

PMMI Fluid Power Practice Test (Sample)

Study Guide



Everything you need from our exam experts!

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SAMPLE

Questions

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- 1. Which of the following would be a proper solution if a vane style vacuum pump loses vacuum?**
 - A. Clean and flush the pump**
 - B. Drain the excess pump oil**
 - C. Clean out the cold traps**
 - D. Lubricate the bearings**
- 2. What is a proper repair procedure for damaged flared or flareless steel tube fittings?**
 - A. Visually inspect and only replace damaged parts with new parts**
 - B. Replace all parts with new parts from same manufacturer**
 - C. Visually inspect and repair damaged parts**
 - D. Use recommended O ring and Teflon sealing tape**
- 3. When dry cutting a hose, what is one way to ensure maximum cutting wheel life?**
 - A. Fast Cutting**
 - B. Slow Cutting**
 - C. Dither cutting**
 - D. Variable speed cutting**
- 4. What is the primary function of a hydraulic pump?**
 - A. To cool hydraulic fluid**
 - B. To convert mechanical energy into hydraulic energy**
 - C. To store hydraulic fluid**
 - D. To measure fluid pressure**
- 5. What is the significance of "system pressure" in a hydraulic circuit?**
 - A. It indicates the temperature of the hydraulic fluid**
 - B. It determines the force generated by actuators**
 - C. It measures the viscosity of the fluid**
 - D. It is irrelevant to system functionality**

- 6. Which of the following is not a good troubleshooting method?**
- A. System compressor to actuator**
 - B. From the actuator back to the compressor**
 - C. Part replacement based on maintenance history log**
 - D. Shotgun technique part replacement**
- 7. What is the approximate retraction force that a 2 inch bore cylinder with a 0.5 inch diameter rod will develop with an 80 psi air supply?**
- A. $(12 - 0.252) \times \text{PI} \times 80 = 236 \text{ lbs}$**
 - B. $(22 \times 0.52) \times \text{PI} \times 80 = 251 \text{ lbs}$**
 - C. $(22 - 0.52) \times \text{PI} \times 80 = 942 \text{ lbs}$**
 - D. $(22 + 0.52) \times \text{PI} \times 80 = 1,1068 \text{ lbs}$**
- 8. Why is regular maintenance crucial for hydraulic systems?**
- A. To improve aesthetic appearance**
 - B. To ensure compatibility with other fluids**
 - C. To prolong system life and maintain performance**
 - D. To modify the system design**
- 9. The term "cavitation" in hydraulic systems refers to what phenomenon?**
- A. The formation of vapor bubbles**
 - B. Excessive heat generation**
 - C. Fluid leakage**
 - D. Pressure loss due to friction**
- 10. A pneumatic cylinder is unable to move its load to full extension. What is not a probable cause for this failure?**
- A. Lubricator failure**
 - B. Reduced air supply**
 - C. Leaking piston seals**
 - D. Ambient temperature has increased**

Answers

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

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Explanations

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1. Which of the following would be a proper solution if a vane style vacuum pump loses vacuum?

- A. Clean and flush the pump**
- B. Drain the excess pump oil**
- C. Clean out the cold traps**
- D. Lubricate the bearings**

A proper solution for a vane style vacuum pump that loses vacuum is to clean and flush the pump. Over time, dirt, debris, and other contaminants can accumulate inside the pump, leading to decreased efficiency and ultimately causing a loss of vacuum. By cleaning and flushing the pump, you remove these obstructions, which can restore the pump to its optimal functioning condition. This maintenance step is crucial because vane pumps rely on precise movement and spacing to create an effective vacuum. Residue buildup can interfere with the operation, resulting in decreased performance. Regular cleaning and maintenance allow for longevity and reliability in vacuum systems. While other options might address different aspects of pump maintenance, they may not directly resolve the issue of losing vacuum as effectively as cleaning and flushing the pump does. For instance, draining excess oil and lubricating bearings concern pump lubrication and operation but may not be directly related to vacuum loss caused by contamination or blockages. Cleaning out cold traps may help with a larger system's efficiency but does not address the internal condition of the pump itself.

