta	☐	☐	☐	☐	☐	☐
	c) Carry out tests a float switch circuit of a pump using the right test instrument ▪ Continuity test on components, control and power circuits ▪ Polarity test on control circuit ▪ Insulation resistance test on the motor	☐	☐	☐	☐	☐	☐

Examiner's comments:

Examiner Name:.....

Learner's Name:.....

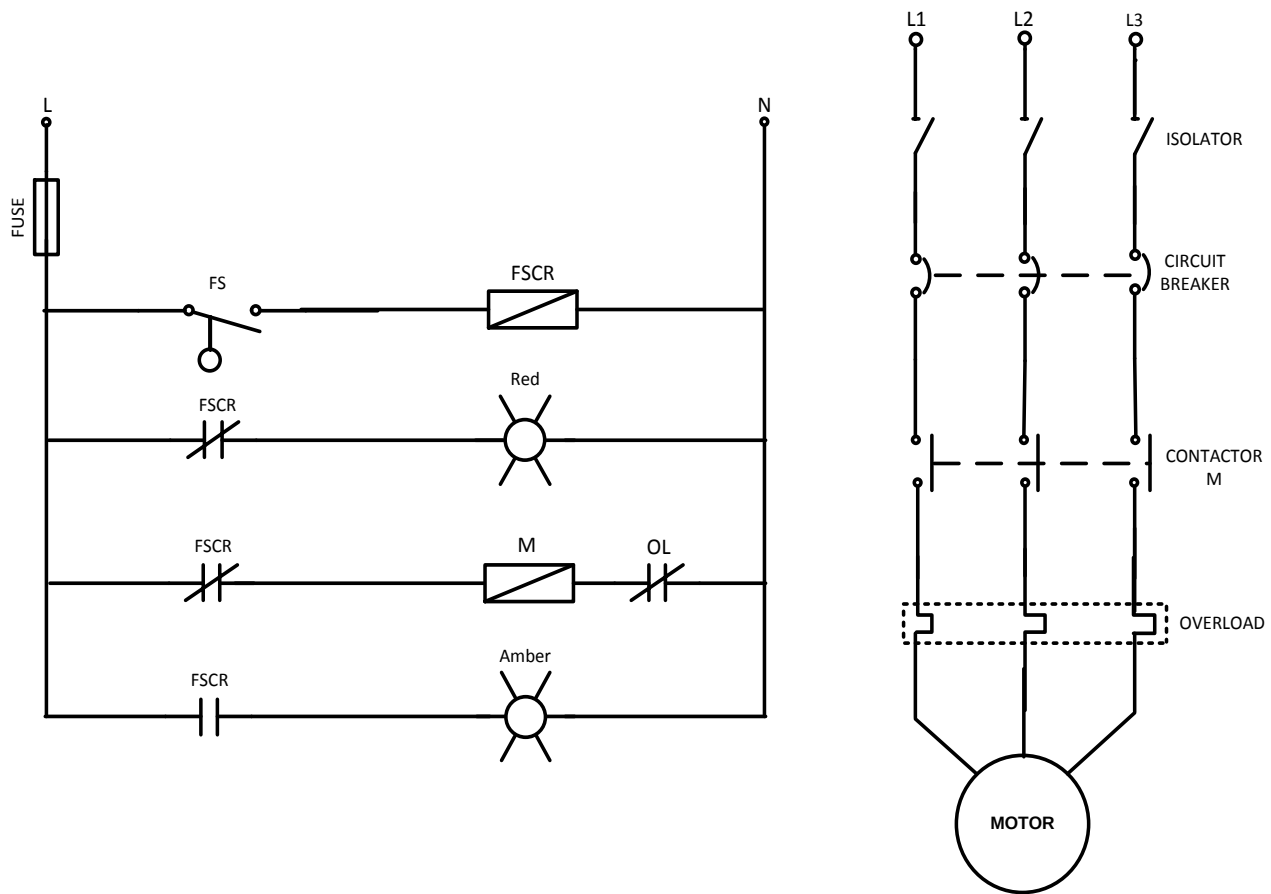
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Task 11: FLOAT SWITCH CONTROL OF A PUMP – CONTROL AND POWER CIRCUIT



MATERIAL LIST

1. 1 x contactor box
2. 1 x control fuse or 5A MCB
3. 1 x push button box to accommodate two push buttons
4. 2 x 220V – 240V Contactor with 5N/O and 1N/C
5. 1 x float switch
6. 2 x lamp holders
7. 2 x indicator lamps
8. 1 x overload to suit size of motor
9. 1 x 380V 3 phase induction
10. 5 x 20mm saddles
11. 1.5m x 20mm² conduit pipe
12. 6 x 20mm² male bushes

13. 6 x 20mm² female bushes
14. 6m x 1.5mm² red cable
15. 3.5m x 1.5mm² black cable
16. 4m x 2.5mm² red cable
17. 1.5m x 2.5mm² earth cable
18. 20 x 3/4" self-tapping screws

Task 12: INSTALLATION OF A SINGLE PUMP USING A SELECTOR SWITCH

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire a single pump incorporating a selector switch the given specifications. This should include ▪ Mounting a contactor box ▪ Installing and terminate Conduit pipes using couplings and bushes ▪ Making 90° bends without kinks ▪ Making Offsets ▪ Mounting saddles ▪ Wiring a control circuit ▪ Terminating cables neatly	☐	☐	☐	☐	☐	☐
	b) Wire a single pump incorporating a selector switch from the given specifications. This should include ▪ Using the right cable size for a power circuit ▪ Terminating cables neatly ▪ Connecting the motor in star or delta	☐	☐	☐	☐	☐	☐
	c) Carry out tests on a single pump incorporating a selector switch using the right test instrument ▪ Continuity test on components, control and power circuits ▪ Polarity test on control circuit ▪ Insulation resistance test on the motor	☐	☐	☐	☐	☐	☐

Examiner's comments:

Examiner Name:.....

Learner's Name:.....

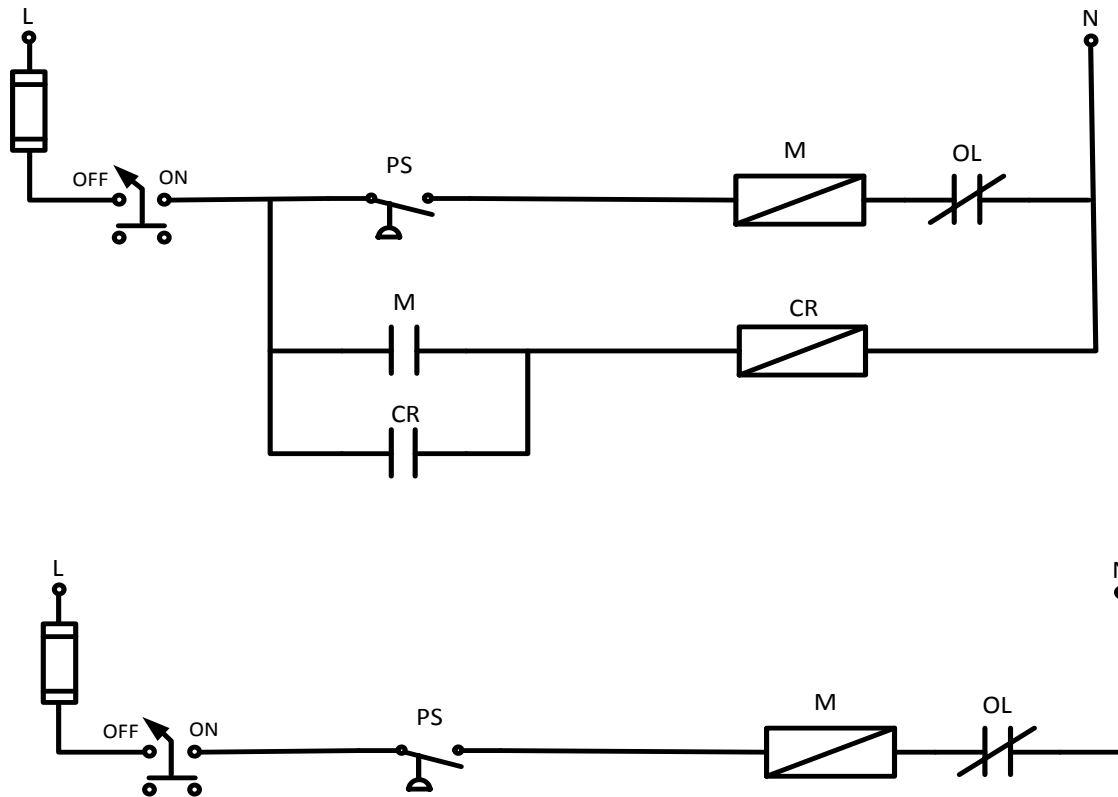
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Date:.....

