Your Scholarship Number Is B53843

Please see that this number is placed on all REMITTANCES LETTERS, and on all LESSONS sent in for grading.

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This Bond issued to Mr. Clarence Hackney,

who has enrolled for my complete course of Correspondence Instructions. I hereby guarantee to him the following: TO-WIT

That if, *upon completion of my course, he is not satisfied with my method of instruction or does not believe he has received full value for his money, then in that case, I hereby agree to refund the full amount paid by him in tuition for my course; provided that he shall enter complaint of dissatisfaction within ten days after completion of said course, and provided further that he shall state clearly, in writing, his reasons for making a claim of refund, and acknowledge same before a NOTARY PUBLIC.*

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Chicago Engineering Works, Inc.

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Grades

Examination Sheet ~ Go to School at Home

Date Feb. 13, 1928.

Name Clarence Hackney, B53843

Address R.1 ST. ANTHONY, IOWA.

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Scholarship No. B.538437

Lesson No. Final Examination, Part 1.

What New Lessons have you to work on?

91-97%
92-99%

1. The three factors always present in an electric circuit are current, pressure and resistance

2. Three effect of an electric circuit are magnetic effect, chemical effect and thermal effect

3. The lowest specific gravity to which a lead battery should be discharged is 1.200

4. The general shape of the lines of force around a magnet is the lines of force leave at the north pole of a magnet, pass through the air and enter at the south pole and complete their circuit through the magnet.

5. The first law of magnetism is Like magnetic poles repel each other, But unlike poles attract each other.

6. A sketch of a watt-hour meter connected to an Edison 3 wire system.

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Date

Name Clarence Hackney, B53843

Address R1 ST. ANTHONY, IOWA.

Scholarship No. B. 53843

Lesson No. Final Exam. 6

What New Lessons have you to work on? Part 1

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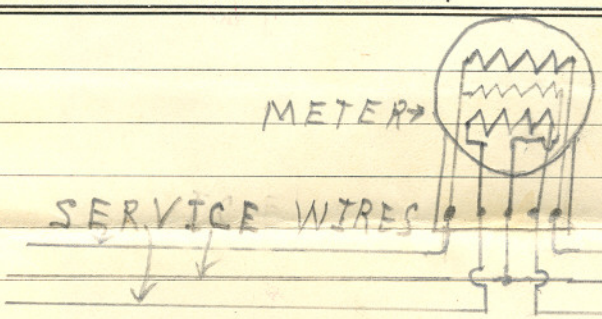
6. con't.



7. The K.W. capacity of a generator furnishing 150 amperes at 120 volts is $\frac{150 \times 120}{1000} = K.W.$

150 × 120 = 18000 W

1000 | 18000 = 18 K.W.

1000

8000

8000

8. The advantages of an Edison 3 wire system over a 2 wire system are; only one voltage may be obtained from a 2 wire system in this case small motors connected to the lighting circuit will blink the lights when they are started, in a 3 wire system they are connected so this trouble is done away with. Two different voltages may be obtained from a 3 wire system, the 110 volt lighting circuits are connected between the neutral and outside buses. 220 volt power circuits may be connected across the two outside wires in this connection

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Date March 29, 1928.

Name Clarence Hackney, B53843

Address R.1 St. Anthony, Iowa.

Scholarship No. B.53843

Lesson No. Final Exam Part 1.

What New Lessons have you to work on?

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8 cont. a 220 volt motor will draw only about ½ as much current as a 110 volt motor of the same horse power rating and the lights will not blink as much.

Another advantage the 3 wire system has over the 2 wire system is that less wire by weight is required and the cost of the installation is materially reduced.

9. The right hand thumb rule is: Take the wire through which current is flowing in the right hand so that the thumb will point in the direction of flow of current. Then the fingers will indicate the direction of the lines of force.

10. The National Electrical code is a code or an written statement to which all electric wiring or and installing shall apply to.

