FCC Exam Element 3 Question Pool for General Class
Effective 7/1/2019 – 6/30/2023

SUBELEMENT G5 – ELECTRICAL PRINCIPLES [3 Exam Questions – 3 Groups]

G5A – Reactance; inductance; capacitance; impedance; impedance matching

G5A01
What is impedance?
A. The electric charge stored by a capacitor
B. The inverse of resistance
C. The opposition to the flow of current in an AC circuit
D. The force of repulsion between two similar electric fields
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G5A02
What is reactance?
A. Opposition to the flow of direct current caused by resistance
B. Opposition to the flow of alternating current caused by capacitance or inductance
C. A property of ideal resistors in AC circuits
D. A large spark produced at switch contacts when an inductor is de-energized
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G5A03
Which of the following causes opposition to the flow of alternating current in an inductor?
A. Conductance
B. Reluctance
C. Admittance
D. Reactance
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G5A04
Which of the following causes opposition to the flow of alternating current in a capacitor?
A. Conductance
B. Reluctance
C. Reactance
D. Admittance
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G5A05

How does an inductor react to AC?

A. As the frequency of the applied AC increases, the reactance decreases
B. As the amplitude of the applied AC increases, the reactance increases
C. As the amplitude of the applied AC increases, the reactance decreases
D. As the frequency of the applied AC increases, the reactance increases

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G5A06

How does a capacitor react to AC?

A. As the frequency of the applied AC increases, the reactance decreases
B. As the frequency of the applied AC increases, the reactance increases
C. As the amplitude of the applied AC increases, the reactance increases
D. As the amplitude of the applied AC increases, the reactance decreases

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G5A07

What happens when the impedance of an electrical load is equal to the output impedance of a power source, assuming both impedances are resistive?

A. The source delivers minimum power to the load
B. The electrical load is shorted
C. No current can flow through the circuit
D. The source can deliver maximum power to the load

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G5A08

What is one reason to use an impedance matching transformer?

A. To minimize transmitter power output
B. To maximize the transfer of power
C. To reduce power supply ripple
D. To minimize radiation resistance

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G5A09

What unit is used to measure reactance?

A. Farad
B. Ohm
C. Ampere
D. Siemens

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G5A10

Which of the following devices can be used for impedance matching at radio frequencies?

A. A transformer
B. A Pi-network
C. A length of transmission line
D. All these choices are correct

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G5A11

Which of the following describes one method of impedance matching between two AC circuits?

A. Insert an LC network between the two circuits
B. Reduce the power output of the first circuit
C. Increase the power output of the first circuit
D. Insert a circulator between the two circuits

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G5B – The decibel; current and voltage dividers; electrical power calculations; sine wave root-mean-square (RMS) values; PEP calculations

G5B01

What dB change represents a factor of two increase or decrease in power?

A. Approximately 2 dB
B. Approximately 3 dB
C. Approximately 6 dB
D. Approximately 12 dB

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G5B02

How does the total current relate to the individual currents in each branch of a purely resistive parallel circuit?

A. It equals the average of each branch current
B. It decreases as more parallel branches are added to the circuit
C. It equals the sum of the currents through each branch
D. It is the sum of the reciprocal of each individual voltage drop

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G5B03

How many watts of electrical power are used if 400 VDC is supplied to an 800 ohm load?

A. 0.5 watts
B. 200 watts
C. 400 watts
D. 3200 watts

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G5B04

How many watts of electrical power are used by a 12 VDC light bulb that draws 0.2 amperes?

A. 2.4 watts
B. 24 watts
C. 6 watts
D. 60 watts

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G5B05

How many watts are dissipated when a current of 7.0 milliamperes flows through a 1250 ohm resistance?

A. Approximately 61 milliwatts
B. Approximately 61 watts
C. Approximately 11 milliwatts
D. Approximately 11 watts

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G5B06

What is the output PEP from a transmitter if an oscilloscope measures 200 volts peak-to-peak across a 50 ohm dummy load connected to the transmitter output?

A. 1.4 watts
B. 100 watts
C. 353.5 watts
D. 400 watts

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G5B07

What value of an AC signal produces the same power dissipation in a resistor as a DC voltage of the same value?

A. The peak-to-peak value
B. The peak value
C. The RMS value
D. The reciprocal of the RMS value

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G5B08

What is the peak-to-peak voltage of a sine wave with an RMS voltage of 120.0 volts?

A. 84.8 volts
B. 169.7 volts
C. 240.0 volts
D. 339.4 volts

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G5B09

What is the RMS voltage of a sine wave with a value of 17 volts peak?

A. 8.5 volts
B. 12 volts
C. 24 volts
D. 34 volts
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G5B10

What percentage of power loss would result from a transmission line loss of 1 dB?

