Avionics Electronics Technician (AET) Practice Test (Sample)

Study Guide

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Questions

1. **What does 'NDB' stand for in aviation navigation?**
   - A. Navigation Database
   - B. Non-Directional Beacon
   - C. Networked Data Bridge
   - D. Navigational Data Board

2. **What is the required separation minimum between aircraft in controlled airspace?**
   - A. 1,000 feet vertically and 1 mile laterally
   - B. 3,000 feet vertically and 1 mile laterally
   - C. 5,000 feet vertically and 3 miles laterally
   - D. 2,000 feet vertically and 2 miles laterally

3. **If a circuit has no output voltage, what is a good first step to troubleshoot?**
   - A. Check the input with a voltmeter
   - B. Replace the circuit components
   - C. Circuit should be powered down immediately
   - D. Check the output with a multimeter

4. **With proper bias applied to a transistor, what type of resistance does the emitter-base junction have?**
   - A. High resistance
   - B. Medium resistance
   - C. Low resistance
   - D. No resistance

5. **When the DC input voltage increases, how does it affect the voltage drop across R2 in a circuit?**
   - A. The voltage drop across R2 will decrease.
   - B. The voltage drop across R2 will remain unchanged.
   - C. The voltage drop across R2 will increase.
   - D. The voltage drop across R2 will become zero.

6. For the output of a full-adder, what is the result when the conditions yield a Sum of 0 and a Carry of 1?

- **A. Sum = 1, Carry = 0**
- **B. Sum = 0, Carry = 1**
- **C. Sum = 1, Carry = 1**
- **D. Sum = 0, Carry = 0**

7. What does a good capacitor show when tested with an ohmmeter?

- **A. No response at all**
- **B. Charging current with a steady high resistance reading**
- **C. Constant low resistance**
- **D. Erratic resistance readings**

8. What is the negative feedback path in a crystal oscillator?

- **A. Completely separate from the crystal's pathway**
- **B. The same as the crystal's pathway**
- **C. Dependent on external components**
- **D. An adjustable feature**

9. What is the total capacitance of three capacitors connected in series with capacitances of 0.2 microfarads, 0.05 microfarads, and 0.10 microfarads?

- **A. 0.1 microfarads**
- **B. 0.25 microfarads**
- **C. 0.029 microfarads**
- **D. 0.05 microfarads**

10. What is the primary job of the Control Display Unit (CDU)?

- **A. To output navigation data to the pilots**
- **B. To allow pilots to input and manage flight management system data**
- **C. To communicate with air traffic control**
- **D. To automatically adjust the aircraft's speed**

Answers

1. **B**
2. **B**
3. **A**
4. **C**
5. **C**
6. **B**
7. **B**
8. **B**
9. **C**
10. **B**

Explanations

1. What does 'NDB' stand for in aviation navigation?

A. Navigation Database

B. Non-Directional Beacon

C. Networked Data Bridge

D. Navigational Data Board

In aviation navigation, 'NDB' stands for Non-Directional Beacon. This is a type of radio transmitter that broadcasts signals in all directions, allowing aircraft equipped with appropriate receivers to determine their bearing relative to the beacon. The signals from an NDB provide a reliable method for pilots to navigate, particularly when visual references are not available, such as during adverse weather conditions or at night. Non-Directional Beacons are primarily used as aids for navigation, providing pilots with a means to find their location and navigate along specific flight paths. They play a critical role in the conventional air traffic system and are often used in conjunction with Automatic Direction Finding (ADF) equipment in aircraft. Understanding the concept of NDB is crucial for avionics technicians, as it influences both the maintenance and operation of navigational systems in aircraft.

2. What is the required separation minimum between aircraft in controlled airspace?

A. 1,000 feet vertically and 1 mile laterally

B. 3,000 feet vertically and 1 mile laterally

C. 5,000 feet vertically and 3 miles laterally

D. 2,000 feet vertically and 2 miles laterally

The required separation minimum between aircraft in controlled airspace is primarily determined by the classifications of airspace and the type of flights operating within them. The answer indicating 3,000 feet vertically and 1 mile laterally aligns with the FAA guidelines for certain airspace classes, particularly in air traffic management scenarios where larger aircraft and faster speeds are involved. For example, in Class A airspace where aircraft operate at high altitudes, a vertical separation of 3,000 feet is often required between aircraft flying above 29,000 feet. This ensures safe distance to prevent wake turbulence and enables management of aircraft at higher altitudes, especially given the potential for more complex traffic patterns. The lateral separation of 1 mile is standard for various categories of controlled airspace, especially when utilizing radar separation techniques. It ensures that aircraft are sufficiently distanced to avoid collision risks as they maintain their respective flight paths. Understanding these separation minimums is crucial for maintaining safety and efficiency in aviation operations, particularly in high-density air traffic environments.