Task 12: OPERATION OF A SINGLE PUMP USING A SELECTOR SWITCH



MATERIAL REQUIRED

1. 1 x contactor box
2. 1 x control fuse or 5A MCB
3. 1 x push button box to accommodate two push buttons
4. 2 x 220V – 240V Contactor with 5N/O and 1N/C
5. 1 x selector switch/ change over switch
6. 1 x pressure switch
7. 1 x overload to suit size of motor
8. 1 x 380V 3 phase induction motor/pump
9. 5 x 20mm saddles
10. 1.5m x 20mm² conduit pipe
11. 6 x 20mm² male bushes
12. 6 x 20mm² female bushes

13. 6m x 1.5mm² red cable
14. 3.5m x 1.5mm² black cable
15. 4m x 2.5mm² red cable
16. 1.5m x 2.5mm² earth cable
17. 20 x 3/4" self-tapping screws

Task 13: INSTALLATION OF TWO PUMPS USING A SELECTOR SWITCH

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire two pumps incorporating a selector switch the given specifications. This should include ▪ Mounting a contactor box ▪ Installing and terminate Conduit pipes using couplings and bushes ▪ Making 90° bends without kinks ▪ Making Offsets ▪ Mounting saddles ▪ Wiring a control circuit ▪ Terminating cables neatly	☐	☐	☐	☐	☐	☐
	b) Wire two pumps incorporating a selector switch from the given specifications. This should include ▪ Using the right cable size for a power circuit ▪ Terminating cables neatly ▪ Connecting the motor in star or delta	☐	☐	☐	☐	☐	☐
	c) Carry out tests on two pumps incorporating a selector switch using the right test instrument ▪ Continuity test on components, control and power circuits ▪ Polarity test on control circuit ▪ Insulation resistance test on the motor	☐	☐	☐	☐	☐	☐

Examiner's comments:

Examiner Name:.....

Learner's Name:.....

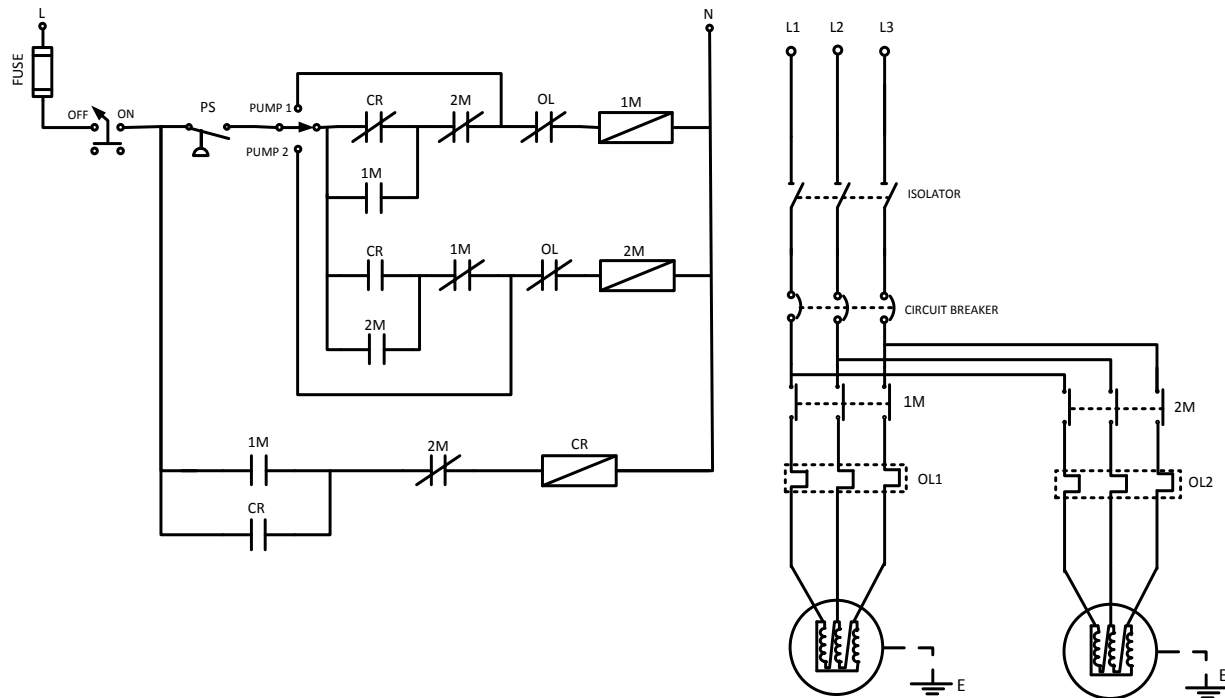
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Task 13: OPERATING TWO PUMPS USING SELECTOR SWITCH



MATERIAL LIST

1. 1 x contactor box
2. 1 x control fuse or 5A MCB
3. 1 x push button box to accommodate two push buttons
4. 3 x 220V – 240V Contactor with 5N/O and 1N/C
5. 1 x pressure switch
6. 1 x selector switch
7. 1 x change over switch
8. 2 x overload to suit size of motor
9. 2 x 380V 3 phase induction motor
10. 5 x 20mm saddles
11. 1.5m x 20mm² conduit pipe
12. 6 x 20mm² male bushes
13. 6 x 20mm² female bushes
14. 6m x 1.5mm² red cable

- 15. 3.5m x 1.5mm² black cable
- 16. 4m x 2.5mm² red cable
- 17. 1.5m x 2.5mm² earth cable
- 18. 20 x 3/4" self-tapping screws

Task 14: INSTALLATION OF A VARIABLE FREQUENCY DRIVE (VFD) CONTROLLER FOR A 3 PHASE MOTOR

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire a variable frequency drive (VFD) controller for a 3 phase motor according to the given specifications. This should include ▪ Mounting a contactor box ▪ Installing and terminate Conduit pipes using couplings and bushes ▪ Making 90° bends without kinks ▪ Making Offsets ▪ Mounting saddles ▪ Wiring a control circuit ▪ Terminating cables neatly	☐	☐	☐	☐	☐	☐
	b) Wire a variable frequency drive (VFD) controller for a 3 phase motor from the given specifications. This should include ▪ Using the right cable size for a power circuit ▪ Terminating cables neatly ▪ Connecting the motor correctly in star or delta	☐	☐	☐	☐	☐	☐
	c) Carry out tests on a variable frequency drive (VFD) controller for a 3 phase motor using the right test instrument ▪ Continuity test on components, control and power circuits ▪ Polarity test on control circuit ▪ Insulation resistance test on the motor	☐	☐	☐	☐	☐	☐

Examiner's comments:

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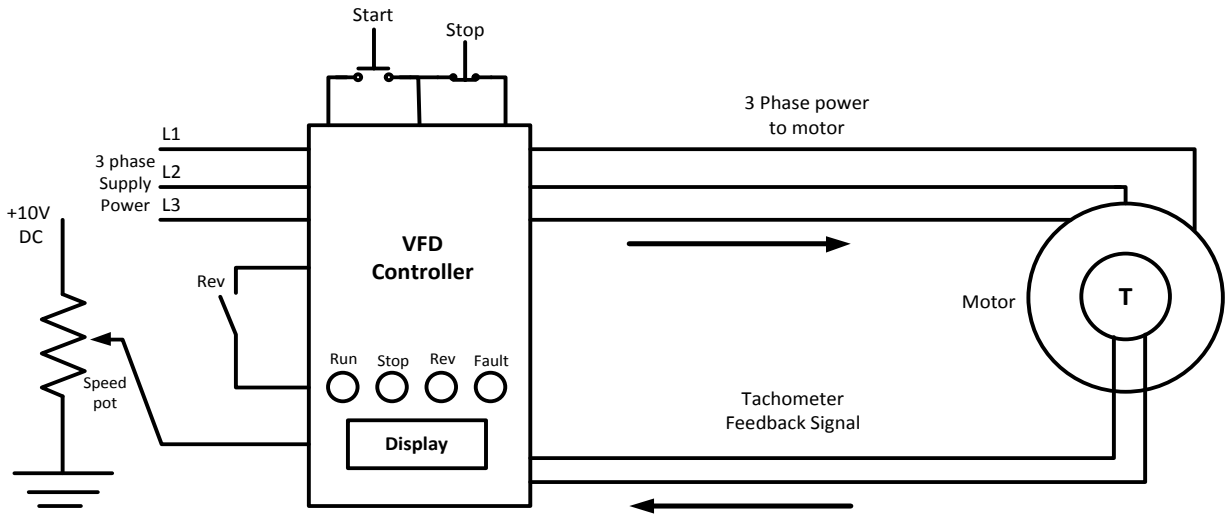
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Task 14: VARIABLE FREQUENCY DRIVES (VFD) CONTROLLER FOR A 3 PHASE MOTOR



MATERIAL LIST

1. 1 x push button box to accommodate two push buttons
2. 1 x VFD controller
3. 1 x start push button
4. 1 x stop push button
5. 1 x overload to suit size of motor
6. 1 x 380V 3 phase induction
7. 5 x 20mm saddles
8. 1.5m x 20mm² conduit pipe
9. 6 x 20mm² male bushes
10. 6 x 20mm² female bushes
11. 6m x 1.5mm² red cable
12. 3.5m x 1.5mm² black cable
13. 4m x 2.5mm² red cable
14. 1.5m x 2.5mm² earth cable
15. 20 x 3/4" self-tapping screws
16. 1 x Contactor box

