Air New Zealand Tech Practice Exam (Sample)

Study Guide

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Questions

1. According to Bernoulli's theorem, which form of energy can be ignored in air flow assessment?

A. Potential energy

B. Pressure/temperature energy

C. Kinetic energy

D. Thermal energy

2. How does latitude affect convergency?

A. It increases at the equator

B. It is constant throughout the globe

C. It decreases toward the poles

D. It increases toward the poles

3. What characterizes a jet engine surge?

A. Engine stalls during normal operation

B. Airflow reverses through the engine leading to thrust loss

C. Increased thrust beyond maximum capacity

D. A minor increase in thrust with normal airflow

4. What happens to the ASI/Mach meter during a climb when the static probe is blocked?

A. It reads correctly

B. It under-reads

C. It over-reads

D. It shows no significant change

5. What happens to Indicated Airspeed (IAS) with a constant Mach number as altitude increases?

A. IAS remains constant

B. IAS increases significantly

C. IAS decreases

D. IAS fluctuates unpredictably

6. How does a gyroscope maintain its axis to true north?

- **A. By self-calibration**
- **B. Through magnetic orientation**
- **C. With the aid of gravity**
- **D. By rotating about the earth's horizontal axis**

7. Why is a fan engine considered flat rated?

- **A. It varies thrust with engine temperature**
- **B. It provides a constant rate of thrust at varying altitudes**
- **C. It provides a constant rate of thrust at a fixed temperature**
- **D. It allows for increased thrust with lower fuel consumption**

8. What is the aviation definition of height?

- **A. Distance above sea level**
- **B. Distance above the ground**
- **C. Distance from the horizontal plane**
- **D. Distance from the nearest airport**

9. What is the effect of weight on the glide range of an aircraft?

- **A. No effect; glide range is proportional to the life-drag ratio**
- **B. Glide range decreases significantly as weight increases**
- **C. Glide range is increased with greater weight**
- **D. Weight should always be minimized for better glide performance**

10. Which instrument primarily measures engine pressure ratio (EPR)?

- **A. Fuel flow gauge**
- **B. N1 gauge**
- **C. EPR gauge**
- **D. Exhaust gas temperature gauge**

Answers

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

Explanations

1. According to Bernoulli's theorem, which form of energy can be ignored in air flow assessment?

A. Potential energy

B. Pressure/temperature energy

C. Kinetic energy

D. Thermal energy

In the context of Bernoulli's theorem, potential energy can often be ignored during assessments of airflow, especially when the flow occurs along a horizontal plane. Bernoulli's theorem primarily focuses on the relationship between pressure, velocity, and elevation for an incompressible, frictionless fluid, which is typically assumed in many airflow scenarios. In many practical air flow assessments, particularly in aviation and fluid dynamics, the vertical height changes (and therefore the potential energy) are minimal compared to changes in pressure and kinetic energy. Since airflow is often analyzed over short distances where the elevation change is negligible, potential energy's contribution to the overall energy in the system becomes insignificant. This allows engineers and scientists to simplify calculations by focusing on the kinetic energy of the moving air and the pressure energy associated with it, which are more crucial for understanding the behavior of the flow. Thus, in applications related to airflow, neglecting potential energy is a valid and commonly accepted practice, making this choice accurate.

2. How does latitude affect convergency?

A. It increases at the equator

B. It is constant throughout the globe

C. It decreases toward the poles

D. It increases toward the poles

Latitude significantly influences convergency, particularly in the context of how lines of longitude converge at the poles. As you move from the equator toward the poles, the circumference of the Earth decreases, causing the longitudinal lines to come closer together. At the equator, which has a latitude of 0 degrees, the distance between lines of longitude is at its maximum, meaning that there is minimal convergency. As latitude increases—approaching 90 degrees at the poles—the angles between these lines decrease, and the lines converge more sharply. This resulting phenomenon creates a stronger convergency toward the poles compared to the equator. Understanding this relationship helps in various fields, including climatology, navigation, and geography, where patterns of convergence can impact weather systems and travel routes. Thus, the assertion that convergency increases toward the poles aligns with established geographical and scientific principles surrounding the shape of the Earth and the characteristics of latitude.