3. If a circuit has no output voltage, what is a good first step to troubleshoot?

A. Check the input with a voltmeter

B. Replace the circuit components

C. Circuit should be powered down immediately

D. Check the output with a multimeter

When a circuit shows no output voltage, checking the input with a voltmeter is an effective first step in troubleshooting. This approach allows you to confirm whether the circuit is receiving the necessary voltage to operate correctly. Ensuring that the input voltage is present helps narrow down the potential issues; if the input is absent, you know to focus on upstream components or power supply problems. This proactive measure avoids unnecessary component replacement or circuit disassembly before verifying that the basic requirements for operation are met. It also helps in isolating issues quickly, allowing for a more efficient troubleshooting process. By confirming the input voltage first, you can determine whether the problem lies within the input supply or if it is downstream in the circuit.

4. With proper bias applied to a transistor, what type of resistance does the emitter-base junction have?

A. High resistance

B. Medium resistance

C. Low resistance

D. No resistance

When proper bias is applied to a transistor, specifically in the context of a bipolar junction transistor (BJT), the emitter-base junction becomes forward-biased. In this state, the junction exhibits low resistance. This characteristic is essential for allowing current to flow easily through the transistor, enabling its operation as an amplifier or a switch. In a forward-biased condition, charge carriers (electrons and holes) are injected across the junction, which decreases the barrier potential and allows for increased current flow. This low resistance is critical to the transistor's function, as it helps in controlling the overall flow of current from the collector to the emitter when the transistor is in the active region. Understanding this concept is fundamental in grasping how transistors work within electronic circuits, as it highlights the importance of biasing in determining the operational state of the device.

5. When the DC input voltage increases, how does it affect the voltage drop across R2 in a circuit?

A. The voltage drop across R2 will decrease.

B. The voltage drop across R2 will remain unchanged.

C. The voltage drop across R2 will increase.

D. The voltage drop across R2 will become zero.

In a circuit with resistors, the voltage drop across a resistor is governed by Ohm's Law, which states that the voltage drop (V) across a resistor is equal to the current (I) flowing through it multiplied by the resistance (R), or V = I * R. When the DC input voltage increases, this typically leads to an increase in the total current flowing through the circuit, assuming the resistance values remain unchanged. As the input voltage rises, the total current in the circuit will also increase due to the higher voltage potential driving the current through the circuit elements. Consequently, if R2's resistance remains constant, the increase in current will cause a corresponding increase in the voltage drop across R2. This is because the voltage across any resistor is directly proportional to the amount of current flowing through it, according to Ohm's Law. Therefore, when the DC input voltage increases, it results in an increased voltage drop across R2, reflecting the direct relationship between voltage, current, and resistance in electrical circuits.

6. For the output of a full-adder, what is the result when the conditions yield a Sum of 0 and a Carry of 1?

A. Sum = 1, Carry = 0

B. Sum = 0, Carry = 1

C. Sum = 1, Carry = 1

D. Sum = 0, Carry = 0

In the context of a full-adder, which is a digital circuit that adds three bits (two significant bits and a carry-in bit), the outputs are defined as the Sum and the Carry. Specifically, the Sum represents the least significant bit of the addition result, while the Carry signifies whether there is a need to carry over a bit to the next higher significance. When you have a Sum of 0 and a Carry of 1, it indicates a specific condition in the addition process. The full-adder can produce this output when the combination of its inputs leads to a situation where the total value of the inputs exceeds the binary limit for a single digit, effectively meaning that although the Sum itself does not have a value (it is 0), there is a transition that necessitates carrying over to the next more significant bit. This scenario could occur, for instance, if two binary inputs are both 1 (which yields a 2 in decimal) and there is a carry-in of 0. The full-adder would then compute the addition as follows: 1 + 1 + 0 produces a Sum of 0 (because 2 in binary results in 10) with a Carry of 1 (the '1'