2. What is a proper repair procedure for damaged flared or flareless steel tube fittings?

- A. Visually inspect and only replace damaged parts with new parts**
- B. Replace all parts with new parts from same manufacturer**
- C. Visually inspect and repair damaged parts**
- D. Use recommended O ring and Teflon sealing tape**

Replacing all parts with new parts from the same manufacturer is a proper repair procedure for damaged flared or flareless steel tube fittings because it ensures the integrity and compatibility of the components in a fluid power system. Using new components from the same manufacturer means that the specifications and materials will match, maintaining system pressure ratings and performance standards. This method minimizes the risks of leaks or failures that could arise from mismatched or damaged components. In fluid power applications, maintaining a secure and leak-free connection is critical for operational safety and efficiency. New parts can guarantee that the fitting surfaces are undamaged and will provide reliable sealing capabilities. This approach is particularly important in systems conveying hydraulic fluids under high pressures. Visual inspection and the idea of repairing parts may not guarantee the same level of reliability, as even small imperfections can lead to failures in high-pressure systems. Utilizing an O-ring and Teflon tape might improve sealing in certain contexts but does not address underlying wear or damage in the fittings themselves. Therefore, opting for a complete replacement is the safest method to ensure system functionality and safety.

3. When dry cutting a hose, what is one way to ensure maximum cutting wheel life?

- A. Fast Cutting**
- B. Slow Cutting**
- C. Dither cutting**
- D. Variable speed cutting**

When cutting a hose using a cutting wheel, one of the best practices to ensure maximum cutting wheel life is to employ a slow cutting technique. This is because fast cutting generates excessive heat due to friction, which can quickly degrade both the cutting wheel and the material being cut. By cutting slowly, the heat generated is minimized, allowing the cutting wheel to maintain its integrity and prolong its life. Slow cutting also improves the accuracy of the cut, leading to cleaner edges and reducing the chance of materials fraying or becoming damaged during the cutting process. This technique conserves the abrasive elements of the cutting wheel, ultimately allowing it to serve its purpose effectively over an extended period. Overall, maintaining a controlled, slower speed during the cutting process enhances the durability of the cutting wheel and promotes a more successful outcome.

4. What is the primary function of a hydraulic pump?

- A. To cool hydraulic fluid**
- B. To convert mechanical energy into hydraulic energy**
- C. To store hydraulic fluid**
- D. To measure fluid pressure**

The primary function of a hydraulic pump is to convert mechanical energy into hydraulic energy. This is essential in fluid power systems because the hydraulic pump creates the flow of hydraulic fluid, which then transmits power throughout the system. The conversion process involves the pump drawing in hydraulic fluid and increasing its pressure, enabling it to flow through hydraulic circuits and actuate devices like cylinders or motors. Understanding this function is fundamental in fluid power applications, as the efficiency and performance of the entire system depend on how effectively the pump can convert mechanical energy (often provided by an electric motor or an engine) into the hydraulic energy necessary to perform work. Different types of pumps, such as gear pumps, vane pumps, and piston pumps, may achieve this conversion in various ways, but their primary role remains centered around this energy conversion process.

5. What is the significance of "system pressure" in a hydraulic circuit?

- A. It indicates the temperature of the hydraulic fluid**
- B. It determines the force generated by actuators**
- C. It measures the viscosity of the fluid**
- D. It is irrelevant to system functionality**

"System pressure" in a hydraulic circuit is crucial because it directly determines the force generated by actuators. In hydraulics, the principle governing operation is based on Pascal's law, which states that pressure applied to a confined fluid is transmitted undiminished throughout the fluid. The force exerted by a hydraulic actuator, such as a cylinder or motor, is calculated using the formula: $\text{Force} = \text{Pressure} \times \text{Area}$. This means that as system pressure increases, the force produced by the actuator also increases, assuming the area remains constant. Therefore, understanding and maintaining the appropriate system pressure is essential for ensuring that the hydraulic system performs effectively and can do the work required without exceeding safe limits that could lead to component failure. The other options relate to components that are not directly influenced in the same way by "system pressure." Temperature and viscosity are important factors for fluid performance but do not define how force is generated in the system. Additionally, system pressure is far from irrelevant; it is foundational to the hydraulic circuit's functionality.

6. Which of the following is not a good troubleshooting method?

- A. System compressor to actuator**
- B. From the actuator back to the compressor**
- C. Part replacement based on maintenance history log**
- D. Shotgun technique part replacement**

The shotgun technique part replacement is not a good troubleshooting method because it involves randomly replacing parts without a clear understanding of the actual issue. This approach can lead to unnecessary expenditures, as it does not systematically identify the root cause of the problem. In troubleshooting, efficiency and targeted actions are essential, and replacing parts based on haphazard assumptions does not align with those principles. In contrast, effective troubleshooting methods such as tracing the system from the compressor to the actuator or backtracking from the actuator to the compressor involve systematic analysis of the fluid power circuit. These methods allow for examining specific components and determining where failures may be occurring. Additionally, part replacement based on a maintenance history log can be a useful approach when there is a documented correlation between specific parts and failures, enabling repairs to be more focused and effective.

