ABSTRACT
        One of four individualized courses included in a
radio and television repair curriculum, this course focuses on
alternating current relationships and computations, transformers,
power supplies, series and parallel resistive-reactive circuits, and
series and parallel resonance. The course is comprised of eight
units: (1) Introduction to Alternating Current, (2) Alternating
Current Relationships, (3) The Transformer, (4) Power Supplies, (5)
Alternating Current Computations, (6) Series Resistive-Reactive
Circuits, (7) Series Resonance, and (8) Parallel Resistive-Reactive
Circuits. Each unit begins with a Unit Learning Experience Guide that
gives directions for unit completion. The remainder of each unit
consists of Learning Activity Packages (LAP) that provide specific
information for completion of a learning activity. Each LAP is
comprised of the following parts: objective, evaluation procedure,
resources, procedure, supplemental sheets, study guide, and a LAP
test with answers. The course is preceded by a pretest which is
designed to direct the student to units and performance activities.
(LRA)

MOUNTAIN PLAINS LEARNING EXPERIENCE GUIDE:

Radio and T.V. Repair.

Course: A.C. Circuits.

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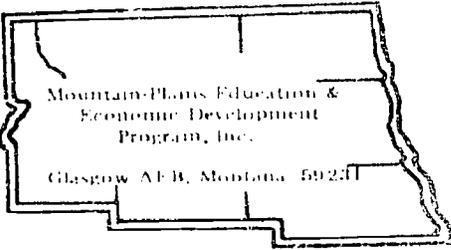
Learning Experience Guide

COURSE: A.C. CIRCUITS

DESCRIPTION:

Alternating current (AC) circuits deals with basic concepts and applications
related to simple and complex circuits. Topics emphasized are AC relationships
and computations, transformers, power supplies, series and parallel resistive-
reactive circuits, and series and parallel resonance.

RATIONALE:

The AC circuits course will provide you with extensive theory. This theory will
enable you to understand electrical AC relationships and to work effectively as
a service person.

OBJECTIVES:

Given a student handbook and unit booklets, you will complete workbook exercises
about alternating current (AC) circuits that enables you to:

1. use mathematics to describe electronic properties of circuits.
2. identify circuit purpose.
3. explain operational characteristics of circuits.

PREREQUISITES:

Course: D.C. CIRCUITS

RESOURCES:

A resource list is attached.

GENERAL INSTRUCTIONS:

This course has eight units. Each unit has a Unit Learning Experience Guide (LEG)
that gives directions for unit completion. Each unit consists of Learning Activity
Packages (LAPs) that provide specific information for completion of a learning
activity. Pretesting results direct the student to units and performance activities.

The general procedure for this course is as follows:

1. Read the assigned unit LEG for this course.
2. Begin and complete the first assigned LAP.

3. Proceed to the next assigned LAP in the unit.
4. Complete all required LAPs for the unit by following steps
   2 through 4.
5. Take the unit tests as described in the Unit LEG "Evaluation
   Procedures".
6. Proceed to the next assigned unit in this course.
7. Follow steps 1 through 7 for all required units for this course.
8. Proceed to the next assigned course.

You will work independently unless directed to do otherwise. When questions or
problems arise, you are expected to discuss them with the instructor. At all
times remember to follow correct safety procedures during the performance activity.

UNIT TITLES:

.01 Introduction to A.C.
.02 A.C. Relationships
.03 The Transformer
.04 Power Supplies
.05 A.C. Computations
.06 Series Resistive-Reactive Circuits
.07 Series Resonance
.08 Parallel Resistive-Reactive Circuits

EVALUATION PROCEDURE:

Course evaluation of the student is by pre and post testing using a multiple-
choice type of test.

In this course, the course test is used as a pretest to determine which units,
if any, the student may be able to validate. For each unit on the course
pretest that the student correctly completes 4 out of 5 items, for each LAP
part, the student is considered validated.

The course test will also be taken by the student as a post test to determine
any changes resulting from taking all or part of the course.

FOLLOW-THROUGH:

After reading this Course LEG, you are ready to move on to the Learning Experience
Guide (LEG) for the first unit. Read the LEG carefully and follow directions
given in it. If you have a question, consult with your instructor.

Printed Materials

1. AC Circuits, An Individualized Approach to Electronics, (set of eight unit booklets, student handbook, and progress tests). Paul E. Trejo, Westinghouse Learning Corporation, New York, New York, 1972.

Audio/Visuals

Equipment

9/10/75

COURSE TEST ANSWER SHEET

Occupational Area: <u>PRE & POST</u>
File Code: <u>77.02.00.00 A2-2</u>
Name: _____
Family Pay Number _____   Sex   M   F   (Circle 1)

<u>ANSWERS</u>

77.02.01.01   03   02

1. B _____   21. C _____   41. B _____

2. B _____   22. B _____   42. C _____

3. A _____   23. B _____   43. C _____

4. D _____   24. C _____   44. B _____

5. D _____   25. D _____   45. D _____

02   04   03

6. B _____   26. C _____   46. D _____

7. C _____   27. D _____   47. A _____

8. A _____   28. D _____   48. D _____

9. A _____   29. B _____   49. C _____

10. B _____   30. C _____   50. C _____

77.02.02.01   05   04

11. C _____   31. C _____   51. C _____

12. B _____   32. B _____   52. D _____

13. D _____   33. B _____   53. A _____

14. C _____   34. C _____   54. B _____

15. A _____   35. A _____   55. A _____

02   77.02.03.01   77.02.04.01

16. A _____   36. A _____   56. A _____

17. C _____   37. C _____   57. B _____

18. B _____   38. B _____   58. D _____

19. B _____   39. D _____   59. A _____

20. B _____   40. C _____   60. C _____

COURSE TEST ANSWER SHEET

Occupational Area: PRE & POST

File Code: 77.02.00.00 A2-2

Name:

ANSWERS

02
61. B _____

62. B _____

63. D _____

64. B _____

65. A _____

77.02.05.01
66. D _____

67. A _____

68. D _____

69. B _____

70. C _____

02
71. A _____

72. D _____

73. B _____

74. A _____

75. A _____

77.02.06.01
76. B _____

77. C _____

78. C _____

79. B _____

80. A _____

02
81. B _____

82. A _____

83. A _____

84. A _____

85. D _____

03
86. A _____

87. C _____

88. B _____

89. C _____

90. C _____

04
91. A _____

92. B _____

93. B _____

94. D _____

95. D _____

77.02.07.01
96. A _____

97. C _____

98. B _____

99. A _____

100. C _____

02
101. D _____

102. B _____

103. A _____

104. C _____

105. B _____

77.02.08.01
106. D _____

107. A _____

108. C _____

109. B _____

110. D _____

02
111. B _____

112. D _____

113. D _____

114. B _____

115. D _____

03
116. A _____

117. A _____

118 A _____

119 D _____

120 A _____

COURSE TEST ANSWER SHEET

Occupational Area: PRE & POST
File Code: 77.02.00.00 A2-2
Name:

ANSWERS

04
121. A _____
122. C _____
123. B _____
124. A _____
125. A _____

05
126. D _____
127. A _____
128. D _____
129. D _____
130. C _____
131. _____
132. _____
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180. _____

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COURSE POST TEST: A.C. CIRCUITS

77.02.01.01

1.   For the sine wave shown, how much time is required to complete one cycle?

   a.   8 seconds
   b.   4 seconds
   c.   2 seconds
   d.   6 seconds
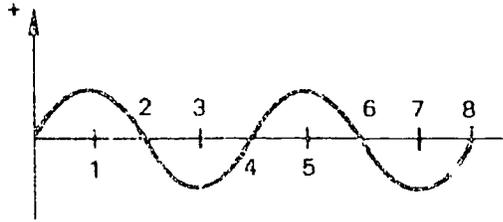
2.   What is the frequency of this sine wave?

   a.   ½ Hz
   b.   1 Hz
   c.   1 second
   d.   2 Hz
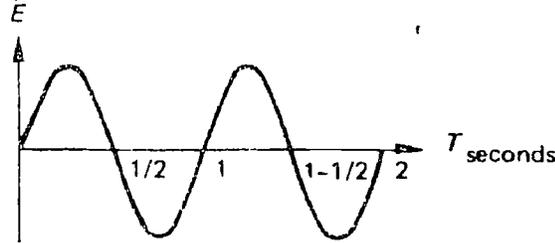
3.   If the time required to complete one cycle is 1 msec., the frequency is:

   a.   1000 Hz
   b.   100 Hz
   c.   10 Hz
   d.   10,000 Hz

4   Most ac meters are calibrated in:

   a.   amplitude values
   b.   average values
   c.   peak-to-peak values
   d.   effective values

5.   What is the peak-to-peak value of the sine wave shown?

   a.   20 V
   b.   60 V
   c.   0 V
   d.   120 V

9

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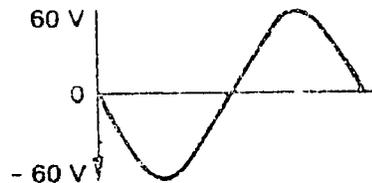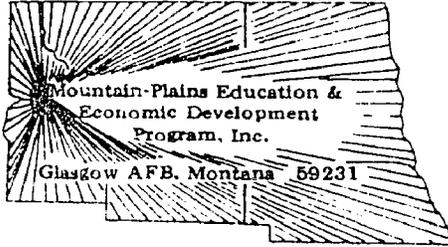
77.02.01.02

6. Another name for an ac generator is:

   a. a stator
   b. an alternator
   c. a commutator
   d. a rotor

7. The brushes that carry current from the slip rings to the outside circuit are usually made of:

   a. copper
   b. lead
   c. carbon
   d. zinc

8. A generator is a device used to convert mechanical energy into:

   a. electrical energy
   b. potential energy
   c. inductive energy
   d. magnetic energy

9. Which of the following statements pertains to AC?

   a. generated by magnetic mechanical action
   b. electrons moving in one direction
   c. can be generated by chemical action
   d. electrons moving at a constant rate
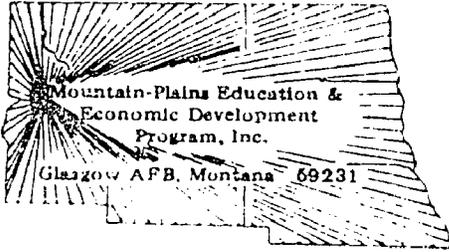
77.02.01.02 (Continued)

10. Using the illustration provided, which of the following numbered items
    are the brushes:

    a. 1
    b. 3
    c. 2
    d. 4
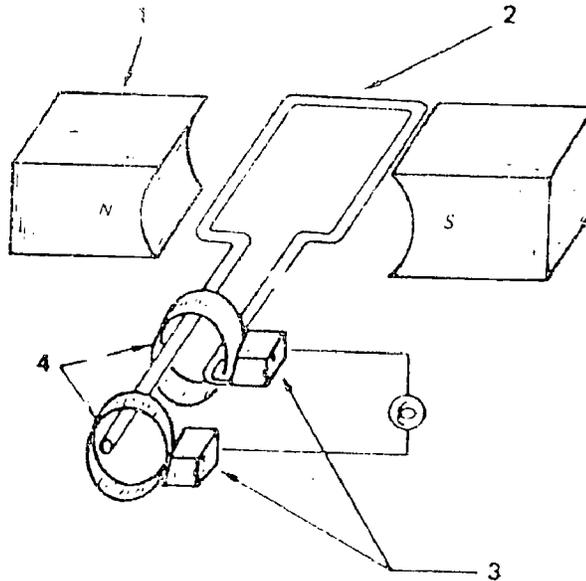
77.02.02.01

11. The numerical value of 2 is 6.28. Which of these equations that include the
    numerical value of 2 is correct for determining X_L ?

    a. $\dfrac{1}{6.28FL}$ c. 6.28FL

    b. $6.28 \times \dfrac{F}{L}$ d. $\dfrac{6.28}{FL}$

12. What would be the value of X_L if the frequency were 60 Hz and the inductance
    100 mH?

    a. 26.5 ohms
    b. 37.7 ohms
    c. 3.77 ohms
    d. 2.65 ohms

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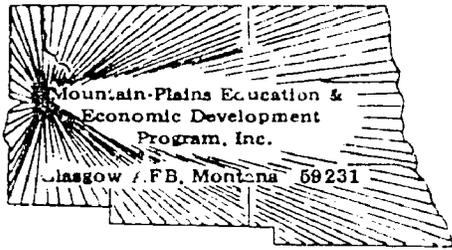
77.02.02.01   (Continued)