11. ~~The way a voltmeter differ~~ The difference between a voltmeter and an ammeter is the resistance of the voltmeter is large and the resistance of the ammeter is low or the ammeter

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Examination Sheet ~ Go to School at Home

Date March, 29, 1928.

Name Clarence Hackney, B53843 A-1

Address St. Anthony, Iowa.

Scholarship No. B 53843

Lesson No. Final Exam

What New Lessons have you to work on? Part I.

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consists of a few turns of heavy wire while the voltmeter is wound with many turns of fine wire.

12 To reverse the direction of rotation of a direct current motor, you must reverse the flow of current either through the armature or through the fields, but not both.

13. The most efficient way of varying the speed of a shunt motor, is toward its field strength.

14. The effect that inter-poles have on sparking at the commutator is that their field opposes the armature current field and eliminates the possibility of armature reaction and sparking of brushes.

15. The pressure needed to send 18 amperes through a resistance of 5 ohms is 90 volts
18 amperes × 5 ohms = 90 volts

16 A rheostat connected to a 550 volt circuit and allow ½ ampere to flow, its resistance must be 275 ohms = 550 volts ÷ ½ ampere = 275 ohms

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550 ÷ ½ = 550 × 2/1 = 1100 ohms

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Date Mar. 29, 1928.

Name Clarence Hackney, B53843 R.I.

Address ST. ANTHONY, IOWA

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Scholarship No. B. 53843

Lesson No. Final Exam. Part I.

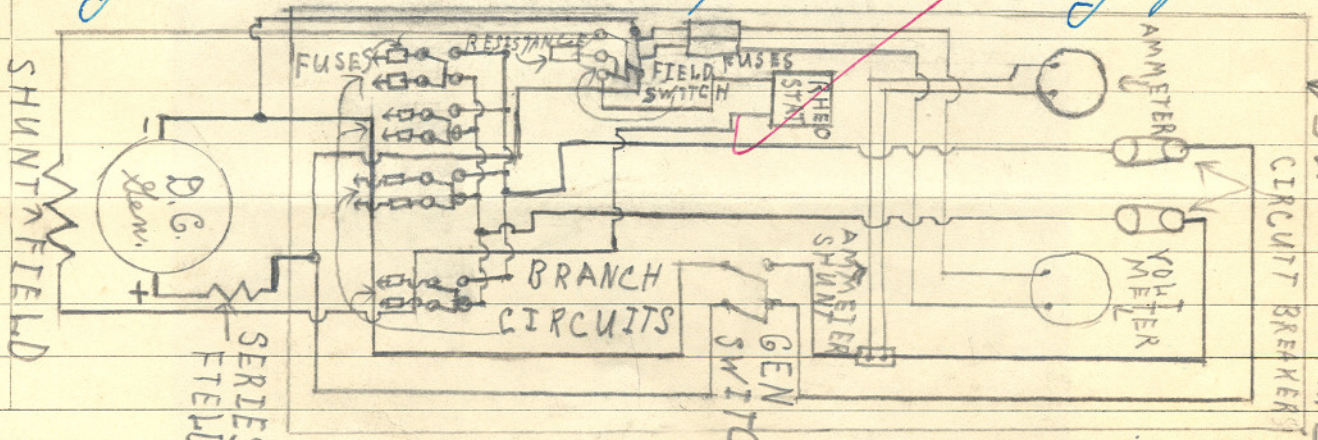
What New Lessons have you to work on?

17. The effect that overloading has on a direct current generator is that it causes it to heat, and the voltage to fall.

18. The device used for varying the voltage of a generator is a Rheostat and is connected in series with the field circuit.

19. When a dynamo is operating under a load, armature reaction is produced by the current in the armature because it will produce a magnetizing effect upon the field of the machine.

20. A sketch showing a one-panel switch-board for compound wound generator showing an ammeter, ammeter shunt, voltmeter and 4 branch circuits controlled by switches and protected by fuses.