Task 15: INSTALLATION OF A DC MOTOR STARTER WITH A CURRENT LIMITING RESISTOR

No	Activity	Satisfactory			Not Satisfactory		
		Attempts			Attempts		
	During observation of work activities, the candidate demonstrated that they can:	1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire a dc motor starter with a current limiting resistor from the given specifications. This should include ▪ Mounting a contactor box ▪ Installing and terminate Conduit pipes using couplings and bushes ▪ Making 90° bends without kinks ▪ Making Offsets ▪ Mounting saddles ▪ Wiring a control circuit ▪ Terminating cables neatly	☐	☐	☐	☐	☐	☐
	b) Wire a dc motor starter with a current limiting resistor from the given specifications. This should include ▪ Using the right cable size for a power circuit ▪ Terminating cables neatly ▪ Connecting the motor in star or delta	☐	☐	☐	☐	☐	☐

	c) Carry out tests on a dc motor starter with a current limiting resistor using the right test instrument ▪ Continuity test on components, control and power circuits ▪ Polarity test on control circuit ▪ Insulation resistance test on the motor	☐	☐	☐	☐	☐	☐	☐
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Examiner's comments:

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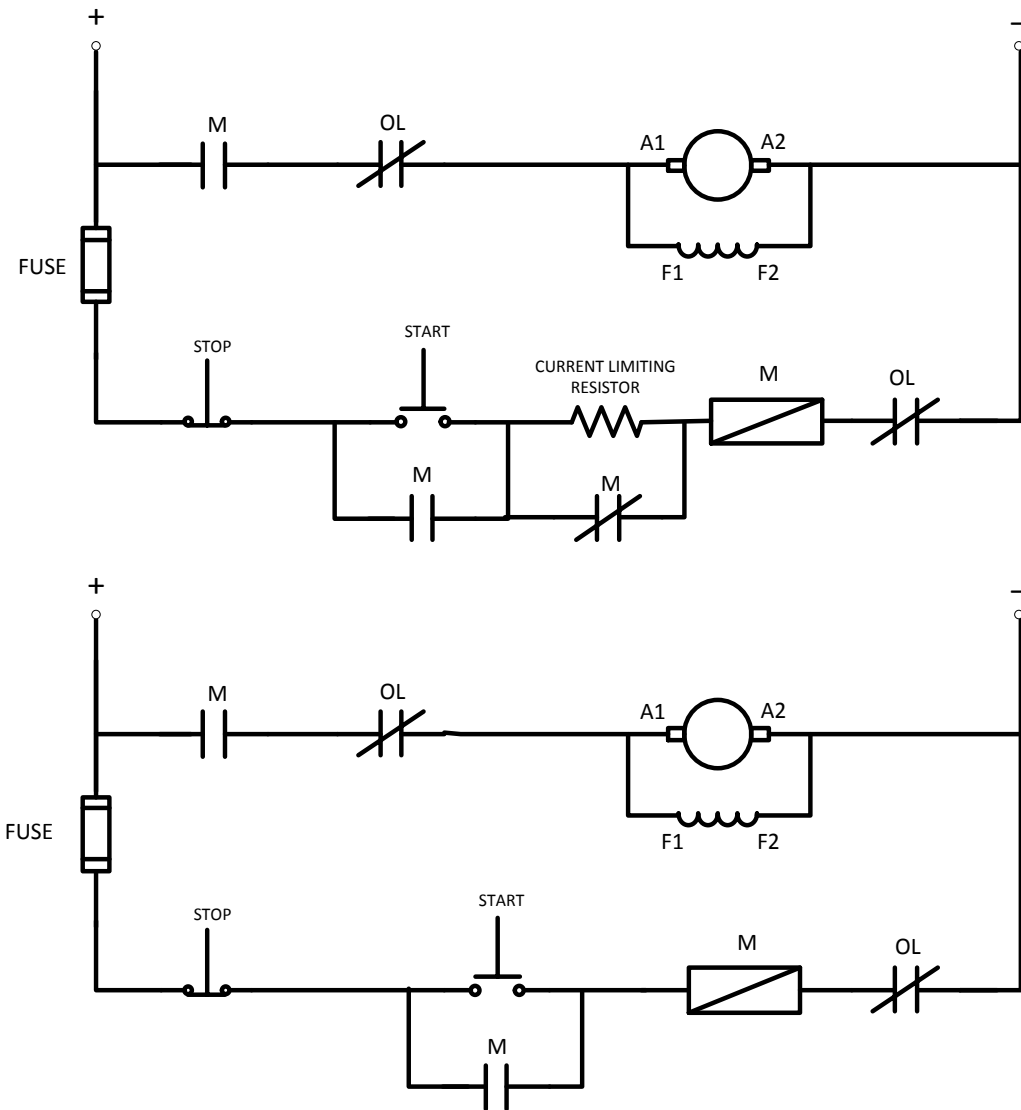
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Task 15: DC MOTOR STARTER WITH A CURRENT LIMITING RESISTOR



MATERIAL LIST

1. 1 x contactor box
2. 1 x control fuse or 5A MCB
3. 1 x push button box to accommodate two push buttons
4. 1 x 220V – 240V Contactor with 5N/O and 1N/C
5. 1 x current limiting resistor
6. 1 x start push button

7. 1 x stop push button
8. 1 x overload to suit size of motor
9. 1 x dc shunt motor
10. 5 x 20mm saddles
11. 1.5m x 20mm² conduit pipe
12. 6 x 20mm² male bushes
13. 6 x 20mm² female bushes
14. 6m x 1.5mm² red cable
15. 3.5m x 1.5mm² black cable
16. 4m x 2.5mm² red cable
17. 1.5m x 2.5mm² earth cable
18. 20 x $\frac{3}{4}$ " self-tapping screws

Task 16: INSTALLATION OF A DC SERIES MOTOR WITH A TIME DELAY ON STARTING

No	Activity	Satisfactory	Not Satisfactory
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		Attempts			Attempts		
		1 st	2 nd	3 rd	1 st	2 nd	3 rd
During observation of work activities, the candidate demonstrated that they can:							
	a) Wire a dc series motor with a time delay on starting from the given specifications. This should include ▪ Mounting a contactor box ▪ Installing and terminate Conduit pipes correctly using couplings and bushes ▪ Making 90° bends without kinks ▪ Making Offsets ▪ Mounting saddles ▪ Wiring a control circuit ▪ Terminating cables neatly	☐	☐	☐	☐	☐	☐
	b) Wire a dc series motor with a time delay on starting from the given specifications. This should include ▪ Using the right cable size for a power circuit ▪ Terminating cables neatly ▪ Connecting the motor in star or delta	☐	☐	☐	☐	☐	☐

	c) Carry out tests a dc series motor with a time delay on starting using the right test instrument ▪ Continuity test on components, control and power circuits ▪ Polarity test on control circuit ▪ Insulation resistance test on the motor	☐	☐	☐	☐	☐	☐
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Examiner`s comments:

Examiner Name:.....