13.   Using the illustration below, solve for X_L:

a.   1884 ohms
b.   18.84 ohms
c.   188.4 ohms
d.   18,840 ohms

$f = 1$ kHz $L = 3$ H
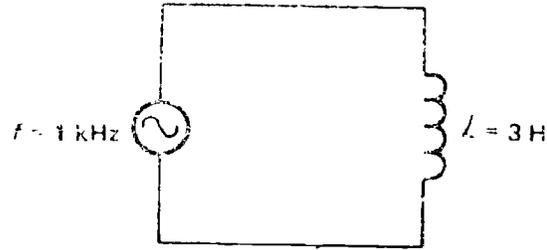
14.   By using the information provided below, solve for total X_L:

a.   10 ohms
b.   60 ohms
c.   15 ohms
d.   900 ohms

$X_L = 30 \, \Omega$ $X_L = 30 \, \Omega$
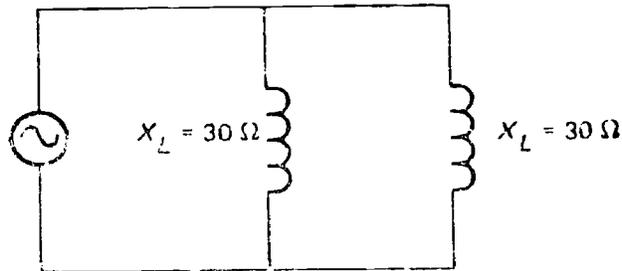
15.   Solve for X_L:

a.   99.7 ohms
b.   9.9 ohms
c.   99.9 ohms
d.   9970 ohms

$f = 12.5$ kHz $L = 1.27$ mH

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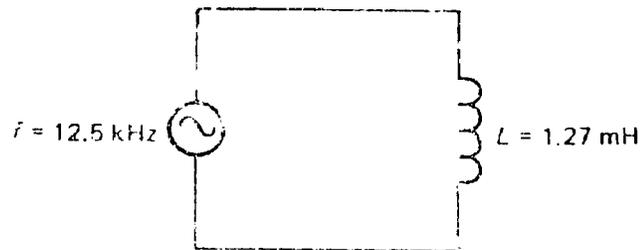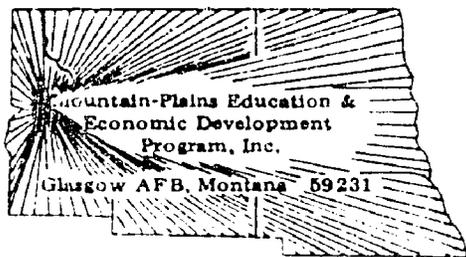
77.02.02.02.

16.   What is the vector sum (resultant) of the vectors shown?

   a.   15
   b.   11
   c.   10
   d.   21
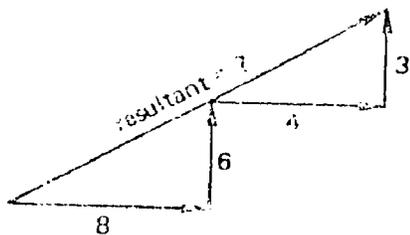
17.   In the figure below,

   a.   1 leads E by 90^0
   b.   1 lags E by 180^0
   c   1 leads E by 180^0
   d.   1 leads E by 120^0
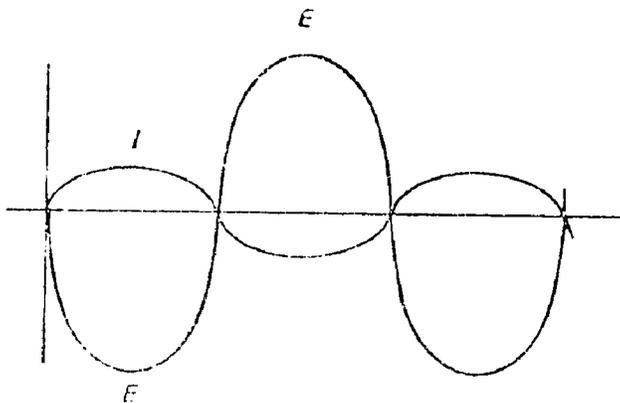
18.   What is the angle of the vector in the drawing below?

       30^0
   b.   _
   c 120^0
   d. 150^0

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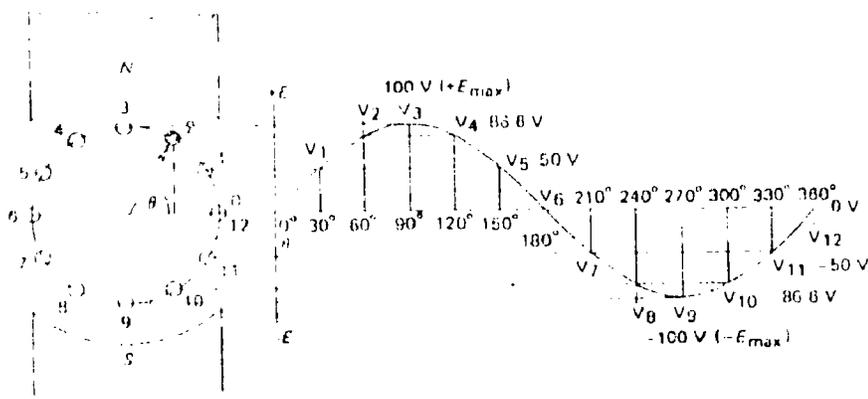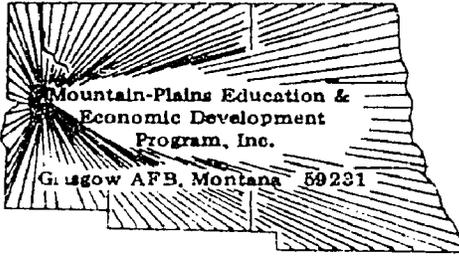
77.02.02.02 (Continued)

19.   What is the angle of the vector as shown below?

a. 30°
b. 150^{c}
c. 210°
d. 230°
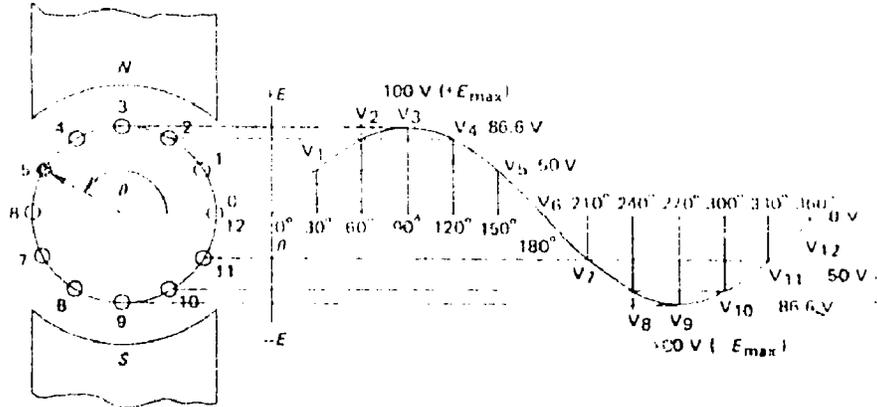
20.   In the figure below, the vector has rotated 240°. Reading the angle clockwise from the baseline, we see that the lag in degrees is:

a. 60°
b. 120°
c. 240°
d. 180°
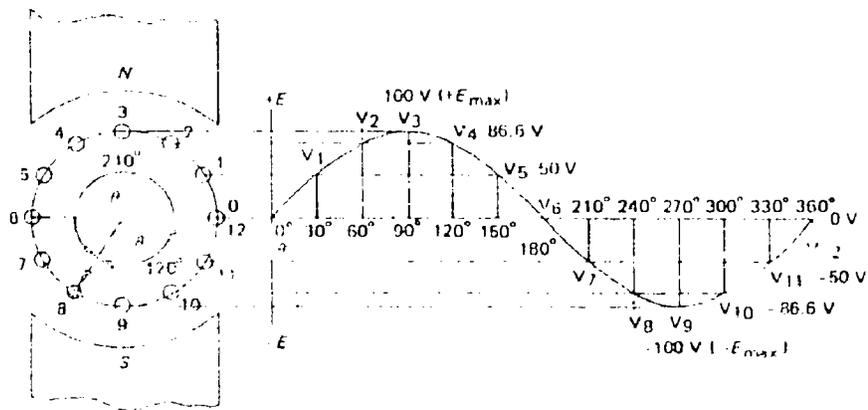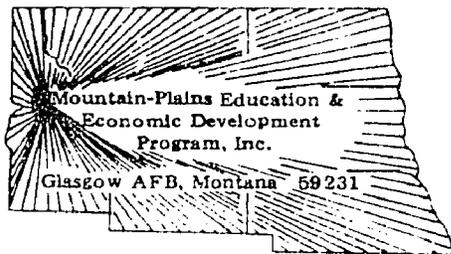
77.02.02.03

21. Check the statement that are true for the circuit shown. While the capacitor is charging or discharging,

    a. the terminal voltage does not change
    b. a voltage is developed across C_1
    c. the capacitor voltage does not equal E
   d. the value of the resistor changes
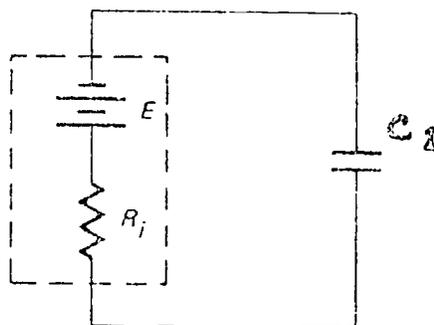
22. A capacitor

    a. blocks AC
    b. acts as an open in a DC circuit when fully charged
    c. blocks a steady flow of AC
    d. acts as a short in a DC circuit when fully charged

23. Since capacitive reactance is inversely proportional to frequency, when frequency is decreased,

    a. X_c decreases
    b. X_c increases
    c. X_c stays the same
   d. C increases

24. If capacitance is increased,

    a. X_c will stay the same
    b. X_c will increase
    c. X_c will decrease
    d. X_c will go to zero

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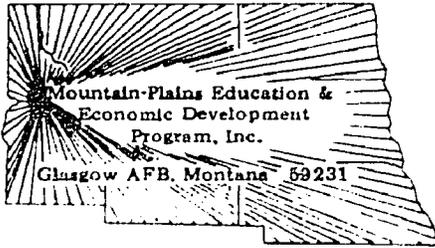
77.02.02.03 (Continued)

25. Calculate X_c in the circuit shown?

a. 18 ohms
b. 32 ohms
c. 1.25 ohms
d. 8 ohms
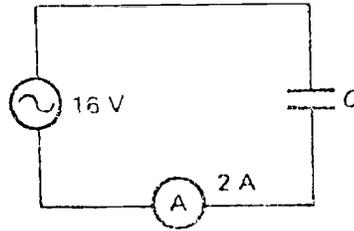
77.02.02.04

26. R_T is equal to the sum of the resistances and, according to Kirchhoff's voltage
   law, E is equal to the :

     a. voltage drop
     b. difference between the voltage drops
     c. sum of the voltage drops
     d. current + voltage

27. When vectors are used to describe a series circuit, which common circuit value
     listed below is used as the reference?

     a. time
     b. resistance
     c. voltage
     d. current

28. In the circuit shown, the combination of out-of-phase voltages V_c and V_r is
   greater than either individual value

     a. and the same of the direct sum of the two
     b. and greater than the direct sum of the two
     c. and equal to the direct sum of the two
     d. but less than the direct sum of the two

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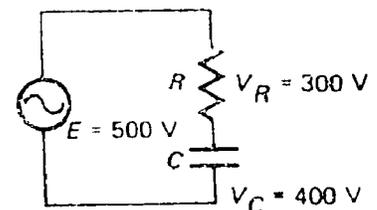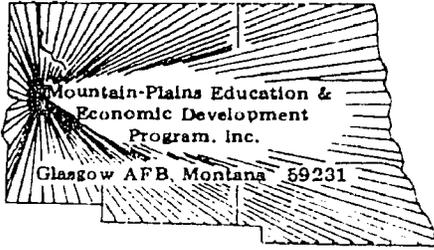
77.02.02.04 (Continued)

29. If a circuit is resistive and reactive, the impedance is a special combination of R and X. Regardless of the type of circuit, the correct term for total opposition to alternating current is :

a.   reactance
b.   impedance
c.   resistance
d.   wattage

30. What is the total voltage in the circuit shown ?

a.   47.2 V
b.   50 V
c.   125 V
d.   12 V
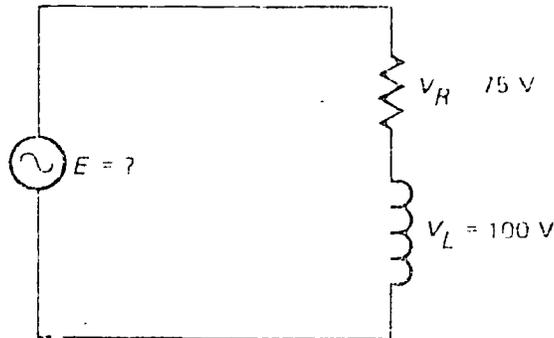
77.02.02.05

31. Since power is the conversion of energy from one form to another, how many watts would be converted to heat in the circuit shown?

a.   62.5 W
b.   625 W
c.   6,250 W
d.   62,500 W

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Date: _____   Date Published: __5-24-74__