3. What characterizes a jet engine surge?

A. Engine stalls during normal operation

B. Airflow reverses through the engine leading to thrust loss

C. Increased thrust beyond maximum capacity

D. A minor increase in thrust with normal airflow

A jet engine surge is characterized by a condition where the airflow through the engine experiences a significant disruption, leading to a reversal of airflow. This condition occurs due to a loss of stable airflow, which can be caused by various factors such as sudden engine performance changes, obstructions in the airflow, or improper engine operation. When this reversal happens, it can result in a momentary loss of thrust, which is critical in ensuring the safe and efficient operation of the aircraft. This phenomenon is particularly concerning because it can lead to violent vibrations, potential damage to the engine components, and can even impact the overall flight safety. Therefore, understanding the mechanics behind a surge helps engineers and pilots develop strategies to prevent and respond to such an event effectively. In contrast, other options describe conditions that do not accurately represent the nature of a surge, such as an engine stall during normal operation or increased thrust beyond capacity, which are different phenomena in jet engine behavior.

4. What happens to the ASI/Mach meter during a climb when the static probe is blocked?

A. It reads correctly

B. It under-reads

C. It over-reads

D. It shows no significant change

When the static probe becomes blocked during a climb, the ASI (Airspeed Indicator) and Mach meter will respond differently than under normal conditions. The ASI relies on static pressure, which is used to determine the difference between dynamic pressure (from the pitot tube) and static pressure. If the static probe is blocked, the static pressure reading will remain constant, which does not accurately reflect the actual altitude change. In a climb, outside air pressure decreases, leading to a decrease in static pressure. However, if the static probe is blocked, the ASI continues to read based on its last known static pressure input, which is higher than the actual static pressure at the new altitude. As a result, the ASI/Mach meter will read higher than it should, leading to an over-reading of airspeed. This phenomenon arises due to the discrepancy between the actual decreasing static pressure and the stale, incorrect static pressure that the ASI is measuring from the blocked probe. Understanding this situation is critical for pilots as it emphasizes the importance of ensuring pitot-static systems are functioning correctly during flights, especially during altitude changes.

5. What happens to Indicated Airspeed (IAS) with a constant Mach number as altitude increases?

A. IAS remains constant

B. IAS increases significantly

C. IAS decreases

D. IAS fluctuates unpredictably

When an aircraft is flying at a constant Mach number and the altitude increases, the Indicated Airspeed (IAS) decreases. This is due to the relationship between Mach number, airspeed, and air density. As altitude increases, the air pressure and density decrease. Mach number is the ratio of the true airspeed (TAS) to the speed of sound in the surrounding air, which also varies with temperature and pressure. While the Mach number is held constant, the true airspeed will increase to maintain that Mach number because the speed of sound decreases at higher altitudes due to lower temperatures. However, the Indicated Airspeed, which is derived from dynamic pressure and is affected by air density, will decrease. The altimeter and airspeed indicators work based on the denser air at lower altitudes, so as the density decreases, the IAS decreases even if the aircraft is maintaining a constant Mach number. This phenomenon illustrates the difference between true airspeed, indicated airspeed, and groundspeed, reinforcing the importance of understanding how air density and pressure influence aircraft performance parameters at various altitudes.

6. How does a gyroscope maintain its axis to true north?

A. By self-calibration

B. Through magnetic orientation

C. With the aid of gravity

D. By rotating about the earth's horizontal axis

A gyroscope maintains its axis to true north primarily through the principle of angular momentum, which enables it to resist changes in orientation. When a gyroscope spins, it creates stability due to its rotational inertia. This characteristic allows the gyroscope to maintain its axis even when external forces or movements are applied. By rotating about the Earth’s horizontal axis, the gyroscope aligns itself with the Earth's rotation, which is related to true north. This alignment is critical for navigation and orientation purposes, as the gyroscope can thus provide a reference point for determining direction relative to the Earth's surface. The other choices focus on different mechanisms that may contribute to orientation but do not adequately explain how a gyroscope, specifically, maintains its axis. Self-calibration, magnetic orientation, and the aid of gravity can be aspects of guidance systems or navigational aids, but they do not capture the fundamental physics of gyroscopic precession and stability that define how a gyroscope aligns with true north.