7. What is the approximate retraction force that a 2 inch bore cylinder with a 0.5 inch diameter rod will develop with an 80 psi air supply?

A. $(12 - 0.252) \times \text{PI} \times 80 = 236 \text{ lbs}$

B. $(22 \times 0.52) \times \text{PI} \times 80 = 251 \text{ lbs}$

C. $(22 - 0.52) \times \text{PI} \times 80 = 942 \text{ lbs}$

D. $(22 + 0.52) \times \text{PI} \times 80 = 1,1068 \text{ lbs}$

To determine the approximate retraction force of a cylinder, it's important to understand how the force is calculated based on the diameter of the cylinder and the rod, alongside the air supply pressure. In this case, the cylinder has a 2-inch bore and a 0.5-inch rod diameter. The effective area that generates force during retraction is the area of the cylinder minus the area of the rod. First, you need to compute the areas using the formula for the area of a circle ($A = \pi \times r^2$). 1. ****Calculate the effective area**:** - The diameter of the bore is 2 inches, making the radius 1 inch. The area of the bore (A_{bore}) is: $A_{\text{bore}} = \pi \times (1 \text{ in})^2 = \pi \times 1 = \pi$ square inches. - The diameter of the rod is 0.5 inches, making the radius 0.25 inches. The area of the rod (A_{rod}) is: $A_{\text{rod}} = \pi \times (0.25 \text{ in})^2 = \pi \times 0.0625 = 0.0625\pi$ square inches. 2. ****Determine the area difference**:** The effective area for the

8. Why is regular maintenance crucial for hydraulic systems?

A. To improve aesthetic appearance

B. To ensure compatibility with other fluids

C. To prolong system life and maintain performance

D. To modify the system design

Regular maintenance is crucial for hydraulic systems primarily because it helps to prolong system life and maintain performance. Hydraulic systems operate under high pressure and can be sensitive to issues such as fluid contamination, wear and tear of components, and the degradation of seals and hoses. By conducting regular maintenance, such as fluid changes, filter replacements, and system inspections, potential problems can be identified and addressed before they lead to significant failures. This proactive approach not only helps in extending the operational lifespan of the system but also ensures that it operates efficiently, which is vital for the effectiveness of tasks dependent on hydraulic power. When a hydraulic system is well-maintained, it minimizes unexpected downtime and costly repairs, leading to increased reliability and productivity in industrial applications. While improving aesthetic appearance or ensuring fluid compatibility has its place, they do not directly impact the fundamental functionality and reliability of the hydraulic system in the same way that consistent maintenance does. Modifying the system design is not a part of regular maintenance activities; hence, it does not relate to the ongoing upkeep essential for system performance.

9. The term "cavitation" in hydraulic systems refers to what phenomenon?

- A. The formation of vapor bubbles**
- B. Excessive heat generation**
- C. Fluid leakage**
- D. Pressure loss due to friction**

Cavitation in hydraulic systems specifically refers to the phenomenon where vapor bubbles form in the fluid due to local pressure drops. When the pressure in a hydraulic system decreases to below the vapor pressure of the fluid, vapor-filled cavities develop. As these vapor bubbles move to areas of higher pressure, they collapse violently, creating shock waves. This can lead to significant damage within pumps and other hydraulic components due to the intense forces generated by the implosion of these bubbles. Understanding cavitation is essential for the design and operation of hydraulic systems since it can affect performance and reliability. Proper system design and maintenance are paramount to prevent cavitation from occurring, ensuring that pressures within the system remain adequate to avoid the formation of vapor bubbles in the first place.

10. A pneumatic cylinder is unable to move its load to full extension. What is not a probable cause for this failure?

- A. Lubricator failure**
- B. Reduced air supply**
- C. Leaking piston seals**
- D. Ambient temperature has increased**

When a pneumatic cylinder fails to move its load to full extension, various factors can contribute to this issue. The correct indication here is that an increase in ambient temperature is not typically a probable cause of such a failure. In pneumatic systems, performance issues are often associated with factors directly affecting air pressure, volume, and seal integrity. A lubricator failure could lead to insufficient lubrication, causing the cylinder to stick or operate inefficiently. A reduced air supply can lower the cylinder's operational pressure, preventing it from achieving full extension. Leaking piston seals allow compressed air to escape, which also results in inadequate force to fully extend the cylinder. On the other hand, while ambient temperature changes can influence air density and, indirectly, system performance, an increase in temperature alone is unlikely to be a direct cause of the failure to fully extend a pneumatic cylinder. Increased temperatures can even improve the efficiency of certain pneumatic components, as they might reduce the viscosity of lubricants. Thus, in this context, an increase in ambient temperature is not considered a significant factor in causing the failure to extend fully.