
Q515 - Gas Turbine Plants

1. Active corrosion on copper alloys is indicated by which of the following?

- A copper-oxide crust formation.
- **A gray-green patina formation.**
- A verdigris formation.
- A white-gray powder formation.

Note:
Active corrosion on copper alloys is indicated by a gray-green patina formation. This discoloration signifies ongoing corrosion beyond the initial protective oxide layer, reflecting the formation of hydrated copper salts and carbonates.

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2. What are the two common forms of axial compressor rotor blade roots?

- Fir tree and key
- Sawtooth and knob
- Grub and bulb
- **Fir tree and bulb**

Note:
Fir tree and bulb roots are the standard shapes for axial compressor rotor blade attachments due to their ability to distribute loads and provide secure fastening to the rotor disc.

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3. How do the high-velocity high-temperature gases cause the gas turbine rotor to rotate?

- By increasing the velocity of the gases.
- By creating a low-pressure area before the rotor.
- **By transferring velocity energy and thermal energy to the turbine blades.**
- By converting the high-velocity gas to low-velocity gas.

Note:
The gas turbine rotor rotates due to the transfer of velocity and thermal energy from the high-velocity, high-temperature gases to the turbine blades, generating a force that drives the rotation.

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4. Before combustion can occur, the combustion air must be delivered to the combustor at a high-pressure and low-velocity. High-velocity, low-pressure air is converted to high-pressure, low-velocity air at what part of a centrifugal type compressor?

- Inlet plenum
- Turning vanes
- **Diffuser**
- Impeller

Note:
The diffuser converts high-velocity air to high-pressure air by slowing the flow and converting kinetic energy to static pressure, fulfilling the question's requirement for air delivered to the combustor.

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5. Which of the following is an advantage of a single-shaft gas turbine engine compared to a split-shaft gas turbine engine?

- Reversible
- **Fewer moving parts**
- Lower starting torque
- Better fuel economy

Note:
Single-shaft gas turbines have fewer moving parts than split-shaft engines because they combine the compressor and power turbine on a single shaft, eliminating the additional shafts and components found in split-shaft designs.

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6. What type of air seal is used in the sump and turbine areas of a gas turbine engine?

- Pneumatic carbon ring
- Fishmouth
- Lip-type
- **Labyrinth-Honeycomb**

Note:
Labyrinth-honeycomb seals are the standard air seal for gas turbine sump and turbine areas, minimizing leakage through multiple pressure drops with minimal mechanical contact.

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7. What type of air seal is used in the combustor and turbine midframe of a gas turbine?

- Pneumatic carbon ring
- **Fishmouth**
- Labyrinth-Honeycomb
- Lip-type

Note:
Fishmouth seals are used in the combustor and turbine midframe due to their flexible metal tabs, which maintain an effective air seal while accommodating thermal expansion and rotor movement in this high-temperature environment. Other seal types are unsuitable for the extreme heat and movement present in this location.

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8. What type of seal is used in the gearbox of a gas turbine engine?

- Labyrinth-Windback
- Lip-type
- Fishmouth
- **Carbon ring**

Note:
Carbon ring seals are used in gas turbine gearboxes to effectively contain pressurized lubricating oil around rotating shafts, withstanding high temperatures and pressures while minimizing leakage.

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9. The main thrust bearing directly positions which part(s) of the main reduction gear?

- **Bull gear.**
- High-speed gear.
- Low-speed pinion.
- High-speed pinion.

Note:
The main thrust bearing fixes the axial position of the slow-speed shaft, which directly supports the bull gear.

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10. What type of main reduction gear arrangement prevents independent axial and rotational movement of the pinions?

- Independent suspension
- **Locked train**
- Unlocked train
- Hydraulic suspension

Note:
A locked train arrangement mechanically interconnects all pinions, preventing independent axial and rotational movement. This configuration ensures uniform load sharing and fixed gear tooth alignment, contrasting with unlocked trains which allow for some independent movement. Options describing mounting or support systems are irrelevant to the kinematic arrangement of the gear train.