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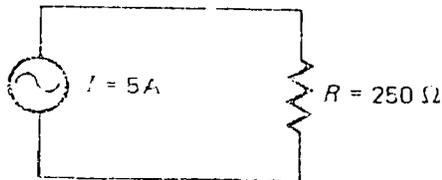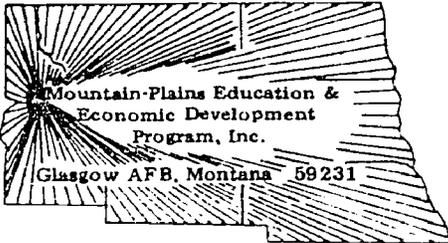
77.02.02.05 (Continued)

32. Determine the value of P_x for the circuit shown, using the formula $P_x = I^2 X_L$:

    a.   0.8 VAR
    b.   800 VAR
    c.   80 VAR
    d.   8,000 VAR

    200 V
    60 Hz

    $X_L = 50 \, \Omega$
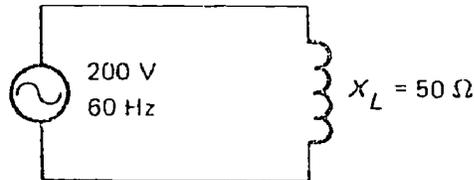
33. In the purely capacitive circuit shown, what is the reactive power?

    a.   1 VAR
    b.   1000 VAR
    c.   10 VAR
   d.   100 VAR

    100 V

    $X_C = 10 \, \Omega$
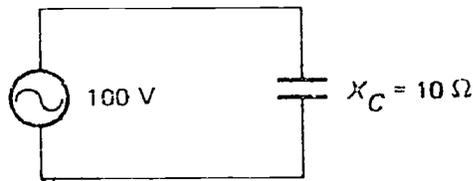
34. In a circuit containing "only inductance", apparent power (P_a) is equal to
     reactive power (P_x). Which formula can be used to solve for P_a or P_x in
     an inductive circuit?

    a. $Pa = E_1 I^2$ c. $Pa = I^2 X_L$

    $\therefore$ Pa $= I^2 p$ d. $Pa = I^2 X_C$

35. Given the circuit below, solve for Z:

    a.   10 ohms
    b.   20 ohms
    c.   .1 ohms
    d.   100 ohms

    $E = 100 \, V$

    $R = 6 \, \Omega$ $X_C = 2 \, \Omega$

    $X_L = 10 \, \Omega$

ERIC

Student: _____   File Code: __77.02.00.00.A2-2__

Date: _____   Date Published: __5-24-74__
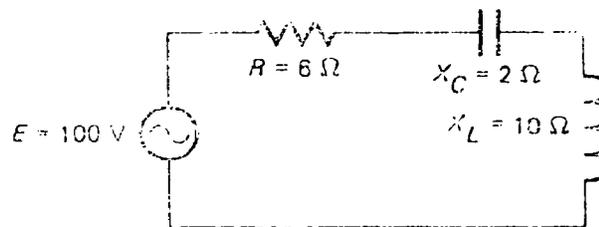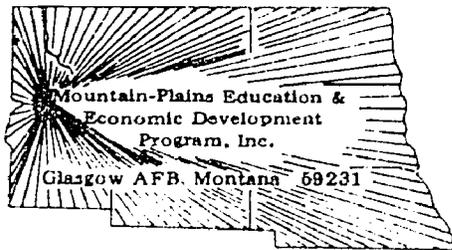
77.02.03.01

36. Transformers are useful in AC circuits because:

    a. electromagnetic induction depends on a changing magnetic field
    b. DC voltages are too high
    c. no magnetic field is associated with direct current
    d. a DC transformer is too large to be practical

37. "Which statement is true about an iron core transformer?"

    a. the primary winding is not separated from the secondary winding by air space
    b. the primary winding is not separated from the secondary winding by insulating material
    c. the coefficient of coupling is greater than in an air core
    d. coils are wound side by side

38. Which type of transformer is the most efficient?

    a. hollow core
    b. shell type
    c. open core
    d. paper core

39. A power supply that operates on a frequency of 60 Hz has a core of:

    a. copper
    b. air
    c. cardboard
    d. iron

40. The terms "step-up" and "step-down" refer to transformer:

    a. power
    b. current
    c. voltage
    d. resistance

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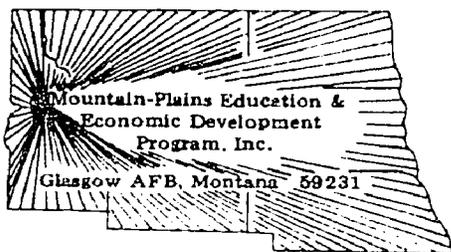
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41. Exciting current flows in the primary in a no-load condition; it supports the magnetic field around the coil, and a small part of it overcomes the resistance of the:

   a. core
   b. winding
   c. secondary
   d. load

42. What is the exciting current in this circuit? (Since R_L is much larger than R, ignore R)

   a. 0.8 A $E = 120$
   b. 12 A $f = 60$ Hz
   c. 1.2 A $R = 1.0\ \Omega$
   d. 8 A $L = 265$ mH

   $E_s = 240$ V
   $R = 15\ \Omega$
   $L = 300$ mH
   $R_L = 6\text{E}\ \Omega$
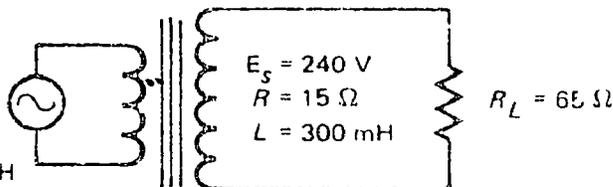
43. The cemf and applied voltage in a transformer primary are how many degrees out of phase?

   a. +45
   b. -45
   c. +180
   d. ^-

44. In most transformers, the secondary is wound directly on top of the primary to:

   a. conserve space
   b. increase coefficient of coupling between coils
   c. work at high voltages
   d. work at low voltages
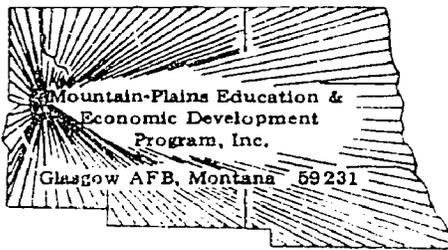
77.02.03.02 (Continued)

45. If there are more turns in the primary than in the secondary, the transformer is a:

    a. step-over transformer
    b. step-up transformer
    c. no step transformer
    d. step-down transformer

77.02.03.03

46. In the transformer shown, the turns ratio of primary to secondary is:

    a. 4:1
    b. 1:2
    c. 1:4
    d. 2:1

 N_p = 1000 turns N_s = 500 turns
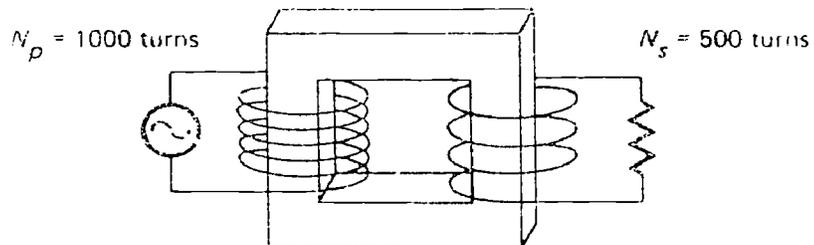
47. An equality between two ratios can be expressed as a statement of:

    a. proportionality
    b. divergence
    c. convergence
    d. disproportionality

48. In the circuit shown, if the secondary voltage is 22 V, the primary voltage must be

    a. 6.6 V
    b. 7.3 V
   c. 73 V
    d. 66 V

    N_p = 2100 turns N_s = 700 turns

    E_p = ? E_s = 22 V
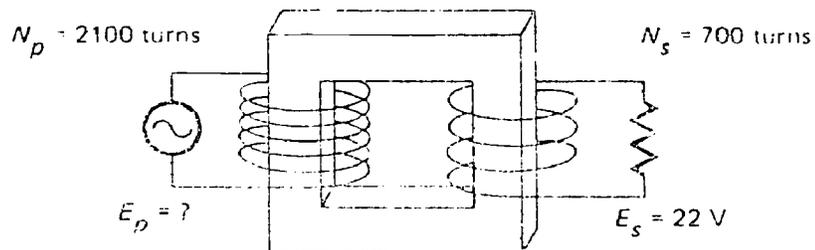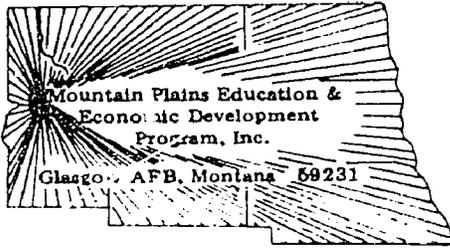
77.02.03.03 (Continued)

49. In this circuit, what is the secondary voltage?

a. 2.5 V
b. 25 V
c. 100 V
d. 10 V

N_p = 25 turns

N_s = 50 turns

E_p = 50 V

E_s = ?
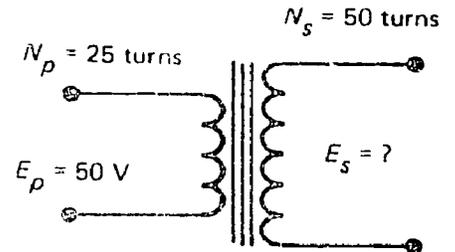
50. What is the turns ratio in the circuit below?

a. 50: 1
b. 1: 5
c. 5: 1
d. 1: 50

E_p = 50 V

E_s = 10 V
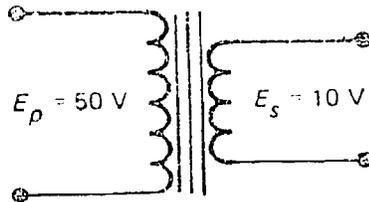
77.02.03.04

51. A transformer has a 60 VA primary and a 55 W secondary. What is the efficiency percentage of this transformer?

a. 89.75%
b. 119,43%
c. 91.66%
d. 96.19%

52. In a 1:40 step-up transformer, the wire in the secondary has:

a. less windings than the primary
b. a larger diameter than the primary
c. the same diameter as the primary
d. a smaller diameter than the primary

53. Circulating currents induced in a transformer core by the changing flux are called.

a. eddy currents
b. displacement currents
c. circulating currents
d. hysteresis currents

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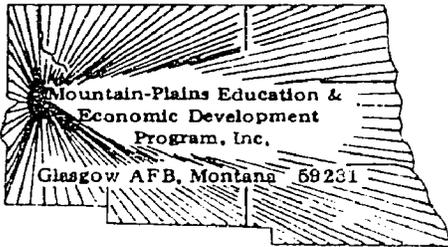
77.02.03.04 (Continued)

54. Lamination of the core material:

    a. decreases transformer efficiency
    b. increases transformer efficiency
    c. does not affect transformer efficency
    d. creates heat

55. Check the statement that is true of an autotransformer.

    a. near unity coupling
    b. advantageous at high turns ratios
    c. heavier and larger than other transformers
    d. advantageous at unity turns ratio

77.02.04.01

56. The symbol for a semiconductor rectifying diode is:

    a. _____   A —|◁—   C ⊕
    b. _____
    c. _____   B ⊕   D —|⊢
    d. _____

57. A diode placed in a circuit so that it permits current to flow through it is said
    to be:

    a. reverse biased
    b. forward biased
    c. passing biased
    d. blocking biased

58. Up to a point, as the current through a semiconductor diode increases, the forwar
    resistance:

    a) ends altogether
    b) increases
    c) remains the same
    d) decreases

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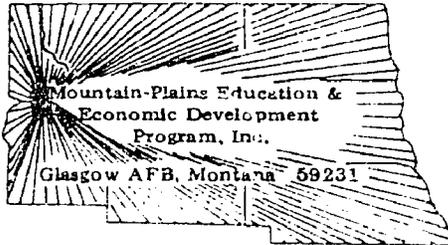
77.02.04.01 (Continued)

59. The forward voltage drop across a typical semiconductor diode varies from:

    a. 0 to 1 V
    b. 1 to 10 V
    c. 10 to 20 V
    d. 25 to 30 V

60. The frequency of the pulsating DC from a rectifier output is the:

    a. output frequency
    b. rectifier frequency
    c. ripple frequency
    d. filter frequency

77.02.04.02

61. In a pulsating DC wave, the peak value of the ripple voltage is 5 V and the maximum
    output voltage is 100 V. What is the minimum output voltage?

    a. 75 V
    b. 90 V
    c. 80 V
    d. 86 V

62. Smoothing action provided by a capacitance filter depends on the:

    a. temperature
    b. storage ability of the capacitor
    c. excess energy
    d. load

63. The major disadvantage of a simple inductance filter is:

    a. high output voltage
    b. nearly constant current output
    c. lower current output
   d. lower voltage output
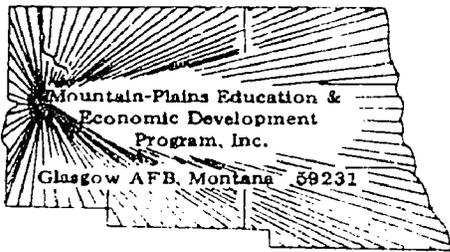
77.02.04.02   (Continued)