7. What does a good capacitor show when tested with an ohmmeter?

A. No response at all

B. Charging current with a steady high resistance reading

C. Constant low resistance

D. Erratic resistance readings

A good capacitor, when tested with an ohmmeter, should show charging current followed by a steady high resistance reading. Initially, as the ohmmeter begins to test the capacitor, the meter registers low resistance because the capacitor is charging from the current generated by the meter itself. Once the capacitor is fully charged, it will block further current flow, which is reflected in the subsequent high resistance reading. This behavior indicates that the capacitor is functioning properly—capable of storing charge—and is not leaking or shorted. A steady high resistance after the initial low reading is a fundamental characteristic of a healthy capacitor, as it signifies that there is no current flow through the dielectric material of the capacitor, ensuring effective operation in a circuit. The other responses reflect conditions that do not correspond with the expected behavior of a functioning capacitor. For example, consistent low resistance would suggest the capacitor is shorted, while erratic readings could indicate a faulty capacitor or issues with the testing method. No response at all would not provide valuable information about the capacitor's health. Thus, observing charging current leading to a high steady resistance is the correct interpretation when assessing a good capacitor with an ohmmeter.

8. What is the negative feedback path in a crystal oscillator?

A. Completely separate from the crystal's pathway

B. The same as the crystal's pathway

C. Dependent on external components

D. An adjustable feature

In a crystal oscillator, the negative feedback path is indeed the same as the crystal's pathway. This is essential for the operation of the oscillator because the crystal acts as a frequency-selective element. It provides the necessary feedback at its resonant frequency, allowing the circuit to maintain stable oscillations. The design of the oscillator relies on applying a part of the output signal back into the input through the crystal, which reinforces the oscillation at the crystal's natural frequency. This feedback is crucial, as it governs the frequency stability and precision of the oscillator. The feedback must align closely with the oscillation path established by the crystal to effectively sustain the oscillation at a constant frequency. Other options present different interpretations of the feedback path, which do not accurately describe its function in relation to the crystal. The feedback must be tightly coupled to the crystal's pathway for the oscillator to behave predictably and efficiently.

9. What is the total capacitance of three capacitors connected in series with capacitances of 0.2 microfarads, 0.05 microfarads, and 0.10 microfarads?

A. 0.1 microfarads

B. 0.25 microfarads

C. 0.029 microfarads

D. 0.05 microfarads

To find the total capacitance of capacitors connected in series, the formula used is $1/C_{total} = 1/C1 + 1/C2 + 1/C3$, where C1, C2, and C3 are the capacitances of the individual capacitors. In this case, you have three capacitors with values of 0.2 microfarads, 0.05 microfarads, and 0.10 microfarads. Applying the formula: 1. For the first capacitor: 1/0.2 = 5 2. For the second capacitor: 1/0.05 = 20 3. For the third capacitor: 1/0.10 = 10 Now, add these values together: $1/C_{total} = 5 + 20 + 10 = 35$ To find the total capacitance, take the reciprocal: $C_{total} = 1/35 = 0.02857$ microfarads, which can be rounded to approximately 0.029 microfarads. This calculation confirms that the total capacitance of the three capacitors in series is approximately 0.029 microfarads, making that the correct choice in this problem.

10. What is the primary job of the Control Display Unit (CDU)?

A. To output navigation data to the pilots

B. To allow pilots to input and manage flight management system data

C. To communicate with air traffic control

D. To automatically adjust the aircraft's speed

The primary job of the Control Display Unit (CDU) is to allow pilots to input and manage flight management system data. The CDU serves as a user interface for pilots, enabling them to enter flight plan information, modify routes, and access various system data needed for navigation and flight management. It provides essential capabilities for pilots to interact with the aircraft's avionics, ensuring that they can effectively plan and execute flight operations. The CDU's functionality includes displaying information about the flight plan, waypoints, and performance data, while also allowing for the input of commands and modifications to the flight profile. This interaction is crucial for managing the aircraft's navigation system efficiently and effectively during different phases of flight.