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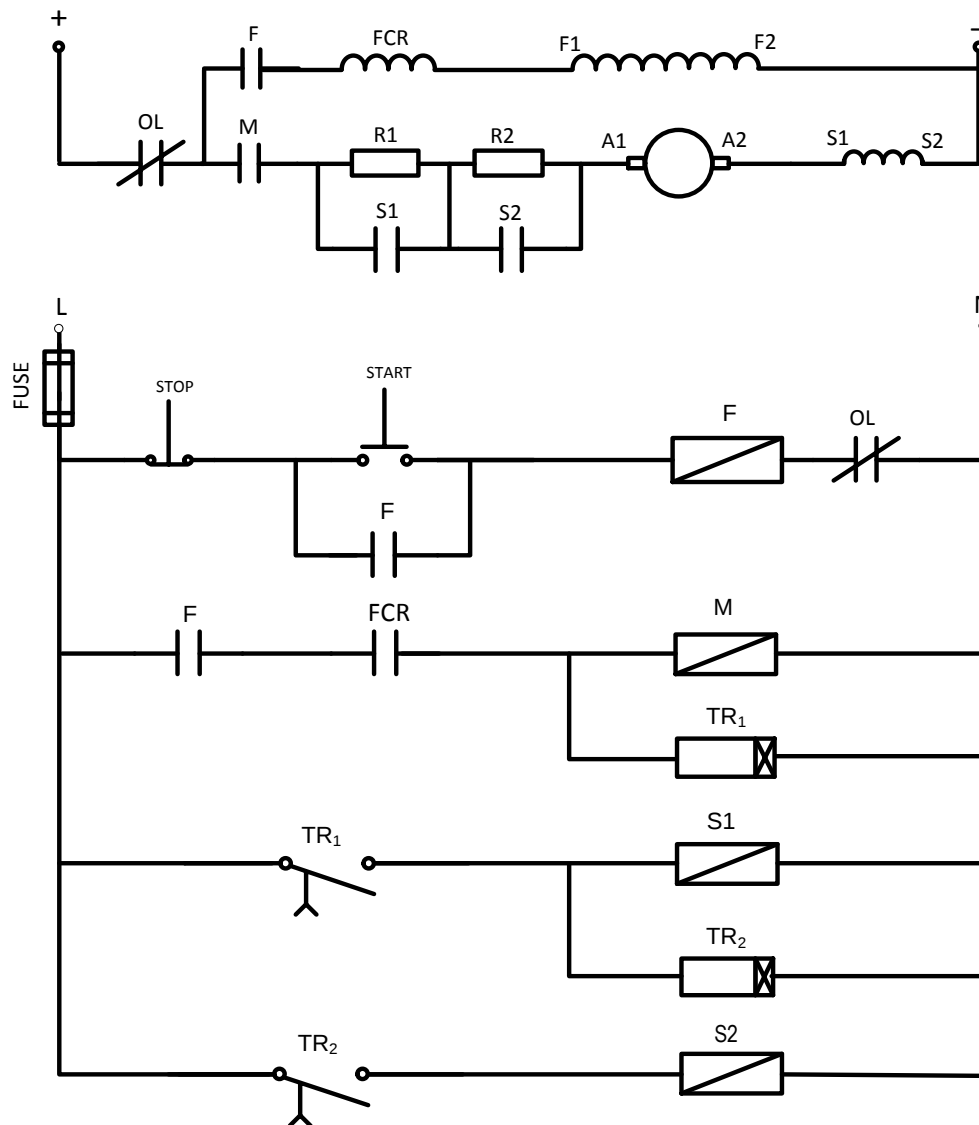
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Task 16: D.C SERIES MOTOR WITH TIME DELAY STARTER



MATERIAL LIST

1. 1 x contactor box
2. 1 x control fuse or 5A MCB
3. 1 x push button box to accommodate two push buttons
4. 4 x 220V – 240V Contactor with 5N/O and 1N/C
5. 2 x on delay timer (TDOE) with 1 N/O and 1N/O
6. 1 x start push button

7. 1 x stop push button
8. 1 x overload to suit size of motor
9. 1 x dc series motor
10. 5 x 20mm saddles
11. 1.5m x 20mm² conduit pipe
12. 6 x 20mm² male bushes
13. 6 x 20mm² female bushes
14. 6m x 1.5mm² red cable
15. 3.5m x 1.5mm² black cable
16. 4m x 2.5mm² red cable
17. 1.5m x 2.5mm² earth cable
18. 20 x $\frac{3}{4}$ " self-tapping screws

Task 17: WIRING OF AN ELECTRONIC POWER SUPPLY CIRCUIT

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire an electronic power supply circuit from the given specifications. This should include ▪ Soldering components on circuit boards ▪ Using an oscilloscope to measure and observe output waveforms from rectifiers and filters ▪ Using a voltmeter to measure the regulated output voltages	☐	☐	☐	☐	☐	☐
	b) Carry out tests on an electronic power supply circuit using the right test instrument. This should include ▪ Continuity test on components and circuit ▪ Polarity test	☐	☐	☐	☐	☐	☐

Examiner's comments:

Examiner Name:.....

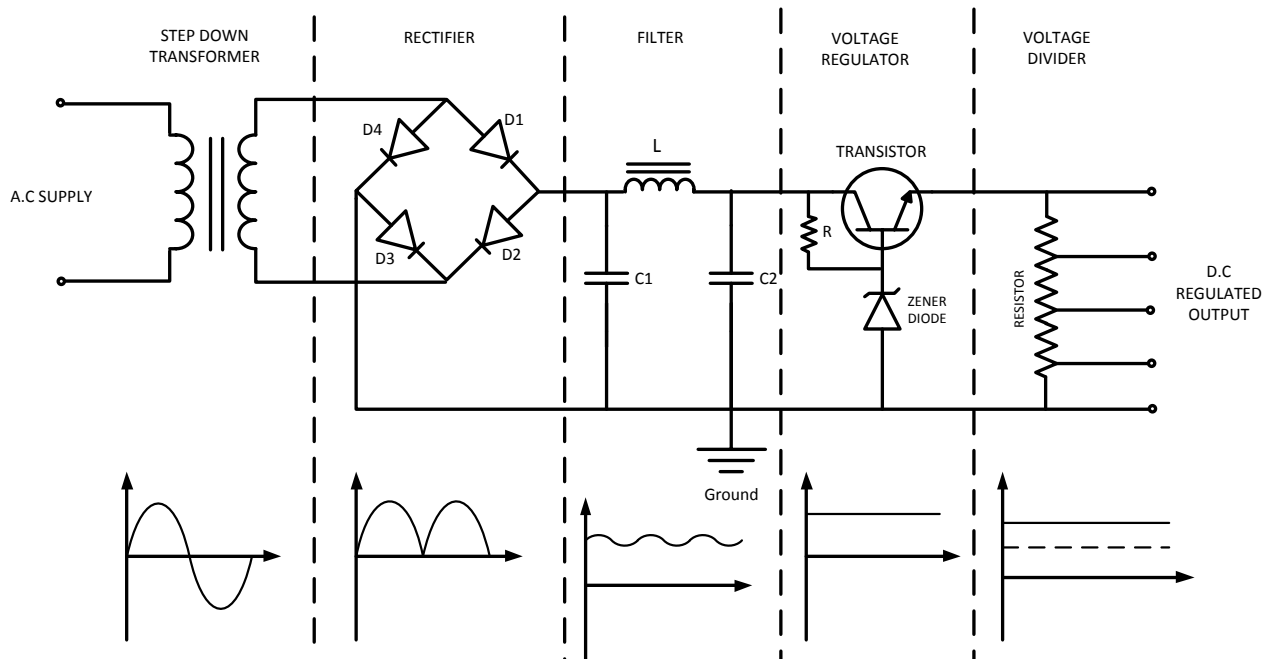
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Date:..... Date:.....

Task 17: ELECTRONIC POWER SUPPLY CIRCUIT



MATERIAL LIST

1. 1 x step down transformer, 240V to 9V
2. 4 x junction diodes
3. 1 x choke or inductor
4. 2 x capacitors
5. 1 x transistors
6. 1 x Zener diode
7. 1 x current limiting resistor
8. 1 x oscilloscope
9. 1 x voltmeter

Task 18: INSTALLATION OF A 3 POINT FACE PLATE STARTER

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire a 3-point face plate starter of a dc motor from the given specifications. This should include ▪ Mounting the face plate starter ▪ Wiring the starter ▪ Terminating the cables neatly	☐	☐	☐	☐	☐	☐
	b) Carry out tests on a 3-point face plate starter using the right test instrument. This should include ▪ Continuity test on components, control and power circuits ▪ Polarity test on control circuit ▪ Insulation resistance test on the motor	☐	☐	☐	☐	☐	☐

Examiner's comments:

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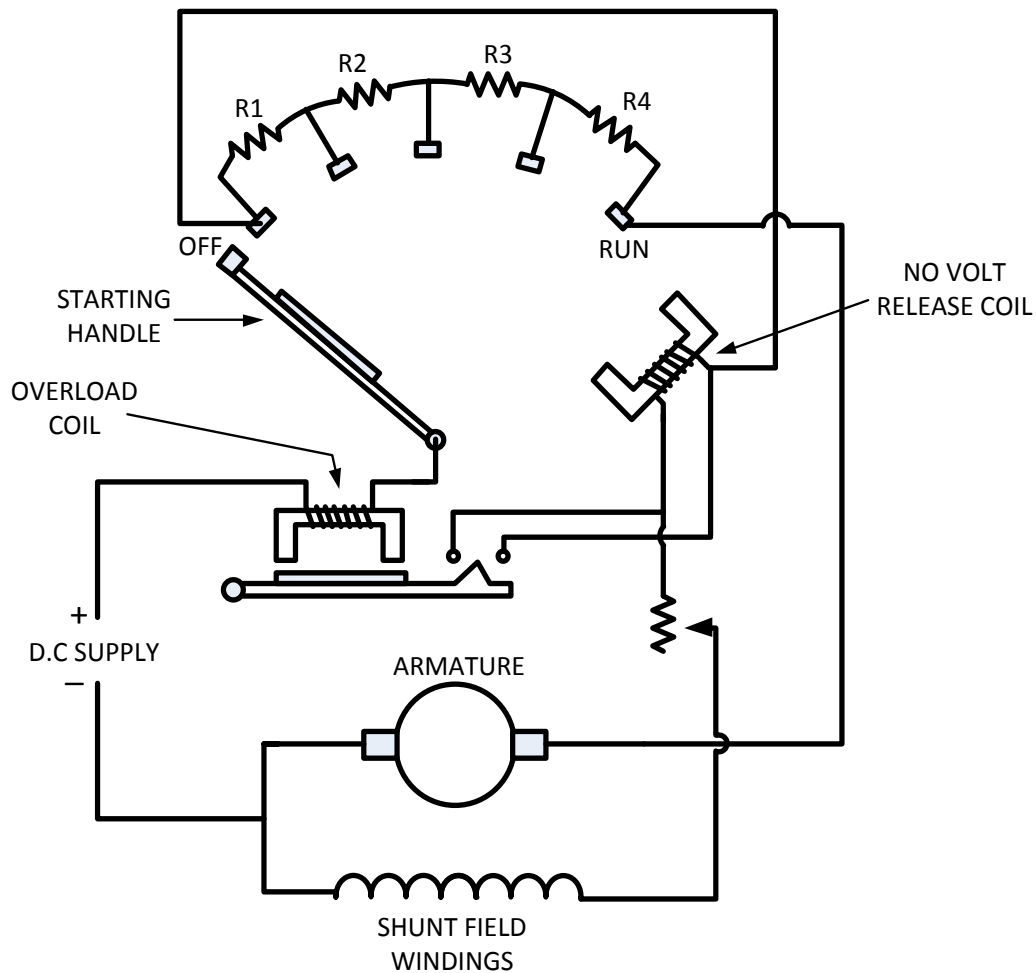
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Date:..... Date:.....