64.   An application requiring a high value and steady current flow from the
      rectifiers to the load and requiring good voltage stability would use a (n).

      a.   pi-section filter
      b.   L-section filter
      c.   simple capacitor
      d.   simple inductor

65.   Which type of filter is sometimes substituted for a pi-section filter?

      a.   resistance capacitor
      b.   simple capacitor
   c.   L-section
      d.   simple inductor

77.02.05.01

66.   In the vector diagram shown, the baseline of the triangle that contains
      represents the value of:

      a. E_C or E_L
      b. E_L or X_L
      c.   Z or E
      d. E_R or R
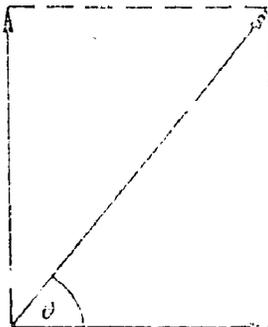
67.   In the triangle referred to in Question 66, the vertical side that is equal in
      length to the side opposite it represents:

      a. E_L or X_L
      b.   E or Z
      c. X_L or R
      d. E_c or X_c

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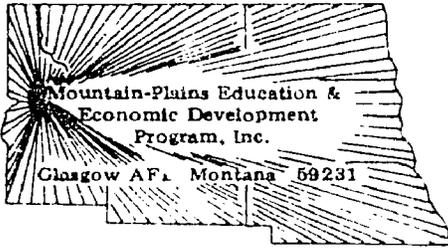
77.02.05.01 (Continued)

68. The resultant vector in the triangle referred to in Question 66 represents the value of:

a.   ⁻ or R
b.   ∠ or R
c. X_L or X_C
d.   E or Z

69. Solve for the applied voltage using the Pythagorean theorem:

a.   350 V
b.   250 V
c.   50 V
d.   100 V
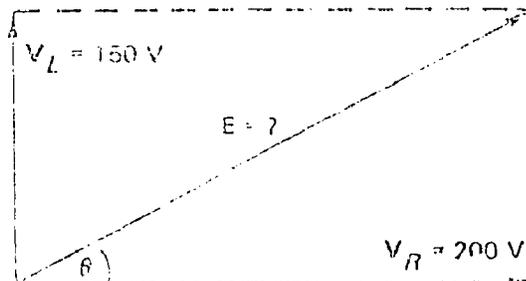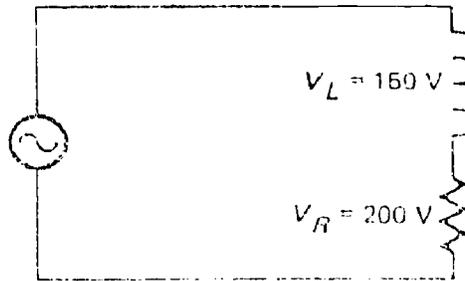
70. What is the PF of a circuit supplied by 600 VA and dissipating 300 W?

a.   100%
b.   200%
c.   50%
d.   75%
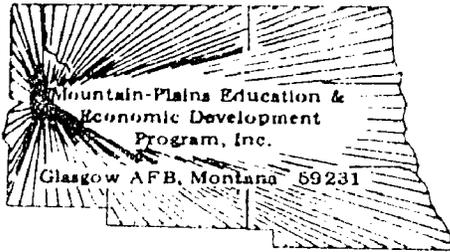
77.02.05.02

71. In the vector diagram shown, the coordinates are:

a. 6 - j3
b. 3 - j6
c. 6 + j3
d. 3 + j6
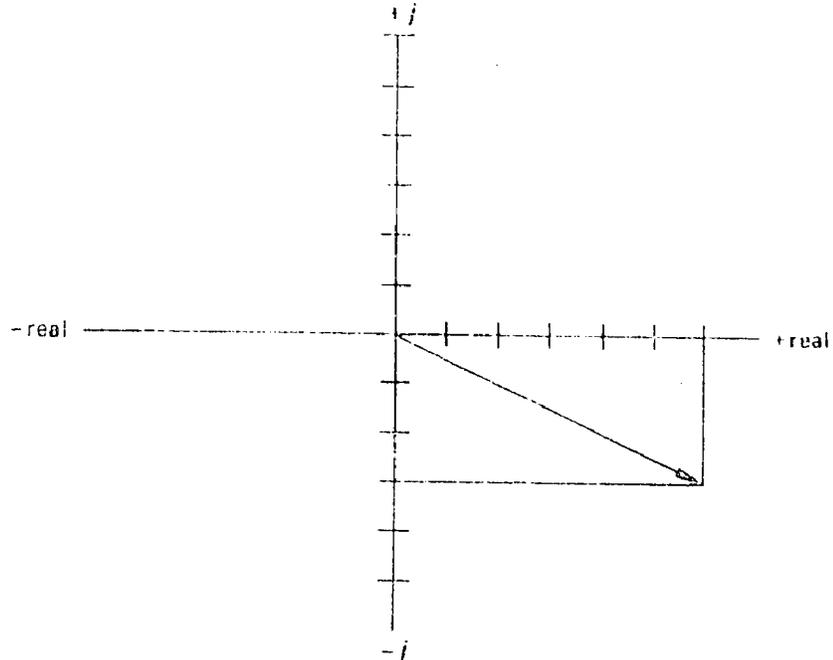
72. The term +j indicates counterclockwise rotation, whereas clockwise rotation is indicated by:

a. - 1
b. + j
c. $\vdots - \vdots$
d. - j

73. To rotate a vector 180 degrees counterclockwise, the vector should be multiplied by the operator:

a. j
b. j^2
c. $j3$
d. j^4
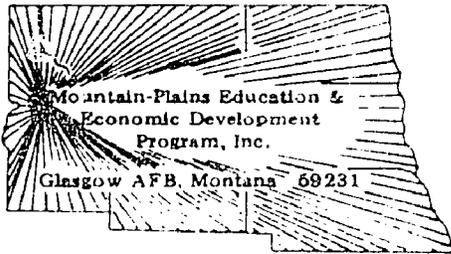
77.02.05.02   (Continued)

74. In mathematics, the standard symbol for the $\sqrt{-1}$ is:

     a.   i
     b.   j
     c.   k
     d.   l

75. Rectangular notation is another method of giving the two sides of a triangle. The reactive side of a triangle is represented by + or -:

     a.   j
     b.   l
     c.   k
     d. π

77.02.06.01

76. If the applied frequency is not changed but the inductance in a series RL circuit is increased, the current will:

     a.   remain the same
     b.   decrease
     c.   increase
     d.   equal $E_L/\cos$

77. If the frequency applied to a series RL circuit is increased, the circuit phase angle will:

     a.   remain the same
     b.   decrease
     c.   increase
     d.   equal $E/\cos$

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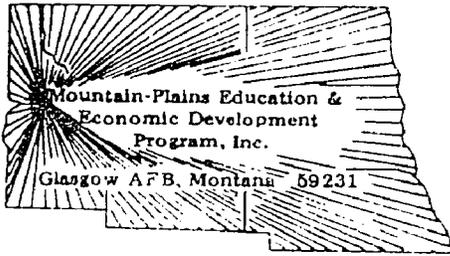
77.02.06.01 (Continued)

78. For a given applied frequency, if the inductance of a series RL circuit is increased, the circuit phase angle will:

a. remain the same
b. decrease
c. increase
d. equal E/L

79. For a given applied frequency, if the inductance of a series RL circuit is decreased. the circuit current will:

a. decrease
b. increase
c. remain the same
d. equal E/X_L

80. In an inductive circuit, if the frequency is decreased, the current will be:

a. increased
b. decreased
c. unaffected
d. squared

77.02.06.02

81. In an RL circuit, the cutoff frequency is the point where the true power has decreased to half the maximum power and:

a. $X_L = X_c$

c. $P_t = P_a$

b. $X_L = R$

d. $\cos \quad = \tan$

82. In the series RL circuit below, if the frequency applied is the f_{co} of the circuit, what is the value of X_L?

a. 1 k Ω
b. 100 Ω
c. 159 Ω
d. 2 k Ω

1000 Ω

100 V
1 kHz

159 mH

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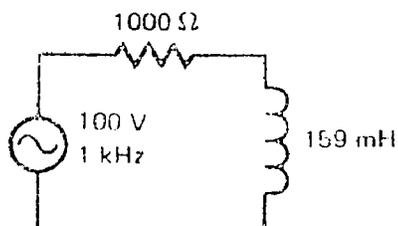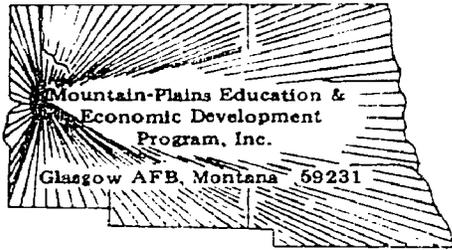
77.02.06.02 (Continued)

83. The effective resistance of any circuit is the combination of:

a. DC resistance and the resistance caused by alternating current
b. DC resistance and the circuit reactances
c. all the voltage drops divided by circuit current
d. all the directly measurable resistances

84. In the series RL circuit shown, if the frequency applied is the f_{co} of the circuit, what is the circuit phase angle?

a. 45 degrees
b. 120 degrees
c. 70.7 degrees
d. 90 degrees

1000 Ω
100 V
1 kHz
159 mH
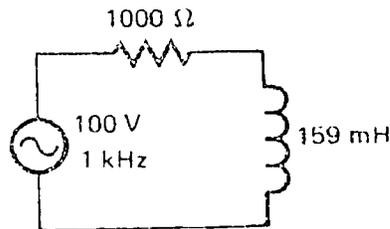
85. What is the cutoff frequency (f_{co}) of the circuit shown?

a. 500 Hz
b. 31.8 Hz
c. 194 Hz
d. 50 Hz

100 Ω
100 V
318 mH
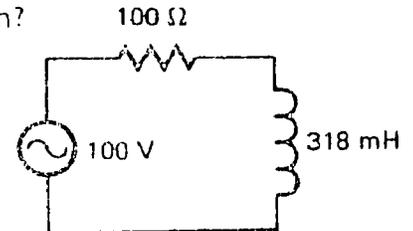
77.02.06.03

86. When a series RC circuit is used a a high-pass filter, the output is taken from across the:

a. resistor
b. capacitor
c. resistor and capacitor
d. generator

87. In the illustration, the current:

a. leads the voltage by 45 degrees
b. lags the voltage by 45 degrees
c. leads the voltage by 90 degrees
d. lags the voltage by 90 degrees

C

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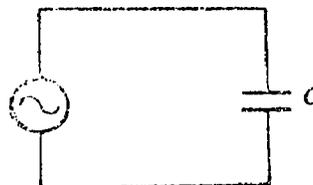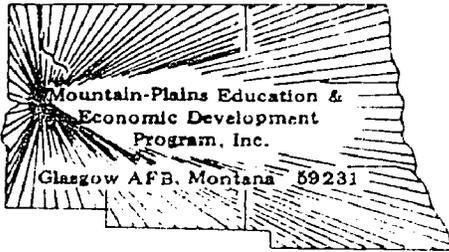
77.02.06.03 (Continued)

88. In a capacitive circuit, if the frequency is increased, the current will be:

    a. decreased
    b. increased
    c. unaffected
    d. reduced slightly

89. If the applied frequency is unchanged but the value of capacitance increased in a series RC circuit, the current will:

    a. decrease
    b. remain the same
    c. increase
    d. equal $E/\cos\Theta$

90. If the frequency applied to an RC circuit is decreased, the voltage drop across the capacitor will:

    a. remain the same
    b. equal $E \times \cos\Theta$
    c. increase
    d. decrease

77.02.06.04

91. What is the impedance in the circuit below?

    a. $72\Omega\ \underline{/\ -57°}$

    b. $72\Omega\ \underline{/\ -33°}$

    c. $110\Omega\ \underline{/\ -57°}$

    d. $110\Omega\ \underline{/\ -33°}$

144 V   39 Ω   40 Ω   100 Ω
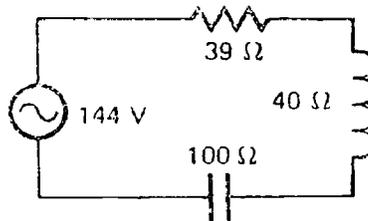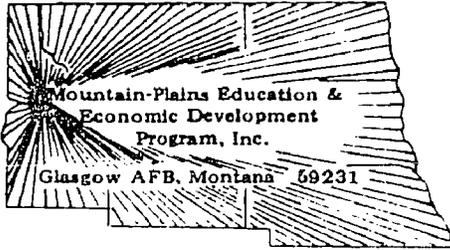
77.02.06.04 (Continued)

92. In a series RLC circuit, the current will be:

    a. greatest through R
    b. equal in R, L, and C
    c. greatest through L
    d. greatest through C