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Name Clarence Hackney, B53843

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Scholarship No. B. 53843

Lesson No. Final Exam

What New Lessons have you to work on? Part 2. 90%

1. If a D. C. generator fails to generate the first trouble I would look for would be grease or dirt on the commutator and brushes.

2. Equalizer cables are used where D. C. generators are to be worked in parallel. The polarity of the points of each generator connected by the equalizer should be the same.

3. The reason 3 way switches are used is because they are more convenient because the circuit may be completed at either switch or completed and broken at either or completed at one and broken at the other it does not make any difference which switch is used first in the last experiment.

4 Remote controled, starting boxes are generally used for starting a motor some distance from the operator such as motors that drive ventilating fans and starting elevators motors from the different floores of a building.

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Date March. 30, 1928

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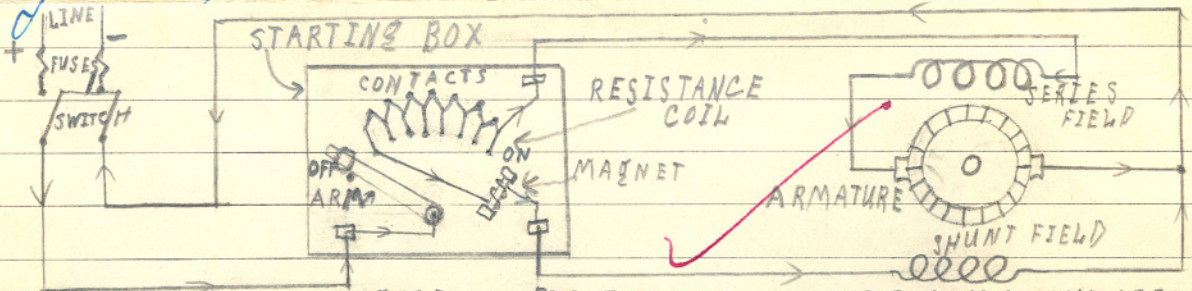
Lesson No. Final Exam Part 2.

What New Lessons have you to work on?

5. A. sketch showing a compound motor connected to a no-voltage release starting box.



WHEN THE STARTING ARM IS BROUGHT TO THE FIRST CONTACT CURRENT FLOWS AS THE ARROWS SHOW.

6. The combined resistance of three coils in parallel if their separate resistance are 80, 8 16 Ohms is 5 Ohms. Worked out Mathematical method

$80R + 8R + 16R = \frac{80}{8} + \frac{8}{16} = \frac{1 + 10 + 5}{80} = \frac{16}{80}$ Inverted =

$\frac{80}{16} = 16\frac{80}{80}$ (5 ohms common denominator Ans 5 Ohms

7. The combined resistance of the above coils when connected in series is 104 Ohms worked out 80 ohms + 8 ohms + 16 ohms = 104 Ohms Ans.

8. Poles are generally spaced about 125 feet apart on distribution lines when they are being set in a straight line.

9 The reason telephone lines are transposed is to eliminate the noise or cross talk.

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Date March. 30, 1928.

Name Clarence Hackney, B53843

Address R.I. ST. ANTHONY, IOWA.

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Scholarship No. B. 53843

Lesson No. Final Exam.

What New Lessons have you to work on? Part 2.

10. The size of wire used on a 230-volt circuit to transmit 100 amperes a distance of 400 feet with a voltage loss of 3 percent (6.9 volts). is No. 00. worked out = 100 amperes x 10.8 resistance per mil foot x 800 ft complete distance of the circuit ÷ 6.9 volt voltage loss =

$$\frac{100 \times 10.8 \times 800}{6.9} = 100 \times 10.8 = 1,080.0 \times 800 = \frac{864\,000}{6.9}$$

$6.9 \overline{)864000.0}^{125,217\frac{9}{13}}$ = 125,217 9/13 = Referring to wire table #1 = No. 00.