Task 18: THREE (3) POINT FACE PLATE STARTER



MATERIAL LIST

1. 1 x face plate starter
2. 1 x control fuse or 5A MCB
3. 1 x dc shunt or compound motor
14. 6m x 1.5mm² red cable
15. 3.5m x 1.5mm² black cable
16. 4m x 2.5mm² red cable
17. 1.5m x 2.5mm² earth cable

18. 15 x $\frac{3}{4}$ " self-tapping screws

Task 19: WIRING OF A CHOKE INPUT OR LC FILTER AND A CAPACITOR FILTER CIRCUIT

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire a choke input or LC filter and a capacitor filter circuit from the given specifications. This should include ▪ Soldering components on circuit boards ▪ Using an oscilloscope to measure and observe output waveforms from rectifiers and filters ▪ Using a voltmeter to measure the regulated output voltages correctly	☐	☐	☐	☐	☐	☐
	b) Carry out tests on a choke input or LC filter and a capacitor filter circuit using the right test instrument. This should include ▪ Continuity test on components and circuit ▪ Polarity test	☐	☐	☐	☐	☐	☐

Examiner's comments:

Examiner Name:.....

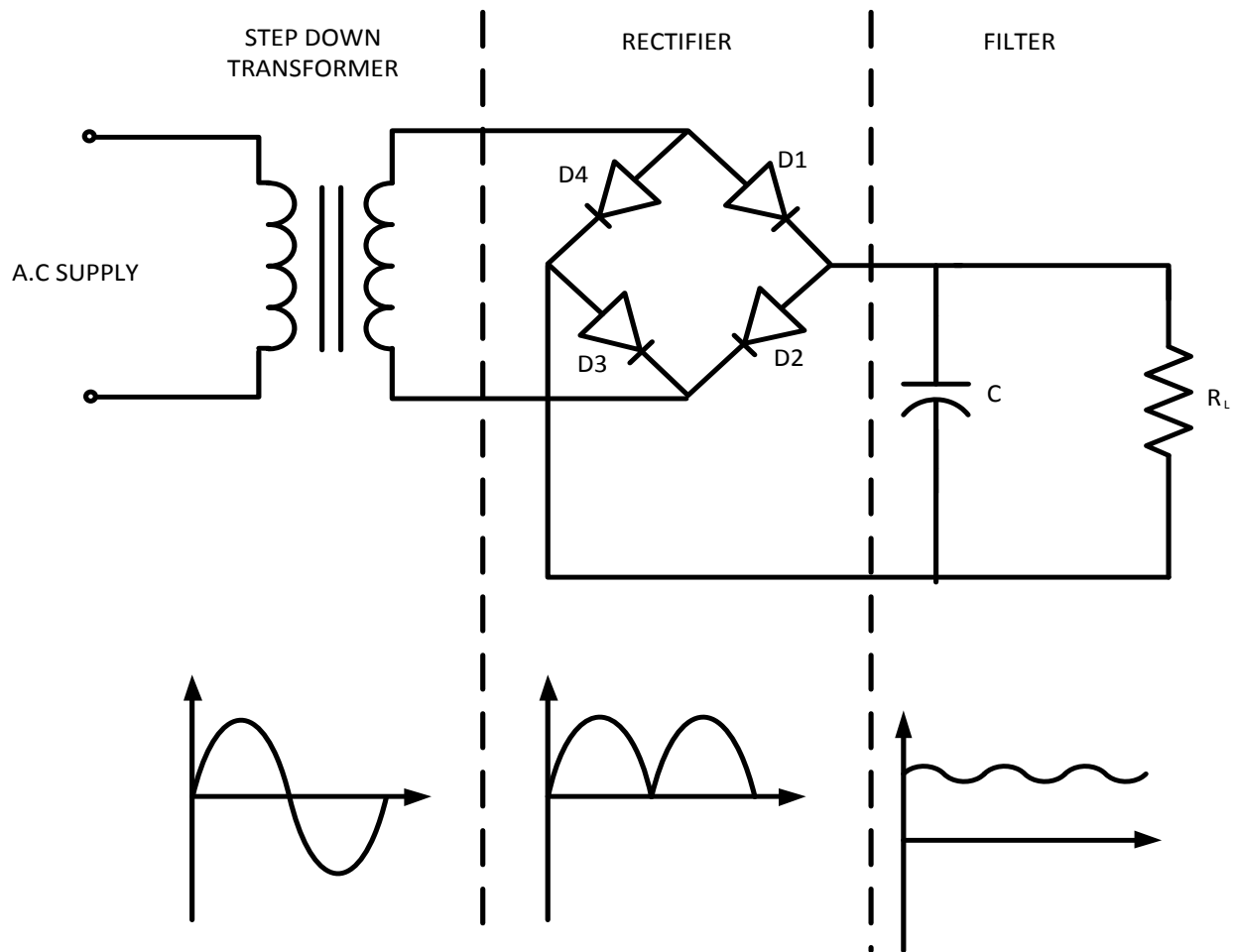
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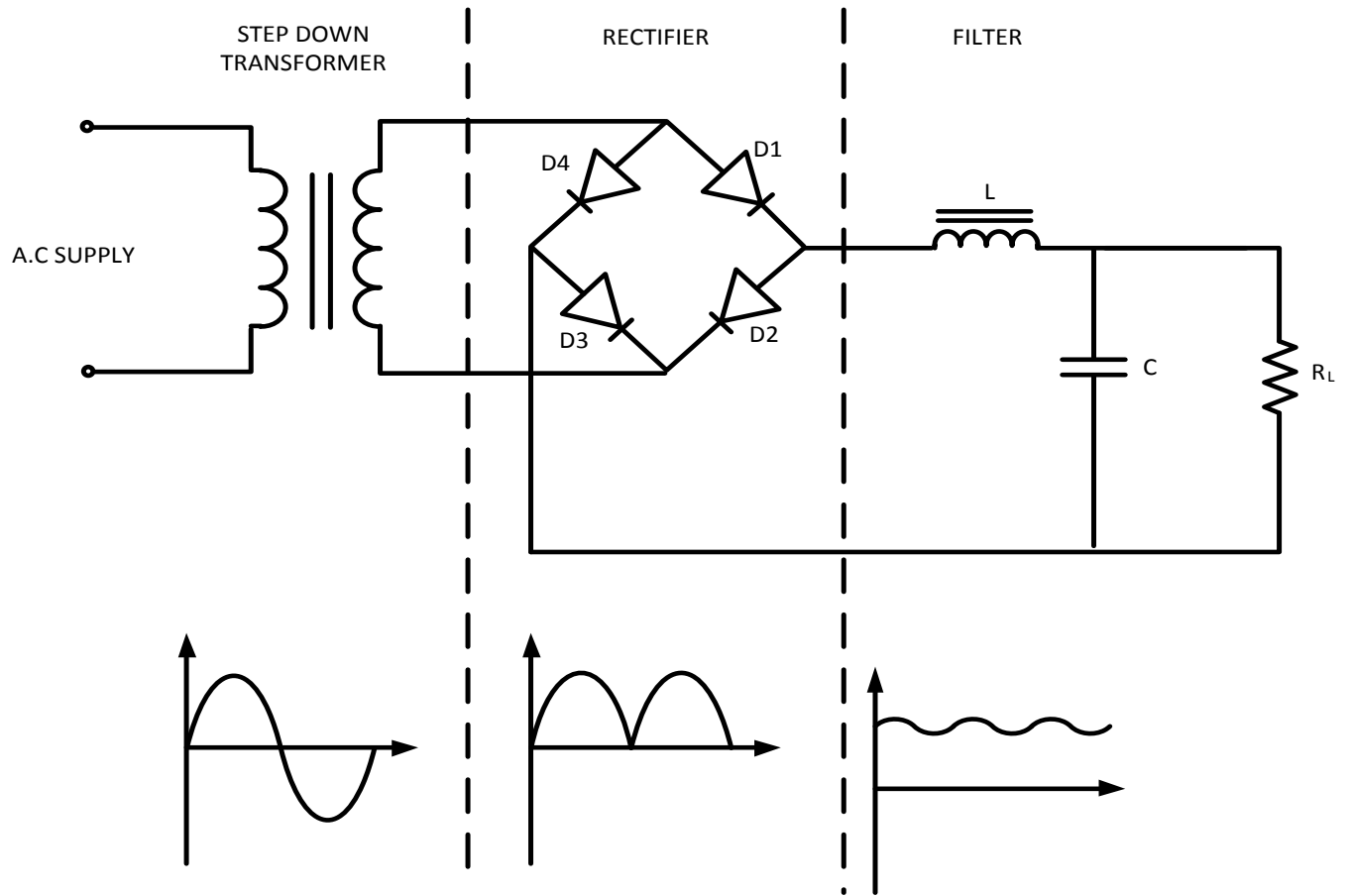
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Task 19: CAPACITOR FILTER CIRCUIT