93. The circuit Q may be maintained at a high level by keeping to a minimum the:

    a. reactance
    b. resistance
    c. capacitance
    d. inductance

94. When a vector is multiplied by +j, the vector is rotated:

    a. counterclockwise 180 degrees
    b. clockwise 90 degrees
    c. clockwise 180 degrees
    d. counterclockwise 90 degrees

95. What is the Q of the circuit below?

    a. 0.005
    b. 400
    c. 0.05
    d. 40
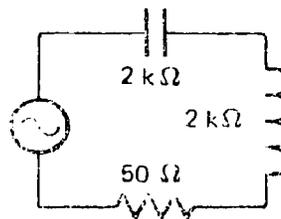
77.02.07.01

96. The total voltage in this circuit is:

    a. 66 V $\angle 65°$
    b. 31 V $\angle 65°$
    c. 32 V $\angle 25°$
    d. 66 V $\angle 25°$
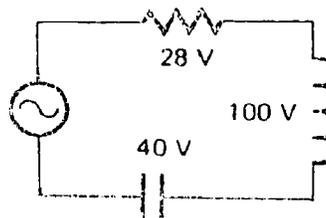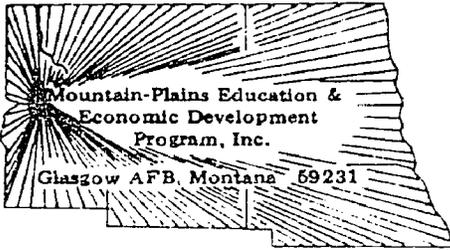
77.02.07.01   (Continued)

97. What is the resonant frequency in this circuit?

    a. 10 Hz
    b. 1 Hz
    c. 1000 Hz
    d. 100 Hz

0.159 µF

159 H

10 Ω
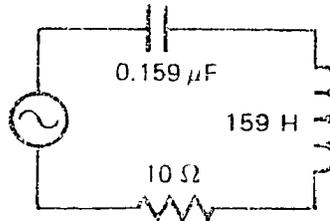
98. If the frequency applied to a series RLc circuit is decreased to a frequency below resonance, the current will:

    a. increase ·
    b. decrease
    c. lag the voltage
    d. be unchanged

99. When the frequency of voltage applied to a coil decreases, the Q of the coil will:

    a. not change
    b. halve
    c. increase
    d. decrease

100. If a series RLC circuit is operating below resonance, the impedance will appear to be:

    a. decreased
    b. resistive
    c. capacitive
    d. inductive

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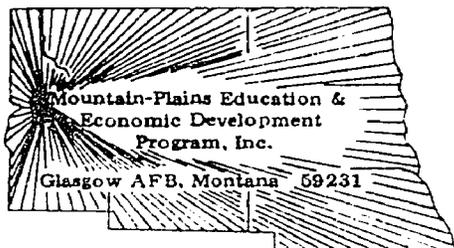
77.02.07.02

101. What two points on the curves below, plotted on a logarithmic scale, indicate a resonant circuit?

    a. B and D
    b. A and B
    c. A and C
    d. C and D
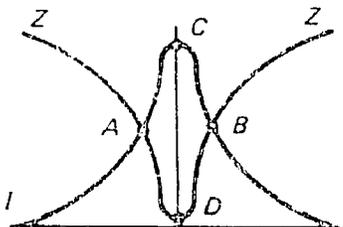
102. When the frequency of voltage applied to a coil increases, the Q of the coil will:

    a. increase
    b. not change
    c   decrease
    d. double

103. What is the bandwidth of a series circuit if the resonant frequency is 50 Hz and the circuit Q is 50?

    a. 1 Hz
    b. 0.10 Hz
    c. 100 Hz
    d. 10 Hz

104. If the Q of the coil in a series resonant circuit is lowered, the bandwidth will:

    a. decrease
    b. not be affected
    c. increase
    d. equal R/X_L

105. In a series RLC circuit, the current will be:

    a. greatest through R
    b. equal in R, L, and C
    c. greatest through L
    d. greatest through C
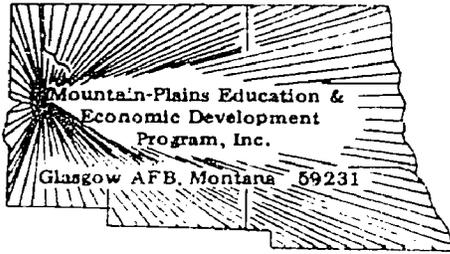
77.02.08.01

106. If the resistance is increased in an RL parallel circuit, the total current will be:

    a.   unchanged
    b.   reduced to zero
    c.   increased
    d.   decreased

107. Which current vector diagram is correct for the circuit below?

    a. _____
    b. _____
    c. _____
    d. _____
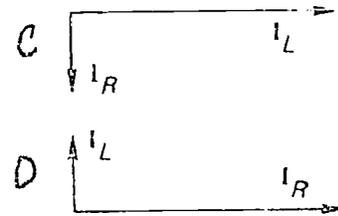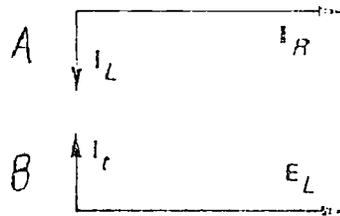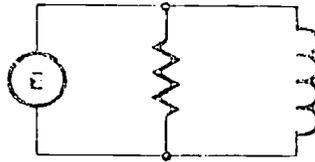
108. What is the phase relationship between voltage and current in a parallel RL circuit?

    a. I_L leads E by 90 degrees

    b. I_R leads E by 90 degrees

    c. I_L lags E by 90 degrees

    d. I_R, I_L, and E are in phase

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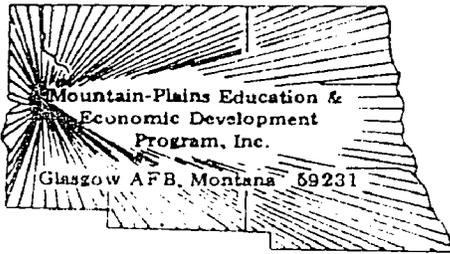
77.02.08.01 (Continued)

109. An equivalent impedance for a parrallel RL circuit is valid only at a given operating frequency because the:

     a.   true power of the circuit is inversely proportional to the frequency of the circuit
     b.   reactive component varies with the frequency
     c.   resistive voltage drop varies directly with the frequency
     d.   applied voltage increases as the frequency is decreased

110. To determine the impedance of a parallel AC circuit,

     a.   apply Ohm's law, assuming a voltage and total current
     b.   add the resistance of the branches vectorially
     c.   add the voltage of the branches vectorially
     d.   add the current of the branches vectorially

77.02.08.02

111. Decreasing the frequency applied to a parallel RL circuit causes a decrease in:

     a. I_L c. P_t

     b. Z_T d. I_R

112. Decreasing the frequency applied to a parallel RL circuit causes an increase in:

     a. I_R c. P_t

     b. Z_T d. I_T

113. Increasing the frequency of applied voltage will cause the current through L_1 to:

     a.   equal $E \times \cos\theta$
     b.   increase
     c.   remain the same
     d.   decrease

                     60 Hz L_1 R_1

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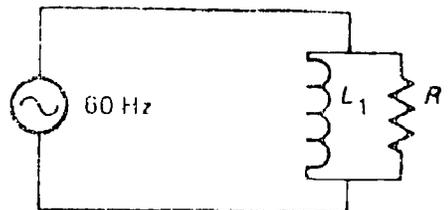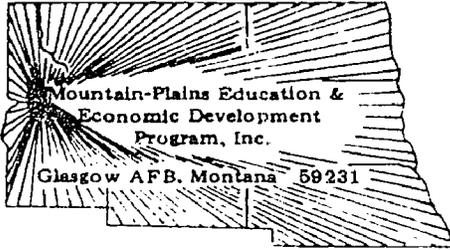
77.02.08.02 (Continued)

114. The addition of a resistor in series with the inductive branch in a parallel RL circuit will cause a decrease in the :

a. power factor
b. phase angle
c. true power
d. resistive branch current

115. Increasing the frequency applied to a parallel RL circuit causes an increase in:

a. I_L

b. phase angle

c. I_T

d. impedance

77.02.08.03

116. In a parallel RC circuit, the phase relationship of the branch currents and applied voltage is correctly represented by which vector diagram?

a. _____
b. _____
c. _____
d. _____
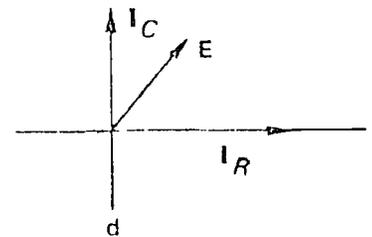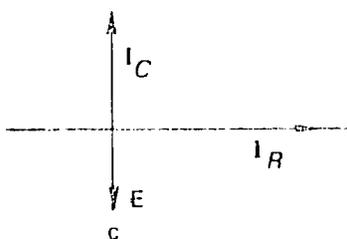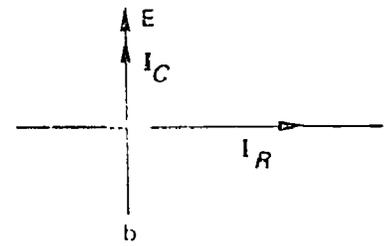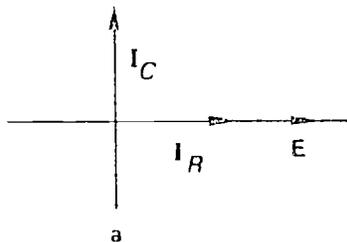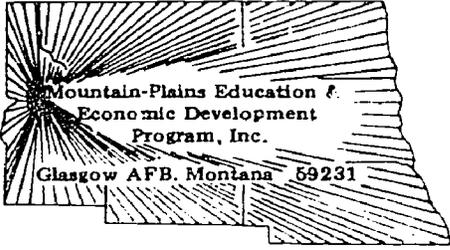
77.02.08.03 (Continued)

117. Which diagram illustrates the relationship between E, I_C, and I_R in a parallel RC circuit?
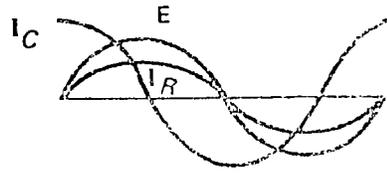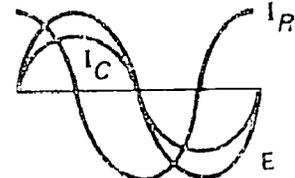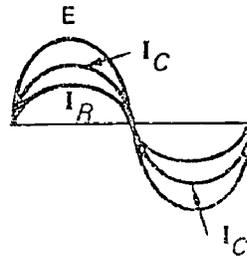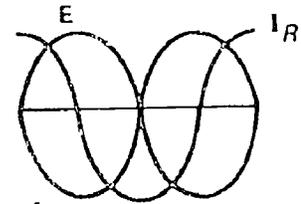
a. _____
b. _____
c. _____
d. _____

118. The total impedance of this circuit is:

a. 71 ohms
b. 50 ohms
c. 142 ohms
d. 112 ohms

$R = 100\Omega$
$X_C = 100\ \Omega$
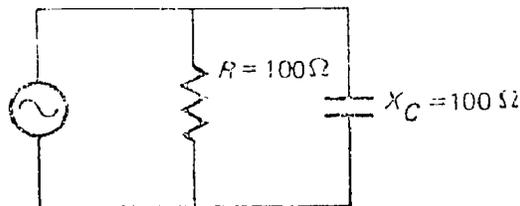
119. Determine total impedance of the circuit below:

a. 125 ohms
b. 175 ohms
c. 100 ohms
d. 60 ohms

$X_C = 75\ \Omega$
$R = 100\ \Omega$

Student: _____ File Code: __77.02.00.00.A2-2__

Date: _____ Date Published: __5-29-74__
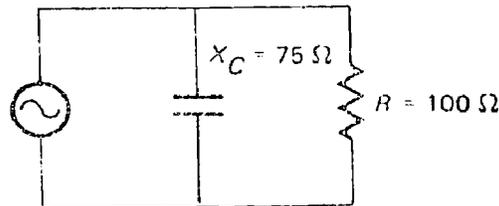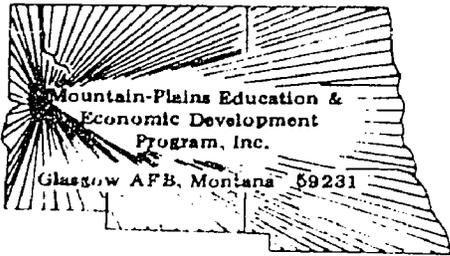
77.02.08.03 (Continued)

120. Decreasing the frequency applied to the circuit below will cause a decrease in:

a. total current
b. impedance
c. power factor
d. capacitive reactance
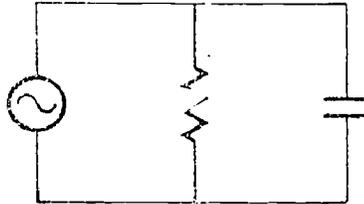
77.02.08.04