7. Why is a fan engine considered flat rated?

A. It varies thrust with engine temperature

B. It provides a constant rate of thrust at varying altitudes

C. It provides a constant rate of thrust at a fixed temperature

D. It allows for increased thrust with lower fuel consumption

A fan engine is considered flat rated because it delivers a constant rate of thrust at a specific fixed temperature setting. This concept pertains to how the engine performance is regulated to ensure that it provides stable and reliable thrust output under specific operational conditions. The fixed temperature rating ensures that the engine operates within the optimal range, ensuring safety, efficiency, and predictability in performance. This particular characteristic is crucial for aircraft performance, especially in varying situations such as load changes and altitude variations. By keeping the thrust constant at a predetermined temperature, pilots and engineers can make more informed decisions regarding thrust requirements during different phases of flight, thus enhancing operational reliability and ensuring that the aircraft performance does not exceed engine limitations.

8. What is the aviation definition of height?

A. Distance above sea level

B. Distance above the ground

C. Distance from the horizontal plane

D. Distance from the nearest airport

The aviation definition of height is specifically identified as the distance above the ground. This term is often used in aviation when discussing the altitude of an aircraft in relation to the terrain below. It is important because it provides pilots with essential information about their aircraft's position relative to the immediate surface, which is crucial for safe navigation, takeoff, and landing procedures. In aviation contexts, height helps determine if the aircraft is flying at a safe elevation above obstacles such as buildings, mountains, or other terrain features. This distinguishes it from altitude, which typically refers to the distance above a predetermined reference point, commonly sea level. Other options provided in the question do not align with aviation terminology in the same way. For instance, distance above sea level refers to altitude rather than height, distance from the horizontal plane is not a standard measurement used in aviation, and distance from the nearest airport is contextually irrelevant to defining height as it does not focus on an aircraft's position in relation to the ground directly beneath it.

9. What is the effect of weight on the glide range of an aircraft?

- A. No effect; glide range is proportional to the life-drag ratio
- B. Glide range decreases significantly as weight increases
- C. Glide range is increased with greater weight
- D. Weight should always be minimized for better glide performance

Glide range is fundamentally influenced by the lift-to-drag ratio of an aircraft, and this ratio remains relatively constant regardless of the weight of the aircraft during a glide. While it is true that heavier aircraft might require more lift, which could affect their performance, the lift-to-drag ratio is the primary determinant of how far an aircraft can glide compared to its altitude loss. Essentially, the glide ratio is not directly impacted by weight, because both lift and drag will scale with weight during a glide, essentially offsetting any potential changes to the glide distance based on weight alone. Therefore, it's accurate to state that glide range is proportional to the lift-to-drag ratio, making weight a lesser direct factor in the glide calculation, especially within the context of standard operational parameters for an aircraft. Understanding this relationship emphasizes that while weight considerations are important in broader aerodynamic performance assessments, the glide range specifically remains largely linked to the aerodynamic efficiency characterized by the aircraft's lift-to-drag ratio.

10. Which instrument primarily measures engine pressure ratio (EPR)?

- A. Fuel flow gauge
- B. N1 gauge
- C. EPR gauge
- D. Exhaust gas temperature gauge

The instrument that primarily measures engine pressure ratio (EPR) is the EPR gauge. This gauge is specifically designed to provide the ratio of the pressure at the turbine inlet to the pressure at the engine's exhaust, allowing for a clear understanding of the engine's performance and efficiency. EPR is a critical parameter for turbofan engines, as it indicates how effectively the engine is converting fuel into thrust. Monitoring EPR is essential for flight operations, as it aids pilots and engineers in assessing engine performance and optimizing fuel consumption. Accurate readings from the EPR gauge help ensure that the engines operate within safe and efficient limits, contributing to overall aircraft safety and performance. Other instruments, like fuel flow gauges and exhaust gas temperature gauges, serve different purposes, such as measuring fuel consumption and exhaust temperatures, and do not provide the specific pressure ratio measurements required for EPR. The N1 gauge reflects the speed of the engine's low-pressure compressor, which, while important, focuses on a different aspect of engine performance.