CHOKE INPUT OR LC FILTER



MATERIAL LIST

1. 1 x step down transformer, 240V to 9V
2. 4 x junction diodes
3. 1 x choke or inductor
4. 1 x capacitors
5. 1 x Resistor
6. 1 x oscilloscope
7. 1 x voltmeter

Task 20: WIRING A CAPACITOR FILTER CIRCUIT WITH A CENTRE TAPPED TRANSFORMER

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire a capacitor filter circuit with a centre tapped transformer from the given specifications. This should include ▪ Soldering components on circuit boards ▪ Using an oscilloscope to measure and observe output waveforms from rectifiers and filters ▪ Using a voltmeter to measure the regulated output voltages correctly	☐	☐	☐	☐	☐	☐
	b) Carry out tests on a capacitor filter circuit with a centre tapped transformer using the right test instrument. This should include ▪ Continuity test on components and circuit ▪ Polarity test	☐	☐	☐	☐	☐	☐

Examiner's comments:

Examiner Name:.....

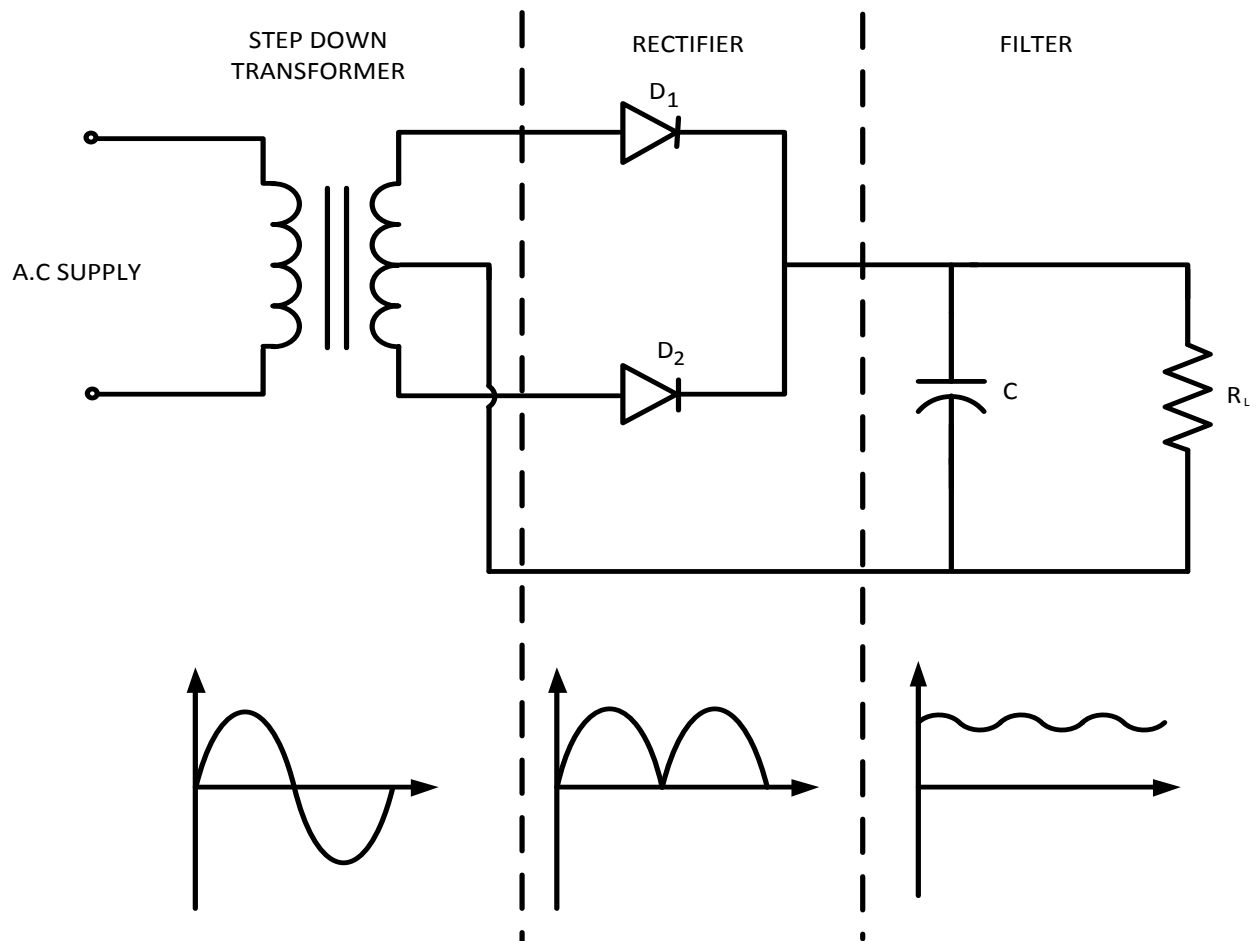
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Date:..... Date:.....

Task 20: CAPACITOR FILTER CIRCUIT INCORPORATING A CENTRE TAPPED TRANSFORMER



MATERIAL LIST

1. 1 x step down transformer, 240V to 9V
2. 2 x junction diodes
3. 1 x choke or inductor
4. 1 x capacitors
5. 1 x Resistor
6. 1 x oscilloscope
7. 1 x voltmeter

Task 21: CIRCUIT DESIGNING

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Design control circuits correctly according to given specifications ▪ Drawing paper prepared neatly and correctly ▪ Direct on line local and remote control circuit (fuse/MCB, start push button, stop push button, overload, contactor, indicator lamps) ▪ Direct on line jogging control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamps) ▪ Forward and reverse control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamp) ▪ Forward and reverse local and remote control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamp) ▪ Forward and reverse jogging control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamp) ▪ Forward and reverse semi-automatic control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamp) ▪ Sequential semi-automatic control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamp)	☐	☐	☐	☐	☐	☐
	b) Design power circuits correctly according to given specifications ▪ Direct on line local and remote power circuit (isolator, MCB, overload, contactor, motor)	☐	☐	☐	☐	☐	☐

	▪ Direct on line jogging power circuit (isolator, MCB, overload, contactor, motor) ▪ Forward and reverse power circuit (isolator, MCB, contactors, motor) ▪ Forward and reverse local and remote power circuit (isolator, MCB, overload, contactors, motor) ▪ Forward and reverse jogging power circuit (isolator, MCB, overload, contactors, motor) ▪ Forward and reverse semi-automatic power circuit (isolator, MCB, overload, contactors, motor) ▪ Sequential semi-automatic power circuit (isolator, MCB, overload, contactors, motor)						
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Examiner's comments:

Examiner Name:.....

Learner's Name:.....

Signed:.....

Signed:.....

Date:.....

Date:.....

MATERIALS LIST

1. 1 x A4 plain paper
2. 1 x A3 plain paper
3. Drawing instruments

Task 22: CIRCUIT DESIGNING

No	Activity	Satisfactory			Not Satisfactory		
		Attempts			Attempts		
		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	During observation of work activities, the candidate demonstrated that they can:						
	a) Design control circuits correctly according to given specifications ▪ Drawing paper prepared neatly and correctly ▪ Star-delta manual control circuit (fuse/MCB, start push button, double acting push button, stop push button, overload, contactor and indicator lamps) ▪ Star-delta semi-automatic control circuit (fuse/MCB, start push button, on delay timer, stop push button, overload, contactor and indicator lamps) ▪ Star-delta forward and reverse control circuit (fuse/MCB, start push button, on delay timer, stop push button, overload, contactor and indicator lamps) ▪ An auto transformer control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamps) ▪ A wound rotor motor starter control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamps) ▪ A synchronous control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamps) ▪ Manual plugging of AC control circuit (fuse/MCB, start push button, double acting push button, stop push button, overload, contactor and indicator lamps)	☐	☐	☐	☐	☐	☐

	b) Design power circuits correctly according to given specifications ▪ Star-delta manual power circuit (isolator, MCB, overload, contactors, motor) ▪ Star-delta semi-automatic power circuit (isolator, MCB, overload, contactors, motor) ▪ Star-delta Forward and reverse power circuit (isolator, MCB, overload, contactors, motor) ▪ An auto transformer power circuit (isolator, overload, auto transformer, MCB, contactors, motor) ▪ A wound rotor motor starter power circuit (isolator, MCB, overload, contactors, motor) ▪ A synchronous power circuit (isolator, MCB, overload, contactors, motor) ▪ Manual plugging of AC power circuit (isolator, MCB, overload, contactors, motor)	□	□	□	□	□	□
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Examiner's comments:

Examiner Name:.....