121. If the frequency applied to a parallel LC circuit is increased from resonance, the current drawn from the source:

a. increases
b. appears inductive
c. decreases
d. lags the voltage

122. If a parallel LC circuit is at resonance and X_L is 2000 ohms, what is the value of X_C?

a. 4000 ohms
b. 1000 ohms
c. 2000 ohms
d. 20 K ohms

123. Determine the resonant frequency of the circuit below:

a. 10 KHz
b. 1 KHz
c. 100 KHz
d. 1000 KHz

0.159 µF   159 mH
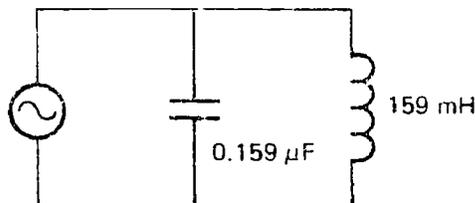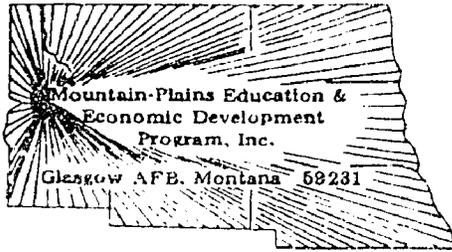
77.02.08.04 (Continued)

124. Decreasing the frequency applied to a parallel LC circuit from resonance cause current drawn from the source to:

    a. increase
    b. decrease
    c. lead the voltage
    d. appear capacitive

125. To determine the resonant frequency of the circuit below, what values must be known?

    a. L and C
    b. R and L
    c. C and R
    d. applied frequency and Z
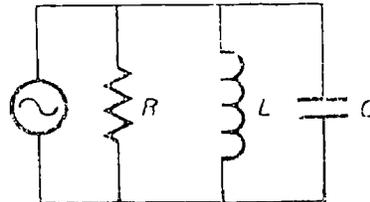
77.02.08.05

126. If the Q of the coil is greater than 10, the effect of R_2 on the impedance of the circuit is:

    a. to double impedance
    b. to increase impedance
    : to decrease impedance
    d. not subtle
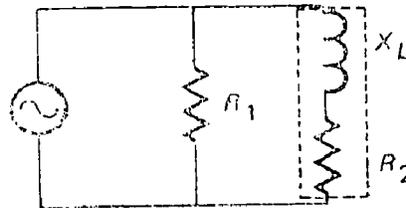
127. Replacing a high-Q coil with a low-Q coil in a parallel RI circuit will cause:

    a. a decrease in phase angle
    b. an increase in phase angle
    c. no change in circuit current
    d. an increase in the voltage drop across the coil

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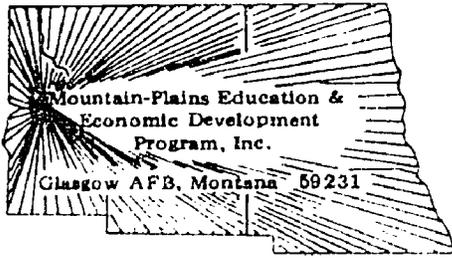
77.02.08.05 (Continued)

126. A decrease in effective resistance in a parallel RL circuit will have what effect on the voltage drop across the inductor?

a. first an increase, then a decrease in V_L

b. a decrease in V_L

c. an increase in V_L

d. no change in V_L

129. Increasing R_{eff} of the coil in a parallel RL circuit will have what effect on true power?

a. an increase in resistance
b. no effect
c. a decrease in P_t
d. an increase in P_t

130. If the R_{eff} of the coil in a parallel RL circuit is increased, the power factor of the circuit will:

a. decrease
b. remain the same
c. increase
d. go to zero

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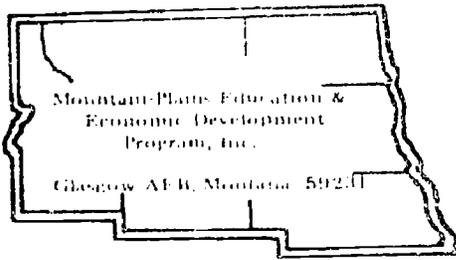
Learning Experience Guide

UNIT: INTRODUCTION TO.A.C.

RATIONALE:

Understanding what AC voltage is and how it is generated is basic knowledge
for a serviceman.

PREREQUISTES:

Course: D.C. Circuits

OBJECTIVES:

Identify an electrical generator, its parts, its function and explain its
operational characteristics.

RESOURCES:

Printed Materials

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 1: Introduction
To AC--, progress tests). Paul E. Trejo, Westinghouse Learning Corporation, New
York, New York, 1972.

GENERAL INSTRUCTIONS:

You have been prescribed into the first unit of this course. The activities that
you perform will be assigned one at a time. A LAP will give you directions for
each activity. Read the LAP and follow the procedure and directions given.

When you finish the performance activities for the unit, you will be given a unit
test as stated in the "Evaluation Procedures" for post testing. After successful
completion of the unit test, the next assigned unit for the course is begun.

PERFORMANCE ACTIVITIES:

.01   Generating AC Voltage
.02   AC and DC Generators

EVALUATION PROCEDURE:

The student takes a progress test about the major concepts and procedures presented
in the unit activities.
Successful completion is correctly answering at least 80% of the test items.

FOLLOW-THROUGH:

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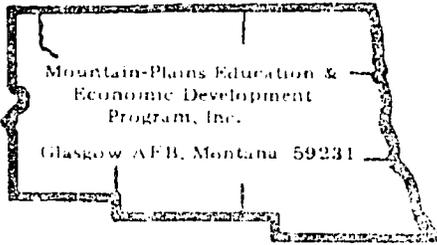
Learning Activity Package

PERFORMANCE ACTIVITY: _____Generating AC Voltage_____

OBJECTIVES:

Identify the symbol for alternating current.

Identify factors that determine frequency of a generating system.

Determine the time required for one cycle, given the generator conditions.

Identify the peak to peak, effective and average voltages, and frequency of a given sine wave.

Given several illustrations of flux lines in AC generators, identify which would produce maximum peak to peak voltage.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 1: Introduction to AC--), Trejo.

PROCEDURE:

1. Read pages 3-28 in Unit 1, AC Circuits.

2. Answer questions within the chapter.

3. Proceed to next LAP.

Principal Author(s):   P. Schuster, B. Vetter

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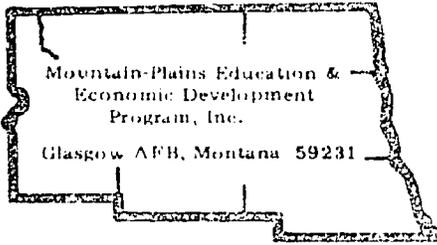
Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: _____ AC and DC Generators _____

OBJECTIVES:

Name and state the function for each part of a typical alternating current generator.

Recognize differences between alternating and direct current generators.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 1: Introduction to AC--, progress test), Trejo.

PROCEDURE:

1. Read pages 29-38 in Unit 1, AC Circuits.

2. Answer questions within the chapter.

3. Take the unit progress test.

Principal Author(s):   P. Schuster, B. Vetter

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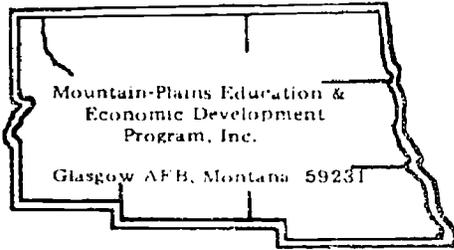
Learning Experience Guide

UNIT: A.C. RELATIONSHIPS

RATIONALE:

Electrical properties are interrelated. Understanding these relationships in
AC circuits provides a logic for diagnosis of circuits in electrical/electronic
devices.

PREREQUISITES:

Unit: Introduction to A.C.

OBJECTIVES:

Explain relationships between current and electromotive force in inductive and
capacitive AC circuits.

Define and calculate impedance, reactance and power for AC circuits.

RESOURCES:

Printed Materials

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 2: AC
Relationships--, progress tests). Paul E. Trejo, Westinghouse Corporation, New
York, New York, 1972.

GENERAL INSTRUCTIONS.

You have been prescribed into the second unit of this course. The activities that
you perform will be assigned one at a time. A LAP will give you directions for
each activity. Read the LAP and follow the procedure and directions given.

When you finish the performance activities for the unit, you will be given a
unit test as stated in the "Evaluation Procedures" for post testing. After
successful completion of the unit test, the next assigned unit for the course
is begun.

PERFORMANCE ACTIVITIES:

.01 Inductive Reactance
.02 Inductive Phase Relationships
.03 Capacitive Reactance
.04 Voltage and Impedance
.05 Power in AC Circuits

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Principal Author(s): D. Hoggatt

EVALUATION PROCEDURE:

The student takes a progress test about the major co epts and procedures presented in the unit activities.

Successful completion is correctly answering at least 80% of the test items.

FOLLOW-THROUGH:

You are now ready to begin the first assigned LAP. If you have questions, consult your instructor.

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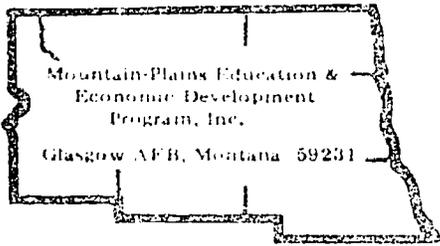
Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: _____Inductive Reactance_____

OBJECTIVES:

Define inductive reactance.

Identify factors that affect inductive reactance.

Compute inductive reactance values for given circuits.

EVALUATION PROCEDURE:

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 2:
AC Relationships--), Trejo.

PROCEDURE:

1. Read pages 3-10 in Unit 2, AC Circuits.

2. Answer questions within the chapter.

3. Proceed to next LAP.

Principal Author(s):   P. Schuster, B. Vetter

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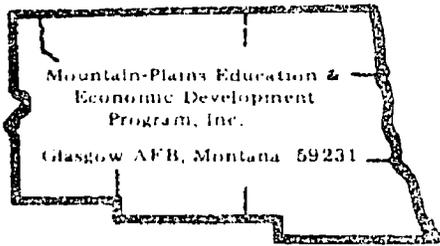
Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: ___Inductive Phase Relationships___

OBJECTIVES:

Describe and illustrate relationships of voltage and current in AC inductive circuits.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 2: AC Relationships--), Trejo.

PROCEDURE:

1. Read pages 11-25 in Unit 2, AC Circuits.

2. Answer questions within the chapter.

3. Proceed to next LAP.

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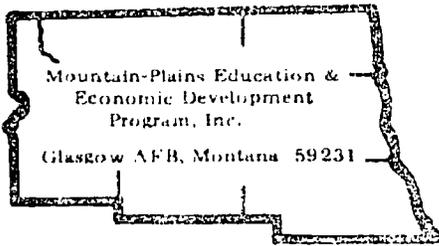
Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Capacitive Reactance

OBJECTIVES:

Define capacitive reactance.

Identify factors that affect capacitive reactance.

Compute capacitive reactance values for given circuits.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 2: AC Relationships--), Trejo.

PROCEDURE:

1. Read pages 26-39 in Unit 2, AC Circuits.

2. Answer questions within the chapter.

3. Proceed to next LAP.

Principal Author(s):   P. Schuster, B. Vetter

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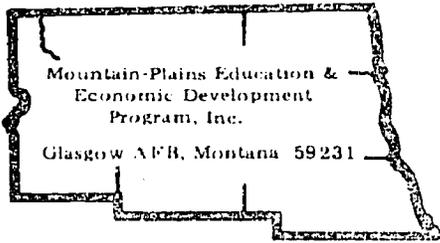
Learning Activity Package

Student: _____

Date. _____

PERFORMANCE ACTIVITY: ___Voltage and Impedance___

OBJECTIVE:

Define impedance.

Explain relationship between AC voltage and impedance.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining
to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 2:
AC Relationships--), Trejo.

PROCEDURE:

1. Read pages 40-53 in Unit 2, AC Circuits.

2. Answer questions within the chapter.

3. Proceed to next LAP.

Principal Author(s):   P. Schuster, B. Vetter

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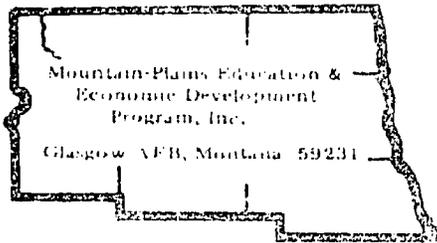
Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: ___ Power in AC Circuits ___

OBJECTIVE:

Define apparent and true power and explain their relationship.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining
to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 2:
AC Relationships--, progress test), Trejo.

PROCEDURE:

1. Read pages 54-64 in Unit 2, AC Circuits.

2. Answer questions within the chapter.

3. Take the unit progress test.

Principal Author(s):   P. Schuster, B. Vetter

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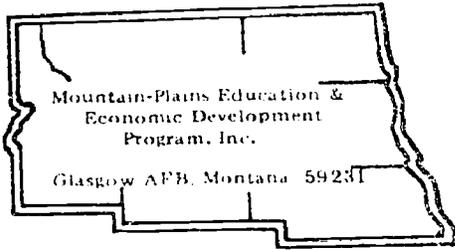
Learning Experience Guide

UNIT: THE TRANSFORMER

RATIONALE:

The transformer is a very commonly used electrical/electronic component used to transfer electrical energy from one circuit to another. A service person will have to diagnose and repair circuits using transformers.

PREREQUISITES:

Unit: A.C. Relationships

OBJECTIVE:

Identify a transformer, its application and explain its characteristics of operation.

RESOURCES:

Printed Materials

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 3: The Transformer--, progress tests). Paul E. Trejo, Westinghouse Learning Corporation, New York, New York, 1972.

GENERAL INSTRUCTIONS:

You have been prescribed into the third unit of this course. The activities that you perform will be assigned one at a time. A LAP will give you directions for each activity. Read the LAP and follow the procedure and directions given.

When you finish the performance activities for the unit, you will be given a unit test as stated in the "Evaluation Procedures" for post testing. After successful completion of the unit test, the next assigned unit for the course is begun.

PERFORMANCE ACTIVITIES:

.01 Transformer Operation and Construction
.02 Transformer Theory
.03 Turns Ratio and Power
.04 Practical Transformers

Principal Author(s): P. Hoggatt

EVALUATION PROCEDURE:

The student takes a progress test about the major concepts and procedures presented
in the unit activities.

Successful completion is correctly answering at least 80% of the test items.

FOLLOW-THROUGH:

After completing this guide, begin with the first assigned LAP.
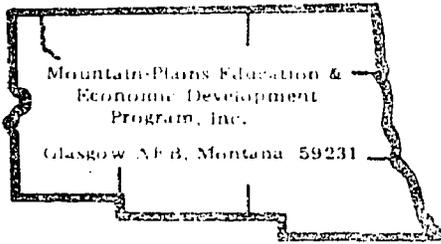
Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: ___ Transformer Operation and Construction

OBJECTIVES:

Identify a transformer and explain its function.

Identify transformer parts.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining
to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 3:
The Transformer--), Trejo.

PROCEDURE:

1. Read pages 3-17 in Unit 3, AC Circuits.

2. Answer questions within the chapter.

3. Proceed to next LAP.

Principal Author(s): P. Schuster, B. Vetter

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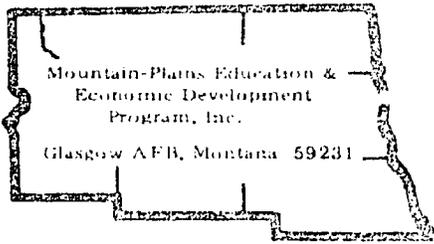
Learning Activity Package

Student: _____

Date: _____

Transformer Theory

PERFORMANCE ACTIVITY: _____

OBJECTIVE:

Explain the operational theory of a transformer.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining
to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 3:
The Transformer--), Trejo.

PROCEDURE:

1. Read pages 18-28 in Unit 3, AC Circuits.

2. Answer questions within the chapter.

3. Proceed to next LAP.

Principal Author(s):   P. Schuster, B. Vetter

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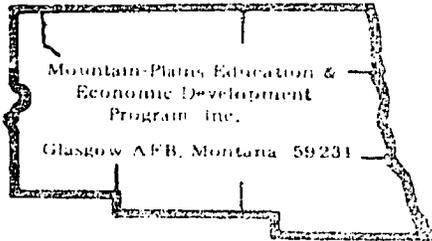
Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: ___Turns Ratio and Power___

OBJ꜠ ꜠IVE:

Determine current ratios, voltage ratios and power for given transformers.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 3: The Transformer--), Trejo.

PROCEDURE:

1. Read pages 29-45 in Unit 3, AC Circuits.

2. Answer questions within the chapter.

3. Proceed to next LAP.

Principal Author(s):   P. Schuster, B. Vetter

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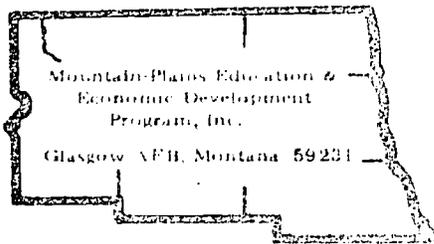
Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: ___Practical Transformers___

OBJECTIVES:

Identify transformer power losses.

Compute transformer efficiency.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining
to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 3:
The Transformer--, progress tests), Trejo.

PROCEDURE:

1. Read pages 46-63 in Unit 3, AC Circuits.

2. Answer questions within the chapter.

3. Take the unit progress test.

Principal Author(s):   P. Schuster, B. Vetter

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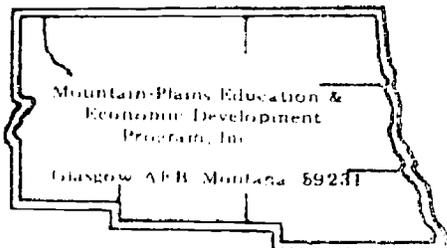
Learning Experience Guide

UNIT: POWER SUPPLIES

RATIONALE:

Power supplies furnish the voltages needed to operate electronic equipment.
A serviceman must understand the functions of power supplies to be effective
in operating and repairing them.

PREREQUISITES:

Unit: The Transformer

OBJECTIVES:

Identify electronic power supplies, identify its function and explain its
operational characteristics.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 4: Power
Supplies--, progress tests). Paul E. Trejo, Westinghouse Learning Corporation,
New York, New York, 1972.

GENERAL INSTRUCTIONS:

You have been prescribed into the fourth unit of this course. The activities
that you perform will be assigned one at a time. A LAP will give directions
for each activity. Read the LAP and follow the procedure and directions given.

When you finish the performance activities for the unit, you will be given a
unit test as stated in the "Evaluation Procedures" for post testing. After
successful completion of the unit test, the next assigned unit for the course
is begun.

PERFORMANCE ACTIVITIES:

.01 Semiconductor Rectifiers
.02 Power Supply Filters

Principal Author(s):

P. Hoggatt

EVALUATION PROCEDURE:

The student takes a progress test about the major concepts and procedures presented in the unit activities.

Successful completion is correctly answering at least 80% of the test items.

FOLLOW-THROUGH:

You may begin with LAP .01 after completing this guide.

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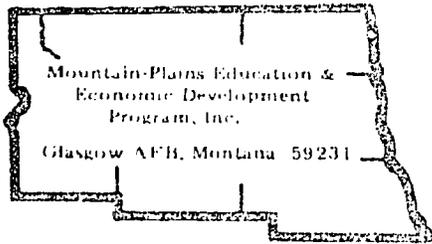
Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: ___Semiconductor Rectifiers___

OBJECTIVES:

Identify the functions of rectifiers and a power supply.

Diagram and explain half-wave and full-wave rectification.

Explain ripple frequency.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining
to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 4:
Power Supplies--), Trejo.

PROCEDURE:

1. Read pages 3-16 in Unit 4, AC Circuits.

2. Answer questions within the Chapter.

3. Go to '' .. :: LAP.

Principal Author(s):   P. Schuster, B. Vetter

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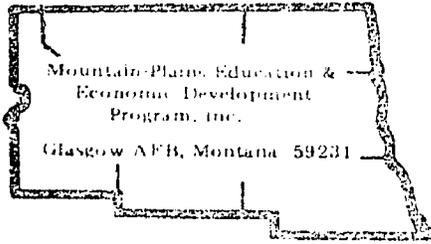
Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Power Supply Filters

OBJECTIVES:

Diagram a choke-input, capacitor-input and pi-section filters.

Explain the function of a power supply filter.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 4: Power Supplies--, progress test), Trejo.

PROCEDURE:

1. Read pages 17-30 in Unit 4, AC Circuits.

2. Answer questions within the Chapter.

3. Take the Unit Progress Test.

Principal Author(s):   P. Schuster, B. Vetter

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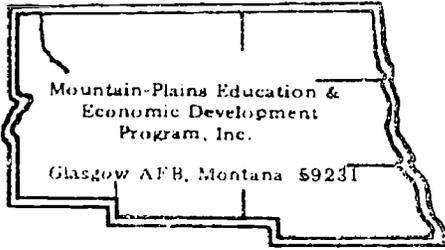
Learning Experience Guide

UNIT: A.C. COMPUTATIONS

RATIONALE:

The ability to compute circuit values is necessary for a more complete understanding of the circuit characteristics. The more known about circuits the easier troubleshooting techniques are developed.

PREREQUISITES:

Unit: Power Supplies

OBJECTIVE:

Use mathematics to describe the electronic properties of alternating current series circuitry.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 5: A.C. Computations--, student handbook, progress tests). Paul E. Trejo, Westinghouse Learning Corporation, New York, New York, 1972.

GENERAL INSTRUCTIONS:

You have been prescribed into the fifth unit of this course. The activities that you perform will be assigned one at a time. A LAP will give you directions for each activity. Read the LAP and follow the procedure and directions given.

When you finish the performance activities for the unit, you will be given a unit test as stated in the "Evaluation Procedures" for post testing. After successful completion of the unit test, the next assigned unit for the course is begun.

PERFORMANCE ACTIVITIES:

.01   Vectors
.02   Rectangular and Polar Notation

Principal Author(s):   P. Hoggatt

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EVALUATION PROCEDURE:

The student takes a progress test about the major concepts and procedures presented in the unit activities.

Successful completion is correctly answering at least 80% of the test items.

FOLLOW-THROUGH:

Go to the first assigned Learning Activity Package (LAP) for this Unit.
If you have questions, consult with your instructor.

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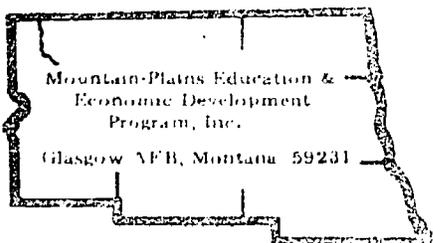
Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: _____ Vectors _____

OBJECTIVE:

Calculate voltage and current phase relationships in alternating current series circuits using vector analysis.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 5: A.C. Computations--, student handbook), Trejo.

PROCEDURE:

1. Read pages 3-18 in Unit 5, AC Circuits.

2. Answer questions within the Chapter.

3. Proceed to the next LAP.

Principal Author(s):   P. Schuster, B. Vetter

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Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: ____Rectangular and Polar Notation__

OBJECTIVE:

Calculate the impedance of alternating current series circuits using polar and rectangular notations.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 5: A.C. Computations--, progress--, student handbook, progress test), Trejo.

PROCEDURE:

1. Read pages 19-40 in Unit 5, AC Circuits.

2. Answer questions within the Chapter.

3. Take the Unit Progress Test.

Principal Author(s):   P. Schuster, B. Vetter

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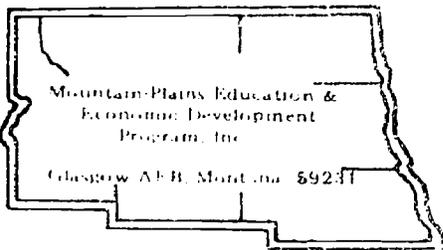
Learning Experience Guide

UNIT: SERIES RESISTIVE-REACTIVE CIRCUITS

RATIONALE:

An understanding of relationships between resistance, inductance, frequency,
current and power is essential in order to explain characteristics of series
resistive-reactive circuits.

PREREQUISITES:

Unit: AC Computations

OBJECTIVE:

Identify electronic properties and explain their relationships for resistive-
inductive and resistive-capacitive alternating current series circuits.

RESOURCES:

AC Circuits,An Individualized Approach to Electronics (booklet- Unit 6:
Series Resistive-Reactive Circuits--, student handbook, progress test).
Paul E. Trejo, Westinghouse Learning Corporation, New York, New York, 1972.

GENERAL INSTRUCTIONS:

You have been prescribed into the sixth unit of this Course. The activities
that you perform will be assigned one at a time. A LAP will give you directions
for each activity. Read the LAP and follow the procedure and directions given.

When you have finished the performance activities for the unit, you will be
given a unit test as stated in the "Evaluation Procedures" for post testing.
After successful completion of the unit test, the next assigned unit for the
course is begun.

PERFORMANCE ACTIVITIES:

.01 Variational Analysis of Series RL Circuits
.02 RL Filter Circuits
.03 Series RC Circuits
.04 Series RLC Circuits

Principal Author(s):   P. Hoggatt

EVALUATION PROCEDURE:

The student takes a progress test about the major concepts and procedures
presented in the unit activities.

Successful completion is correctly answering at least 80% of the test items.

FOLLOW-THROUGH:

If you have questions, consult with your instructor. Please begin the
first assigned LAP.
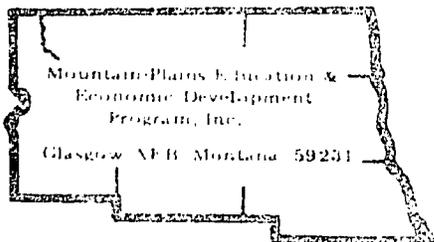
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Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Variational Analysis of Series RL Circuits

OBJECTIVE:

Determine the effect that varying the frequency, resistance, applies
voltage or inductance has on the impedance of a series RL circuit.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining
to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet- Unit 6:
Series Resistive-Reactive Circuits--, student handbook), Trejo.

PROCEDURE:

1. Read pages 3-10, Unit 6 in AC Circuits.

2. Answer questions within the Chapter.

3. Proceed to next LAP.

Principal Author(s):   P. Schuster, B. Vetter

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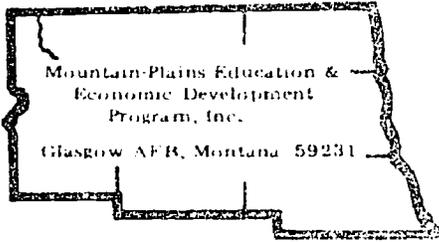
Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: RL Filter Circuits

OBJECTIVE:

Determine the effects of frequency on series RL circuits.

Determine the cut-off frequency of a series RL circuit.

Explain cut-off and half-power point for a series RL circuit.

Identify RL low-pass and high-pass filters.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining
to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 6:
Series Resistive-Reactive Circuits--, student handbook), Trejo.

PROCEDURE:

1. Read pages 11-22, Unit 6 in AC Circuits.

2. Answer questions within the chapter.

3. Proceed to the next LAP.

Principal Author(s):   P. Schuster, B. Vetter

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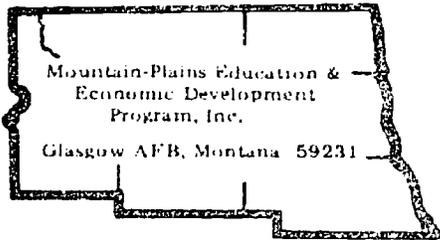
Learning Activity Package

Student: _____

. Date: _____

PERFORMANCE ACTIVITY: ____Series RC Circuits____

OBJECTIVES:

Determine the effects of frequency on series RC circuits.

Explain RC low-pass and high-pass filters.

Calculate the impedance of a series RC circuit using vector diagrams.

Determine the effect that varying the frequency, resistance, applied voltage or inductance has on the impedance of a series RC circuit.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 6: Series Resistive-Reactive Circuits--, student handbook), Trejo.

PROCEDURE:

1. Read pages ?? ??, Unit 3 in AC Circuits.

2. Answer questions within the chapter.

3. Proceed to the next LAP.

Principal Author(s): P. Schuster, B. Vetter

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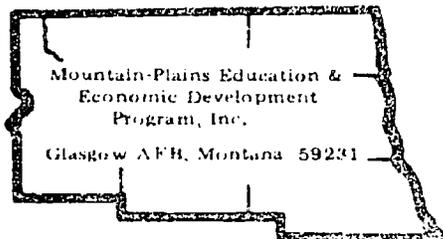
Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: ___ Series RLC Circuits ___

OBJECTIVES:

Explain the figure of merit (Q) of a coil, skin effect and proximity effect.

Calculate impedance in a series RLC circuit.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining
to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 6:
Series Resistive-Reactive Circuits--, student handbook, progress tests), Trejo.

PROCEDURE:

1. Read pages 36-47, Unit 6, AC Circuits.

2. Answer questions within the chapter.

3. Take the Unit Progress Test.

Principal Author(s):   P. Schuster, B. Vetter

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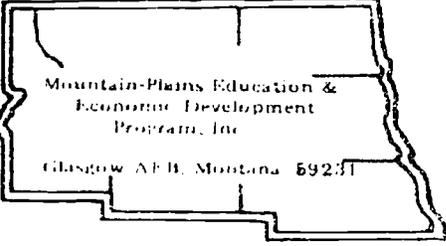
Learning Experience Guide

UNIT: SERIES RESONANCE

RATIONALE:

An understanding of series resonance is the basis for explaining tuning
and alignment.

PREREQUISITES:

Unit: Series Resistive-Reactive Circuits

OBJECTIVE:

Identify and calculate series circuit characteristics at, above and below
resonant frequency.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 7:
Series Resonance--, student handbook, progress tests). Paul E. Trejo,
Westinghouse Learning Corporation, New York, New York, 1972.

GENERAL INSTRUCTIONS:

You have been prescribed into the seventh unit of this Course. The activities
that you perform will be assigned one at a time. A LAP will give you directions
for each activity. Read the LAP and follow the procedure and directions given.

When you finish the performance activities for the unit, you will be given
a unit test as stated in the "Evaluation Procedure" for post testing. After
successful completion of the unit test, the next assigned unit for the
Course is begun.

PERFORMANCE ACTIVITIES:

.01 Series Resonance
.02 Current Behavior and Resonance

Principal Author(s):   P. Hoggatt

EVALUATION PROCEDURE:

The student takes a progress test about the major concepts and procedures
presented in the unit activities.

Successful completion is correctly answering at least 80% of the test items.

FOLLOW-THROUGH:

At this time, you may begin with the first assigned LAP.

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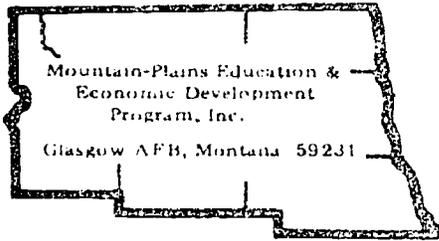
Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: ___Series Resonance___

OBJECTIVES:

Calculate voltage drop across reactive elements in a series circuit using formulas.

Explain conditions for series resonance.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 7: Series Resonance--, student handbook), Trejo.

PROCEDURE:

1. Read pages 3-11, Unit 7 in AC Circuits.

2. Answer questions within the chapter.

3. Proceed to the next LAP.

Principal Author(s):   P. Schuster, B. Vetter

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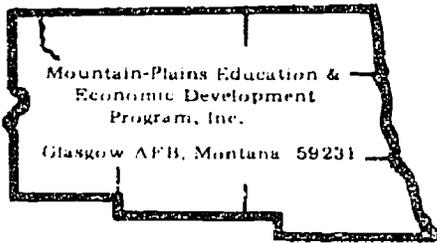
Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: __Current Behavior and Resonance__

OBJECTIVES:

Diagram current and impedance curves for series circuits at resonant frequency.

Identify series circuit resonant behavior above and below the resonant frequency.

Explain how series resonant circuits are used as filters.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining
to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 7:
Series Resonance--, student handbook, progress test), Trejo.

PROCEDURE:

1. Read pages 12-24, Unit 7 in AC Circuits.

2. Answer questions within the chapter.

3. Take the Unit Progress Test.

Principal Author(s):   P. Schuster, B. Vetter

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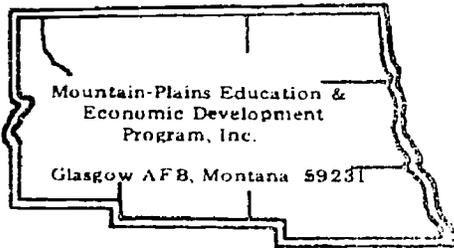
Learning Experience Guide

UNIT: PARALLEL RESISTIVE-REACTIVE CIRCUITS

RATIONALE:

An understanding of parallel resonance is basic to explaining circuit filtering
of frequencies.

PREREQUSITES:

Unit: Series Resonance

OBJECTIVE:

Identify and calculate parallel circuit characteristics at, above and below
resonant frequency.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 8:
Parallel Resistive-Reactive Circuits--, student handbook, progress tests).
Paul E. Trejo, Westinghouse Learning Corporation, New York, New York, 1972.

GENERAL INSTRUCTIONS:

You have been prescribed into the eighth unit of this course. The activities
that you perform will be assigned one at a time. A LAP will give you directions
for each activity. Read the LAP and follow the procedure and directions given.

When you finish the performance activities for the unit, you will be given a
unit test as stated in the "Evaluation Procedure" for post testing. After
successful completion of the unit test, proceed to the next assigned course.

PERFORMANCE ACTIVITIES:

.01 Parallel RL Circuits
.02 Variational Analysis of Parallel RL Circuits
.03 Parallel RC and RLC Circuits
.04 Parallel Resonance
.05 Practical RL Circuits

**Principal Author(s):**   P. Hoggett

EVALUATION PROCEDURE:

The student takes a progress test about the major concepts and procedures
presented in the unit activities.

Successful completion is correctly answering at least 80% of the test items.

FOLLOW-THROUGH:

Proceed to the first assigned Learning Activity Package (LAP) listed on
your Student Progress Record (SPR).
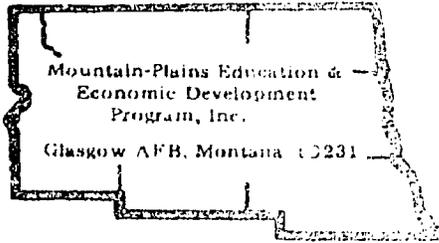
Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: _____ Parallel RL Circuits _____

OBJECTIVES:

Determine the effect that varying the frequency, resistance, applied voltage
or inductance has on impedance of a parallel RL circuit.

Calculate the current, impedance, power and power factor for parallel RL
circuits using formulas.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining
to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 8:
Parallel Resistive-Reactive Circuits--, student handbook), Trejo.

PROCEDURE:

1. Read pages 3-18, Unit 8 in AC Circuits.

2. Answer questions within the chapter.

3. Proceed ....

Principal Author(s): ___ Schuster, B. Vetter

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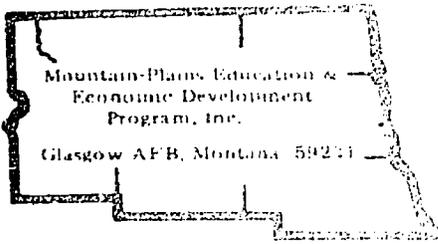
Learning Activity Package

Participant: _____

Date: _____

PERFORMANCE ACTIVITY: __Variational Analysis of Parallel RL Circuits__

OBJECTIVE:

Use variational analysis to calculate the current, impedance, power and power factor for parallel RC circuits.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 8: Parallel Resistive-Reactive Circuits--, student handbook), Trejo.

PROCEDURE:

1. Read pages 19-27, unit 8 in AC Circuits.

2. Answer questions within the chapter.

3. Proceed to the next LAP.

Principal Author(s): P. Schuster, B. Vetter

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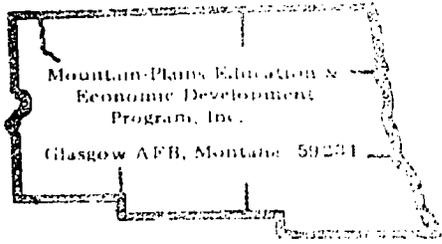
Learning Activity Package

Participant: _____

Date: _____

PERFORMANCE ACTIVITY: ___Parallel RC and RLC Circuits___

OBJECTIVE:

Calculate the current, impedance, power and power factor for parallel RC and
RLC circuits.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining
to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 8:
Parallel Resistive-Reactive Circuits--, student handbook), Trejo.

PROCEDURE:

1. Read pages 29-33, Unit 8 in AC Circuits.

2. Answer questions within the chapter.

3. Proceed to next LAP.

Principal Author(s): R. Schuster, B. Vetter

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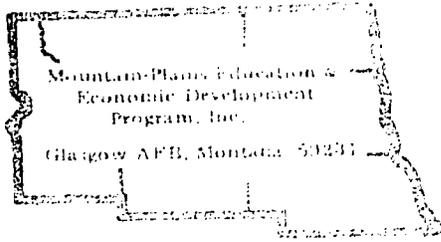
Learning Activity Package

Participant: _____

Date: _____

PERFORMANCE ACTIVITY: __Parallel Resonance_____

OBJECTIVES:

Identify the characteristics of a tank circuit .

Diagram current and impedance curves for parallel circuits at resonant frequency.

Identify parallel resonant circuit behavior above and below the resonant frequency.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 8: Parallel Resistive-Reactive Circuits--, student handbook), Trejo.

PROCEDURE:

1. Read pages 1-17, Unit 8, AC Circuits.

2. Answer questions within the chapter.
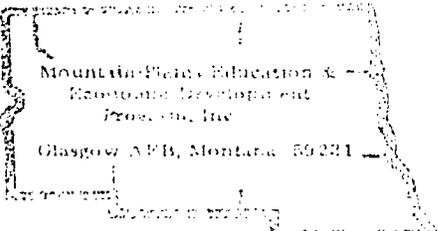
3. Proceed to the next LAP.

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Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: ___ Practical RL Circuits ___

OBJECTIVES:

Explain how parallel resonant circuits are used as filters.

Explain effective resistance of a coil in a parallel RL circuit.

Calculate figure of merit (Q), impedance and current in a practical parallel RL circuit.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 8: Analysis of Resistive-Reactive Circuits--, student handbook, progress tests), Trejo.

PROCEDURE:

1. Read through Unit 8 in AC Circuits.

2. Answer questions within the chapter.

3. Take the Unit Progress Test

P. Schuster, B. Vetter