A. 10.9 percent
B. 12.2 percent
C. 20.6 percent
D. 25.9 percent
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G5B11

What is the ratio of peak envelope power to average power for an unmodulated carrier?

A. 0.707
B. 1.00
C. 1.414
D. 2.00
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G5B12

What would be the RMS voltage across a 50 ohm dummy load dissipating 1200 watts?

A. 173 volts
B. 245 volts
C. 346 volts
D. 692 volts
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G5B13

What is the output PEP of an unmodulated carrier if an average reading wattmeter connected to the transmitter output indicates 1060 watts?

A. 530 watts
B. 1060 watts
C. 1500 watts
D. 2120 watts
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G5B14

What is the output PEP from a transmitter if an oscilloscope measures 500 volts peak-to-peak across a 50 ohm resistive load connected to the transmitter output?

A. 8.75 watts
B. 625 watts
C. 2500 watts
D. 5000 watts
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G5C – Resistors, capacitors, and inductors in series and parallel; transformers

G5C01

What causes a voltage to appear across the secondary winding of a transformer when an AC voltage source is connected across its primary winding?

A. Capacitive coupling
B. Displacement current coupling
C. Mutual inductance
D. Mutual capacitance
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G5C02

What happens if a signal is applied to the secondary winding of a 4:1 voltage step-down transformer instead of the primary winding?

A. The output voltage is multiplied by 4
B. The output voltage is divided by 4
C. Additional resistance must be added in series with the primary to prevent overload
D. Additional resistance must be added in parallel with the secondary to prevent overload
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G5C03

Which of the following components increases the total resistance of a resistor?

A. A parallel resistor
B. A series resistor
C. A series capacitor
D. A parallel capacitor
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G5C04

What is the total resistance of three 100 ohm resistors in parallel?

A. 0.30 ohms
B. 0.33 ohms
C. 33.3 ohms
D. 300 ohms
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G5C05

If three equal value resistors in series produce 450 ohms, what is the value of each resistor?

A. 1500 ohms
B. 90 ohms
C. 150 ohms
D. 175 ohms
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G5C06

What is the RMS voltage across a 500-turn secondary winding in a transformer if the 2250-turn primary is connected to 120 VAC?

A. 2370 volts
B. 540 volts
C. 26.7 volts
D. 5.9 volts
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G5C07

What is the turns ratio of a transformer used to match an audio amplifier having 600 ohm output impedance to a speaker having 4 ohm impedance?

A. 12.2 to 1
B. 24.4 to 1
C. 150 to 1
D. 300 to 1
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G5C08

What is the equivalent capacitance of two 5.0 nanofarad capacitors and one 750 picofarad capacitor connected in parallel?

A. 576.9 nanofarads
B. 1733 picofarads
C. 3583 picofarads
D. 10.750 nanofarads
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G5C09

What is the capacitance of three 100 microfarad capacitors connected in series?

A. 0.30 microfarads
B. 0.33 microfarads
C. 33.3 microfarads
D. 300 microfarads
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G5C10

What is the inductance of three 10 millihenry inductors connected in parallel?

A. 0.30 henries
B. 3.3 henries
C. 3.3 millihenries
D. 30 millihenries
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G5C11

What is the inductance of a 20 millihenry inductor connected in series with a 50 millihenry inductor?

A. 0.07 millihenries
B. 14.3 millihenries
C. 70 millihenries
D. 1000 millihenries
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G5C12

What is the capacitance of a 20 microfarad capacitor connected in series with a 50 microfarad capacitor?

A. 0.07 microfarads
B. 14.3 microfarads
C. 70 microfarads
D. 1000 microfarads
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G5C13

Which of the following components should be added to a capacitor to increase the capacitance?

A. An inductor in series
B. A resistor in series
C. A capacitor in parallel
D. A capacitor in series
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G5C14

Which of the following components should be added to an inductor to increase the inductance?

A. A capacitor in series
B. A resistor in parallel
C. An inductor in parallel
D. An inductor in series
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G5C15

What is the total resistance of a 10 ohm, a 20 ohm, and a 50 ohm resistor connected in parallel?

A. 5.9 ohms
B. 0.17 ohms
C. 10000 ohms
D. 80 ohms

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G5C16

Why is the conductor of the primary winding of many voltage step-up transformers larger in diameter than the conductor of the secondary winding?

A. To improve the coupling between the primary and secondary
B. To accommodate the higher current of the primary
C. To prevent parasitic oscillations due to resistive losses in the primary
D. To ensure that the volume of the primary winding is equal to the volume of the secondary winding

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G5C17

What is the value in nanofarads (nF) of a 22,000 picofarad (pF) capacitor?

A. 0.22
B. 2.2
C. 22
D. 220

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G5C18

What is the value in microfarads of a 4700 nanofarad (nF) capacitor?

A. 47
B. 0.47
C. 47,000
D. 4.7

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