11 An ordinary vacuum cleaner when connected to a 32-volt farm lighting plant will consume 5 amperes, worked out = 160 W ÷ 32 V. = 5 Amps.

12. The advantage circuit breakers have over fuses are when a circuit breaker opens it may be closed again and no damage is done to the breaker, where with blowing fuses once it is burned out it must be renewed this would be an expense and would run into many dollars.

13. The purpose of the compensating winding in a watt hour meter, is to overcome the friction, or to make up for the loss in speed by friction.

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Date March 31, 1928.

Name Clarence Hackney, B53843

Address R.1. St. Anthony, Iowa.

Scholarship No. B. 53843

Lesson No. Final Exam

What New Lessons have you to work on? Part 2.

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14. When we speak of the frequency of an A.C. circuit we mean the number of cycles or complete set of values through which an alternating current passed per second.

15. The frequency of a 6 pole A.C. generator driven at 1200 R.P.M. is 60 cycles =

$$\frac{6 \text{ Number of poles} \times 1200 \text{ R.P.M.}}{2 \times 60} = \frac{7200}{120} = 60 \text{ Cycles}$$

120 | 7200 | 60

720

000

16. When we speak of the power factor of an A.C. circuit we mean, the true power or actual power of an A.C. circuit.

17. The purpose of using transformers is to step-up the voltage, step-down the voltage, boost the voltage along on the transmission lines, to regulate the flow of current in a line, and to get any desired voltage from an alternating current circuit.

18. The way the shell type transformer differs from the core type transformer is that in the shell type transformer the core is in the form of a shell being built around and through the coils. While with the core type transformer

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Date March, 31, 1928

Name Clarence Hackney, B53843

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Scholarship No. B 53843

Lesson No. Final Exam

What New Lessons have you to work on? Part 2.

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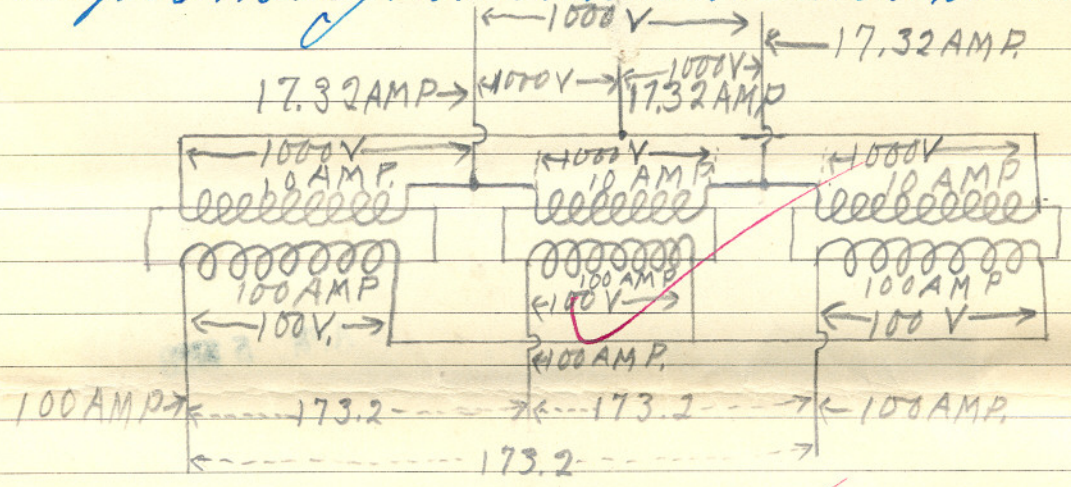
18 cont the coils of wire surround the laminated iron core, with half of the primary coil and half of the secondary coil wounded on each leg of the core, the fine wire coils are wound over the coarse wire coils.

19. Three transformers connected in delta on the primary and in star on the secondary.



20. The Scott system of transformer connection is used when only two single-phase transformers are used and a three-phase connection is required.

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L. L. COOKE

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