Learner's Name:.....

Signed:.....

Signed:.....

Date:.....

Date:.....

MATERIALS LIST

1. 1 x A4 plain paper
2. 1 x A3 plain paper
3. Drawing instruments

Task 23: CIRCUIT DESIGNING

No	Activity	Satisfactory			Not Satisfactory		
		Attempts			Attempts		
		1 st	2 nd	3 rd	1 st	2 nd	3 rd
During observation of work activities, the candidate demonstrated that they can:							
	a) Design control circuits correctly according to given specifications ▪ Drawing paper prepared neatly and correctly ▪ Dynamic braking of AC motor control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamps) ▪ Operator controlled plugging stop control circuit (fuse/MCB, start push button, on delay timer, stop push button, overload, contactor and indicator lamps) ▪ A float switch controlling a pump control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamps) ▪ A resistor starter of an AC motor control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamps) ▪ A DC motor starter with current limiting resistor control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamps) ▪ A 3 point face plate starter control circuit (fuse/MCB, face plate starter)	☐	☐	☐	☐	☐	☐

	b) Design power circuits correctly according to given specifications ▪ Dynamic braking of AC motor power circuit (isolator, MCB, overload, contactors, motor) ▪ Operator controlled plugging stop power circuit (isolator, MCB, overload, contactors, motor) ▪ A float switch controlling a pump power circuit (isolator, MCB, overload, contactors, motor) ▪ A resistor starter of an AC motor power circuit (isolator, overload, auto transformer, MCB, contactors, motor) ▪ A DC motor starter with current limiting resistor power circuit (isolator, MCB, resistor, overload, contactors, motor) ▪ A 3 point face plate starter power circuit (isolator, MCB, face plate starter, motor)	☐	☐	☐	☐	☐	☐
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Examiner`s comments:

Examiner Name:.....

Learner`s Name:.....

Signed:.....

Signed:.....

Date:.....

Date:.....

MATERIALS LIST

1. 1 x A4 plain paper

2. 1 x A3 plain paper
3. Drawing instruments

Task 24: WIRING A SOLAR INSTALLATION

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Wire a solar installation and this should include, ▪ Installing PV modules, charge controller, inverter and deep cycle batteries ▪ Measuring DC voltages across the solar panel, charge controller and deep cycle batteries ▪ Earthing or grounding the installation ▪ Using correct cable size and terminating the cables ▪ Orienting Solar modules or arrays	☐	☐	☐	☐	☐	☐
	b) Carry out tests on the solar installation using the right test instrument. This should include ▪ Continuity test on components and circuit ▪ Polarity test	☐	☐	☐	☐	☐	☐

Examiner's comments:

Examiner Name:.....

Learner's Name:.....

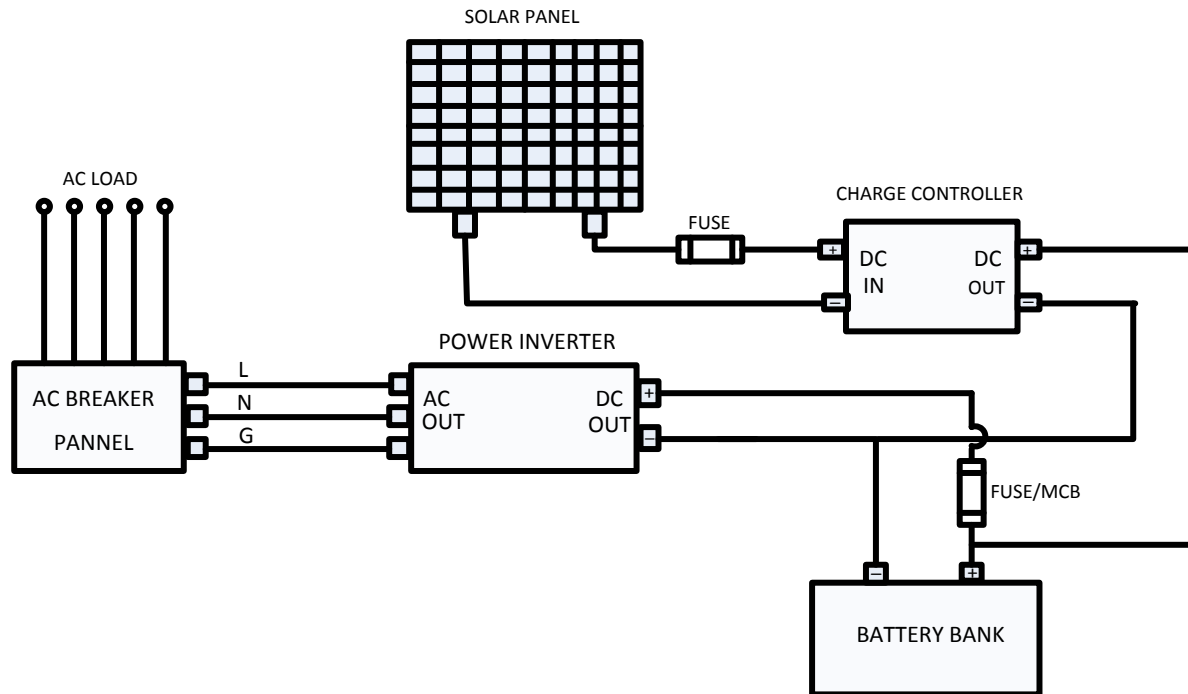
Signed:.....

Signed:.....

Date:.....

Date:.....

Task 24: WIRING OF A SOLAR PANEL INSTALLATION



MATERIAL LIST

1. 2 x 60W, 12V PV modules
2. 1 x 30A, 12V – 48V charge controller
3. 1 x 1000W inverter
4. 2 x 12V, 40AH deep cycle batteries
5. 6m x 4mm² black cable
6. 6m x 4mm² red cable
7. AC load to be supplied with power

Task 25: COMPUTER AIDED DRAWING (CAD)

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Design control circuits correctly using Auto CAD or Microsoft Visio or google sketch up according to given specifications ▪ Direct on line local and remote control circuit (fuse/MCB, start push button, stop push button, overload, contactor, indicator lamps) ▪ Direct on line jogging control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamps) ▪ Forward and reverse control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamp) ▪ Forward and reverse local and remote control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamp) ▪ Forward and reverse jogging control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamp) ▪ Forward and reverse semi-automatic control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamp) ▪ Sequential semi-automatic control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamp)	☐	☐	☐	☐	☐	☐

	b) Design power circuits correctly using Auto CAD or Microsoft Visio or google sketch up according to given specifications ▪ Direct on line local and remote power circuit (isolator, MCB, overload, contactor, motor) ▪ Direct on line jogging power circuit (isolator, MCB, overload, contactor, motor) ▪ Forward and reverse power circuit (isolator, MCB, contactors, motor) ▪ Forward and reverse local and remote power circuit (isolator, MCB, overload, contactors, motor) ▪ Forward and reverse jogging power circuit (isolator, MCB, overload, contactors, motor) ▪ Forward and reverse semi-automatic power circuit (isolator, MCB, overload, contactors, motor) ▪ Sequential semi-automatic power circuit (isolator, MCB, overload, contactors, motor)						
		☐	☐	☐	☐	☐	☐

Examiner's comments:

Examiner Name:.....

Learner's Name:.....

Signed:.....

Signed:.....

Date:..... Date:.....

MATERIAL LIST

1. 1 x computer with Auto CAD or Microsoft Visio or google earth installed
2. A printer to print out drawn circuits

Task 26: COMPUTER AIDED DRAWING (CAD)

No	Activity	Satisfactory			Not Satisfactory		
		Attempts			Attempts		
		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	During observation of work activities, the candidate demonstrated that they can:						
	a) Design control circuits correctly using Auto CAD or Microsoft Visio or google sketch up according to given specifications - Star-delta manual control circuit (fuse/MCB, start push button, double acting push button, stop push button, overload, contactor and indicator lamps) - Star-delta semi-automatic control circuit (fuse/MCB, start push button, on delay timer, stop push button, overload, contactor and indicator lamps) - Star-delta forward and reverse control circuit (fuse/MCB, start push button, on delay timer, stop push button, overload, contactor and indicator lamps) - An auto transformer control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamps) - A wound rotor motor starter control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamps) - A synchronous control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamps) - Manual plugging of AC control circuit (fuse/MCB, start push button, double acting push button, stop push button, overload, contactor and indicator lamps)	☐	☐	☐	☐	☐	☐

	b) Design power circuits correctly using Auto CAD or Microsoft Visio or google sketch up from given specifications ▪ Star-delta manual power circuit (isolator, MCB, overload, contactors, motor) ▪ Star-delta semi-automatic power circuit (isolator, MCB, overload, contactors, motor) ▪ Star-delta Forward and reverse power circuit (isolator, MCB, overload, contactors, motor) ▪ An auto transformer power circuit (isolator, overload, auto transformer, MCB, contactors, motor) ▪ A wound rotor motor starter power circuit (isolator, MCB, overload, contactors, motor) ▪ A synchronous power circuit (isolator, MCB, overload, contactors, motor) ▪ Manual plugging of AC power circuit (isolator, MCB, overload, contactors, motor)	□	□	□	□	□	□
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Examiner's comments:

Examiner Name:.....

Learner's Name:.....

Signed:.....

Signed:.....

Date:.....

Date:.....

MATERIAL LIST

1. 1 x computer with Auto CAD or Microsoft Visio or google earth installed
2. A printer to print out drawn circuits

Task 27: COMPUTER AIDED DRAWING (CAD)

No	Activity	Satisfactory			Not Satisfactory		
		Attempts			Attempts		
		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	During observation of work activities, the candidate demonstrated that they can:						
	a) Design control circuits correctly using Auto CAD or Microsoft Visio or google sketch up according to given specifications - Dynamic braking of AC motor control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamps) - Operator controlled plugging stop control circuit (fuse/MCB, start push button, on delay timer, stop push button, overload, contactor and indicator lamps) - A float switch controlling a pump control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamps) - A resistor starter of an AC motor control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamps) - A DC motor starter with current limiting resistor control circuit (fuse/MCB, start push button, stop push button, overload, contactor and indicator lamps) - A 3 point face plate starter control circuit (fuse/MCB, face plate starter)	☐	☐	☐	☐	☐	☐

	b) Design power circuits correctly using Auto CAD or Microsoft Visio or google sketch up from given specifications ▪ Dynamic braking of AC motor power circuit (isolator, MCB, overload, contactors, motor) ▪ Operator controlled plugging stop power circuit (isolator, MCB, overload, contactors, motor) ▪ A float switch controlling a pump power circuit (isolator, MCB, overload, contactors, motor) ▪ A resistor starter of an AC motor power circuit (isolator, overload, auto transformer, MCB, contactors, motor) ▪ A DC motor starter with current limiting resistor power circuit (isolator, MCB, resistor, overload, contactors, motor) ▪ A 3 point face plate starter power circuit (isolator, MCB, face plate starter, motor)	☐	☐	☐	☐	☐	☐
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Examiner`s comments:

Examiner Name:.....

Learner`s Name:.....

Signed:.....

Signed:.....

Date:..... Date:.....

MATERIAL LIST

1. 1 x computer with Auto CAD or Microsoft Visio or google earth installed
2. A printer to print out drawn circuits

Task 28: PROGRAMMABLE LOGIC CONTROLLER (PLC)

No	Activity	Satisfactory	Not Satisfactory
		Attempts	Attempts

During observation of work activities, the candidate demonstrated that they can:		1 st	2 nd	3 rd	1 st	2 nd	3 rd
	a) Identify and describe the components of a PLC, this includes, ▪ Input module ▪ Output module ▪ Central processing unit ▪ Programming device ▪ Operators interface	☐	☐	☐	☐	☐	☐
	b) Apply PLC programming languages ▪ ladder diagram language ▪ Boolean language ▪ Functional chart	☐	☐	☐	☐	☐	☐

Examiner's comments:

Examiner Name:.....

Learner's Name:.....

Signed:.....

Signed:.....

Date:..... Date:.....

MATERIAL REQUIRED

1. Programmable logic controller
2. 1 x desk top or laptop computer with appropriate PLC software
3. Different loads to be driven by PLC (motor)

Task 29: PROGRAMMABLE LOGIC CONTROLLER (PLC)

No	Activity	Satisfactory			Not Satisfactory		
		Attempts			Attempts		
	During observation of work activities, the candidate demonstrated that they can:	1 st	2 nd	3 rd	1 st	2 nd	3 rd
	▪ Operate a PLC as per given instruction ▪ Covert a relay schematic to a schematic used for programming a PLC	☐	☐	☐	☐	☐	☐

Examiner's comments:

Examiner Name:.....

Learner's Name:.....

Signed:.....

Signed:.....

Date:..... Date:.....

MATERIAL LIST

4. Programmable logic controller
5. 1 x desk top or laptop computer with appropriate PLC software
6. Different loads to be driven by PLC (motor)

Task 30: PROGRAMMABLE LOGIC CONTROLLER (PLC)

No	Activity	Satisfactory			Not Satisfactory		
		Attempts			Attempts		
	During observation of work activities, the candidate demonstrated that they can:	1 st	2 nd	3 rd	1 st	2 nd	3 rd
	▪ Program a PLC	☐	☐	☐	☐	☐	☐

Examiner's comments:

Examiner Name:.....

Learner's Name:.....

Signed:.....

Signed:.....

Date:..... Date:.....

MATERIAL LIST

1. Programmable logic controller
2. 1 x desk top or laptop computer with appropriate PLC software
3. Different loads to be driven by PLC (motor)

FINAL PRACTICAL ASSESSMENT SUMMARY

Practical assessment summary	Satisfactory	Not Satisfactory
INSTALLATION OF AN AUTO TRANSFORMER STARTER	☐	☐
WIRE/INSTALL A WOUND ROTOR INDUCTION MOTOR	☐	☐
INSTALLATION OF A SYNCHRONOUS MOTOR STARTER	☐	☐
INSTALLATION OF A MANUAL	☐	☐

PLUGGING OF AC MOTOR		
INSTALLATION OF DYNAMIC BRAKING AC MOTOR	☐	☐
INSTALLATION OF TIMED CONTROLLED PLUGGING CIRCUIT	☐	☐
INSTALLATION OF AN OPERATOR CONTROLLED PLUGGING STOP CIRCUIT	☐	☐
INSTALLATION OF A SOLID STATE/ THYRISTOR STARTER	☐	☐
INSTALLATION OF A RESISTOR STARTER OF AN AC MOTOR	☐	☐
INSTALLATION OF A REACTOR (CHOKE) STARTER OF AN AC MOTOR	☐	☐
INSTALLATION OF A FLOAT SWITCH CONTROL PUMP	☐	☐
INSTALLATION OF A SINGLE PUMP USING A SELECTOR SWITCH	☐	☐
INSTALLATION OF TWO PUMPS USING A SELECTOR SWITCH	☐	☐
INSTALLATION OF A VARIABLE FREQUENCY DRIVE (VFD) CONTROLLER FOR A 3 PHASE MOTOR	☐	☐
INSTALLATION OF A DC MOTOR STARTER WITH A CURRENT LIMITING RESISTOR	☐	☐
INSTALLATION OF A DC SERIES MOTOR WITH A DELAY ON STARTING	☐	☐
WIRE AN ELECTRONIC POWER SUPPLY CIRCUIT	☐	☐

INSTALLATION OF A 3 POINT FACE PLATE STARTER	☐	☐
INSTALLATION OF A CHOKE INPUT OR LC FILTER AND A CAPACITOR FILTER CIRCUIT	☐	☐
WIRE A CAPACITOR FILTER CIRCUIT WITH A CENTRE TAPPED TRANSFORMER	☐	☐
CIRCUIT DESIGNING	☐	☐
CIRCUIT DESIGNING	☐	☐
CIRCUIT DESIGNING	☐	☐
WIRE A SOLAR INSTALLATION	☐	☐
COMPUTER AIDED DRAWING (CAD)	☐	☐
COMPUTER AIDED DRAWING (CAD)	☐	☐
COMPUTER AIDED DRAWING (CAD)	☐	☐
PROGRAMMABLE LOGIC CONTROLLER (PLC)	☐	☐
PROGRAMMABLE LOGIC CONTROLLER (PLC)	☐	☐
PROGRAMMABLE LOGIC CONTROLLER (PLC)	☐	☐

Assessor/Examiners comments:

ASSESSMENT OUTCOME

Competent ☐

Not Competent ☐

Learner/Trainee	Assessor/Examiner
Learner/Trainee name: _____ (Print)	Assessor/Examiner name: _____ (Print)
Learner/Trainee comments:	Assessor/Examiner comments:
Signature: _____ Date: _____	Signature: _____ Date: _____

VALIDATION OF THE ASSESSMENT

NAME:.....

DATE:.....

POSITION: PRINCIPAL/HEAD OF INSTITUTION

SIGNATURE:.....

NAME INSTITUTION:.....

STAMP:

