

## U.S.C.G. Merchant Marine Exam

DDE-1000/4000 HP

Q632 Gas Turbine Plants

(Sample Examination)

**Choose the best answer to the following Multiple Choice Questions.**

**1.** Compressor surge is caused by which of the following factors?

- (A) Interrupted air flow.
- (B) Maximum fuel pressure.
- (C) Low ambient air temperature.
- (D) Increased demand for secondary air.

*If choice A is selected set score to 1.*

**2.** The two main types of compressor stall are known as what?

- (A) Flame out and inlet temperature stall.
- (B) Over speed and overload stall.
- (C) Steady state and transient.
- (D) Rapid rise and temperature inversion.

*If choice C is selected set score to 1.*

**3.** During an auto-start sequence on the marine gas turbine control console shown in the illustration, what would be the correct order of events required to occur after the start sequence begins?  
Illustration GT-0016

- (A) NGG reaches idle RPM, power turbine reaches ignition RPM, gas temperature greater than 400 degrees F.
- (B) NGG reaches ignition RPM, gas temperature greater than 400 degrees F, NGG reaches idle RPM.
- (C) Power turbine reaches ignition RPM, gas temperature greater than 400 degrees F, power turbine reaches idle RPM.
- (D) Power turbine reaches ignition RPM, gas temperature greater than 400 degrees F, NGG reaches idle RPM.

*If choice B is selected set score to 1.*

**4.** Newton's Third Law of Motion states which of the following?

- (A) For every acting force there is an unequal and opposite reacting force.
- (B) For every acting force there is an equal and opposite reacting force.
- (C) For every acting force there is an equal reacting force in the opposite direction.
- (D) For every acting force there is no reacting force in the up or down directions.

*If choice B is selected set score to 1.*

**5.** What type of starter is commonly used on smaller gas turbine engines?

- (A) Pneumatic
- (B) Air turbine
- (C) Electric
- (D) Hydraulic

*If choice C is selected set score to 1.*

**6.** Accelerometers are generally used on gas turbine engines to sense which of the following?

- (A) Rate of rotor speed changes.
- (B) Gas generator speed with respect to power turbine speed.
- (C) PLARA rate limited feedback to the FSEE.
- (D) High frequency vibration.

*If choice D is selected set score to 1.*

**7.** A pressure stage of an axial-type compressor consists of which of the following?

- (A) Set of rotor blades and a set of stator blades.
- (B) Compressor rotor and a set of inlet guide vanes.
- (C) Set of stator blades.
- (D) Set of rotor blades.

*If choice A is selected set score to 1.*

**8.** Which of the following conditions permits a gas turbine to produce 100% power?

- (A) Maximum fuel flow.
- (B) Minimum air inlet temperature.
- (C) Maximum combustion temperature.
- (D) Minimum air mass/weight flow.

*If choice B is selected set score to 1.*

**9.** What is the purpose of the spring in a lip-type oil seal?

- (A) To remove burrs and dirt from the shaft
- (B) To keep the neoprene snugly fit around the shaft
- (C) To seal against maximum fluid pressure
- (D) To prevent air from entering the sump

*If choice B is selected set score to 1.*

**10.** (2.9.16.6-1) You are preparing for a borescope inspection of an LM2500 gas turbine engine. You are reviewing the correct geometric orientation nomenclature which includes which of the following?

- (A) All references left, right, and radial are orientated as viewed from aft looking forward on the engine.
- (B) All references left, right, and radial are orientated as viewed from forward looking aft on the engine.
- (C) All references are made from the combustor section, forward to the hp turbine and aft to the power turbine.
- (D) All references are made from the combustor section, aft to the hp turbine and forward to the power turbine.

*If choice A is selected set score to 1.*

**11.** A gas turbine engine in which exhaust gas heat energy is added to the air charge between the compressor and combustion chamber is classified as which of the following?

- (A) Open cycle engine.
- (B) Closed cycle engine.
- (C) Semi-open cycle engine.
- (D) Regenerative cycle engine.

*If choice D is selected set score to 1.*

**12.** An axial compressor stage is represented by which of the following components and in which order?

- (A) One set of rotating blades, one set of stationary vanes.
- (B) One set of stationary vanes, one set of rotating blades.
- (C) One set of rotating blades, two sets of stationary vanes.
- (D) One set of rotating vanes, one set of stationary blades.

*If choice A is selected set score to 1.*

**13.** Where are the carbon dioxide nozzles located in the GE LM2500 gas turbine enclosure?

- (A) Above and below the combustor section.
- (B) On either side of the power turbine.
- (C) Above the compressor.
- (D) On the cross beam under the compressor front frame.

*If choice D is selected set score to 1.*

**14.** As shown in the illustration, what is the purpose of pressurizing the main bearing lube oil sumps on a typical marine gas turbine? Illustration GT-0023

- (A) Provides uniform lube oil distribution around the bearing.
- (B) Minimizes oil leakage from the rotor shaft.
- (C) Increases lube oil penetration.
- (D) Assists in cooling the lube oil.

*If choice B is selected set score to 1.*

**15.** Which of the following statements is true regarding centrifugal compressors?

- (A) The impeller of a centrifugal compressor has a radial inlet and axial discharge.
- (B) The efficiency of a centrifugal compressor is greater than that of an axial compressor.
- (C) The centrifugal compressor is frequently used on small, low power turbines.
- (D) Centrifugal compressors are complicated in design and heavy.

*If choice C is selected set score to 1.*

**16.** On a vessel equipped with marine propulsion gas turbines, the operator's initial response to a high vibration alarm should be which of the following?

- (A) Switch to the secondary channel to confirm the alarm.
- (B) Reduce the engine speed.
- (C) Wait for the harmonic vibration to dampen out.
- (D) Change out the vibration transducer.

*If choice B is selected set score to 1.*

**17.** The struts of the GE LM2500 compressor front frame provide passages for all of the following mediums EXCEPT which of the following?

- (A) Scavenge oil
- (B) Fuel oil
- (C) Seal-pressurization air
- (D) Lube oil

*If choice B is selected set score to 1.*

**18.** Which of the following wrenches should NOT be used while working on a gas turbine?

- (A) Adjustable wrench.
- (B) Box wrench.
- (C) Flare nut wrench.
- (D) Crowfoot wrench.

*If choice A is selected set score to 1.*

**19.** Thermal energy is the only form of energy that can be added to or removed from a substance. How is thermal energy that is added to a substance stored?

- (A) In the form of potential kinetic energy.
- (B) In the form of heat.
- (C) In the form of mechanical energy.
- (D) In the form of internal energy.

*If choice D is selected set score to 1.*

**20.** The three most common types of combustors used in gas turbine engines are which of the following?

- (A) can, annular, and can-annular.
- (B) can, derivative, and can-derivative.
- (C) can, vortex, and can-vortex.
- (D) can, angular, and can-angular.

*If choice A is selected set score to 1.*

**21.** Assuming at least a 500 rpm for the input shaft speed from the power turbine, as shown in the illustration, the synchronous self-shifting (SSS) clutch used on marine gas turbine main propulsion gears, requires which of the following inputs or conditions to make engagement possible? Illustration GT-0018

- (A) Availability of low-pressure air to provide control air pressure for engagement.
- (B) Availability of high-pressure air to provide clutch air inflation pressure.
- (C) When the input shaft speed from the power turbine falls below the output shaft speed.
- (D) When the input shaft speed from the power turbine rises to the output shaft speed.

*If choice D is selected set score to 1.*

**22.** In the ignition system of a gas turbine engine, how is optimum spark achieved?

- (A) Concentration of minimum energy in maximum time
- (B) Concentration of maximum energy in minimum time
- (C) Concentration of maximum energy in maximum time
- (D) Concentration of minimum energy in minimum time

*If choice B is selected set score to 1.*

**23.** Which of the following instruments is designed to help you when performing an internal inspection of the gas turbine engine?

- (A) Telescope
- (B) Stroboscope
- (C) Oscilloscope
- (D) Borescope

*If choice D is selected set score to 1.*

**24.** What is the primary purpose of the diffuser and distributor on the GE LM2500 gas turbine?

- (A) To provide uniform air flow to the compressor
- (B) To provide even temperature distribution at the compressor
- (C) To provide uniform air flow to the combustor
- (D) To provide uniform air flow to the turbine

*If choice C is selected set score to 1.*

**25.** Newton's First Law of Motion states which of the following?

- (A) A body in a state of rest tends to remain at rest, and a body in motion continues to stay in motion at a constant speed, unless acted upon by some external force.
- (B) A body at rest will remain at rest when an external force is applied.
- (C) A body in motion will continue to stay in motion, when an equal and opposite external force is applied.
- (D) A body in a state of rest tends to remain at rest, and a body in motion continues to stay in motion, when an external force is applied.

*If choice A is selected set score to 1.*

**26.** For the GE LM2500 gas turbine shown in the illustration, the 9th stage bleed air is used for which of the following? Illustration GT-0017

- (A) High-pressure turbine second stage nozzle cooling.
- (B) Compressor balance piston cavity pressurization.
- (C) Power turbine cooling.
- (D) Sump pressurization and cooling.

*If choice C is selected set score to 1.*

**27.** The lube oil scavenge pressure on the gas turbine engine shown in the illustration is sensed by which of the following? Illustration GT-0017

- (A) Manometer
- (B) RTD
- (C) Transducer
- (D) Probe

*If choice C is selected set score to 1.*

**28.** HP turbine blades are generally cooled by which of the following methods?

- (A) Compressed air entering the tip and exiting the root.
- (B) Cooling water entering the tip and exiting the root.
- (C) Compressed air entering the root and exiting the tip.
- (D) Cooling water entering the root and exiting the tip.

*If choice C is selected set score to 1.*

**29.** A gas turbine engine's main lube oil system pump check valve serves to maintain system prime and perform what other function?

- (A) To increase system pressure
- (B) To prevent reverse flow of oil through a secured pump
- (C) To return oil to the main reduction gear sump
- (D) None of the above

*If choice B is selected set score to 1.*

**30.** Two functions of the compressor stator vanes include which of the following?

- (A) Direct air flow to each rotor stage at the correct angle and deliver air to the combustor at the correct velocity and pressure.
- (B) Direct air flow to rotor blades at the correct angle and are shaped to produce a velocity increase and maintain a constant pressure.
- (C) Direct air flow to rotor blades at the correct angle and are shaped to cause a velocity increase and a pressure decrease.
- (D) Direct air flow to rotor blades at the correct angle and are shaped to maintain a constant velocity and produce a pressure increase.

*If choice A is selected set score to 1.*

**31.** Borescope inspection of the combustor section requires which type of light source?

- (A) 150 watt
- (B) 500 watt
- (C) 1000 watt
- (D) All of the above.

*If choice C is selected set score to 1.*

**32.** What method is utilized to allow turbine nozzle blades to withstand high inlet temperatures?

- (A) Laser cooling
- (B) Thermoelectric cooling
- (C) Water cooling
- (D) Air cooling

*If choice D is selected set score to 1.*

**33.** What feature is commonly used on articulated reduction gear arrangements for the correction of misalignment between the 1st reduction gear and the 2nd reduction pinions?

- (A) Quill shafts.
- (B) Fixed block pads.
- (C) Torsion pads.
- (D) Locked train shims.

*If choice A is selected set score to 1.*

**34.** What is the approximate percentage of air extracted from the compressor that is mixed with fuel for combustion in a gas turbine?

- (A) 12%
- (B) 25%
- (C) 50%
- (D) 75%

*If choice B is selected set score to 1.*

**35.** A centrifugal flow gas turbine uses what type of combustion chamber?

- (A) double-annular
- (B) can
- (C) can-annular
- (D) annular

*If choice B is selected set score to 1.*

**36.** In a gas turbine propulsion installation, the typical control system is designed to perform which of the following three functions?

- (A) Operational control, speed control, and braking.
- (B) Operational control, safety control, and monitoring.
- (C) Pneumatic, hydraulic, and electric control.
- (D) Pneumatic control, electric control and monitoring.

*If choice B is selected set score to 1.*

**37.** What is a compressor midspan shroud?

- (A) A support for the tips of the stator blades.
- (B) The center of a two-piece rotor blade.
- (C) A method of securing stator blades.
- (D) A brace built into the middle of a rotor blade for damping.

*If choice D is selected set score to 1.*

**38.** Accelerating the compressor to the self-sustaining speed of the engine is the function of which of the following components?

- (A) Compressor extension shaft
- (B) Starter
- (C) PT shaft
- (D) Mechanical drive shaft

*If choice B is selected set score to 1.*

**39.** As shown in the illustration of a gas turbine fuel oil system, when the engine fuel oil valves are de-energized, the remaining fuel left in the system is recirculated back to which of the following?  
Illustration GT-0021

- (A) Day tank.
- (B) High-pressure relief valve.
- (C) Fuel purge manifold.
- (D) Fuel pump inlet.

*If choice D is selected set score to 1.*

**40.** In a gas turbine, the air charge is permitted to be compressed adiabatically by what factor, process, or condition?

- (A) Rapid heat transfer
- (B) Low-compression ratio
- (C) Inter-stage cooling
- (D) Speed of the process

*If choice D is selected set score to 1.*

**41.** The circle of turbine stationary vanes that convert pressure and thermal energy to velocity energy and direct the combustion gases in the direction of turbine wheel rotation is referred to as what?

- (A) Rotor assembly.
- (B) Diffuser assembly.
- (C) Compressor assembly.
- (D) Nozzle assembly.

*If choice D is selected set score to 1.*

**42.** The lube oil system shown in the illustration, is designed to lubricate the main bearings by what principle? Illustration GT-0023

- (A) spray lubrication with dry sumps
- (B) totally submerged oil bath
- (C) splash lubrication
- (D) self-contained partial oil bath

*If choice A is selected set score to 1.*

**43.** The acronym FOD stands for which of the following?

- (A) Foreign object damage.
- (B) Fuel override demand.
- (C) Flow offset design.
- (D) Fuel oil discharge.

*If choice A is selected set score to 1.*

**44.** Rotation of the controllable-pitch propeller (CPP) blades is achieved through axial movement of what component in the hub body assembly?

- (A) Crosshead
- (B) Sliding block
- (C) Crank pin ring
- (D) Servomotor piston

*If choice A is selected set score to 1.*

**45.** Mechanical work is defined as which of the following?

- (A) A measurement in pounds per square inch.
- (B) Rate of doing work.
- (C) A force acting through a distance.
- (D) Distance traveled over time.

*If choice C is selected set score to 1.*

**46.** For the GE LM2500 gas turbine engine shown in the illustration, the 13th stage bleed air is used for which of the following? Illustration GT-0017

- (A) Sump pressurization and cooling.
- (B) Power turbine balance piston cavity pressurization.
- (C) Power turbine cooling.
- (D) High-pressure turbine 2nd stage nozzle cooling.

*If choice D is selected set score to 1.*

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

- (A) By creating a low-pressure area before the rotor.
- (B) By converting the high-velocity gas to low-velocity gas.
- (C) By transferring velocity energy and thermal energy to the turbine blades.
- (D) By increasing the velocity of the gases.

*If choice C is selected set score to 1.*

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

- (A) Lower starting torque
- (B) Reversible
- (C) Fewer moving parts
- (D) Better fuel economy

*If choice C is selected set score to 1.*

**49.** Which of the following is the definition of absolute temperature?

- (A) Temperature measured with reference to 0 degrees Fahrenheit.
- (B) Temperature measured with reference to 0 degrees Celsius.
- (C) Temperature measured with reference to 273 degrees Rankine.
- (D) Temperature measured with reference to the theoretical temperature at which all molecular motion stops.

*If choice D is selected set score to 1.*

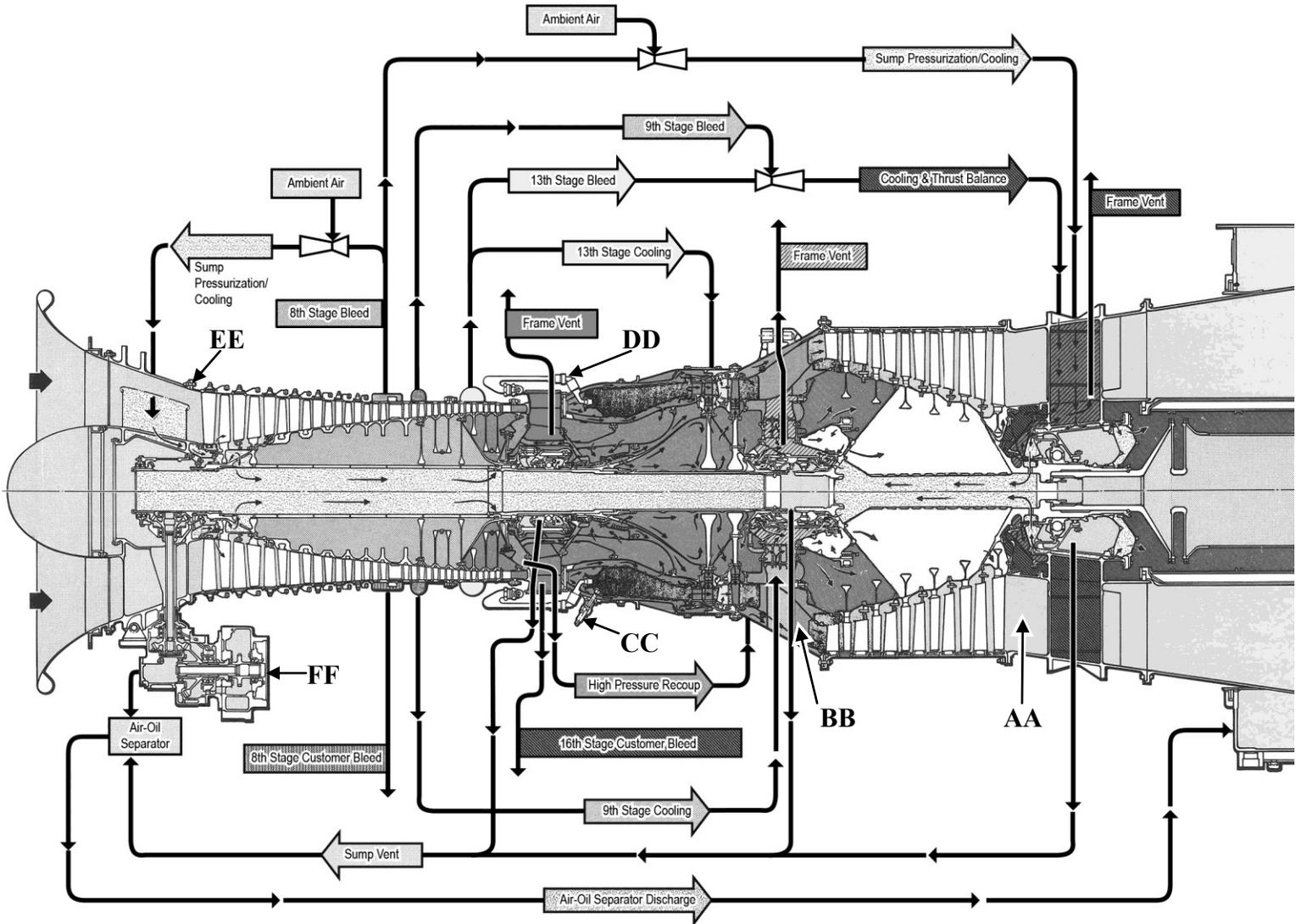
**50.** The only hand tools that should be used on gas turbine engines are chrome plated, nickel plated, or which of the following?

- (A) Cadmium plated
- (B) Unplated
- (C) Silver plated
- (D) Bronze plated

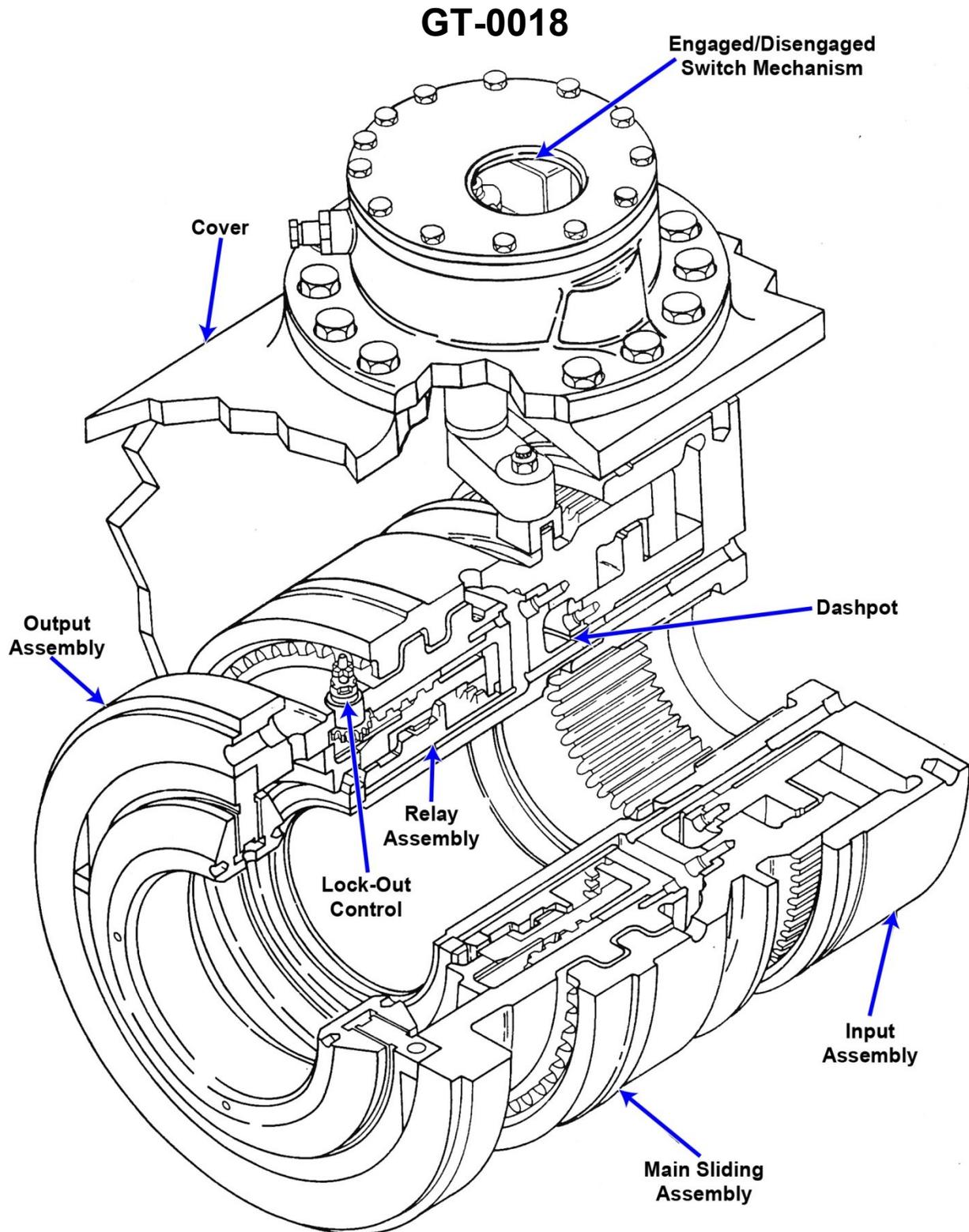
*If choice B is selected set score to 1.*



## GT-0017



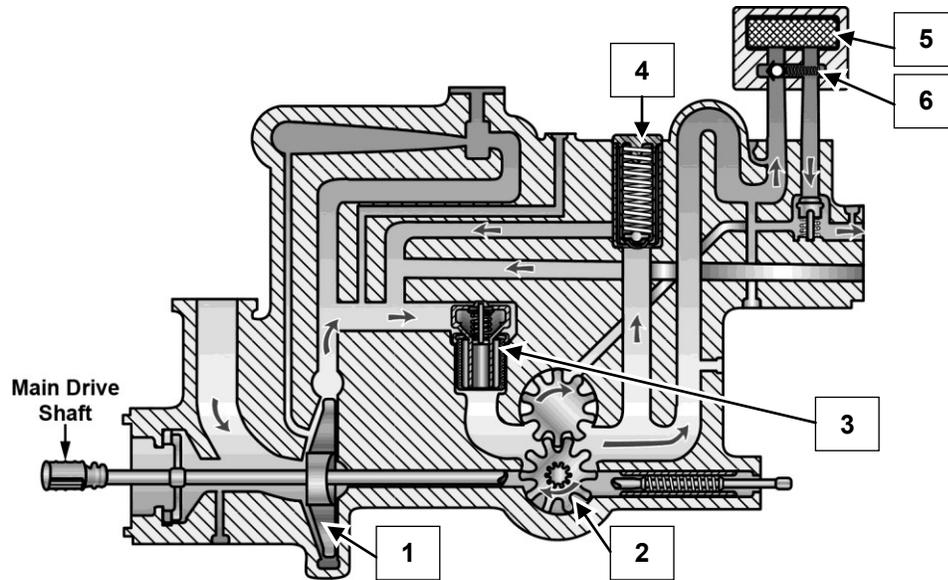
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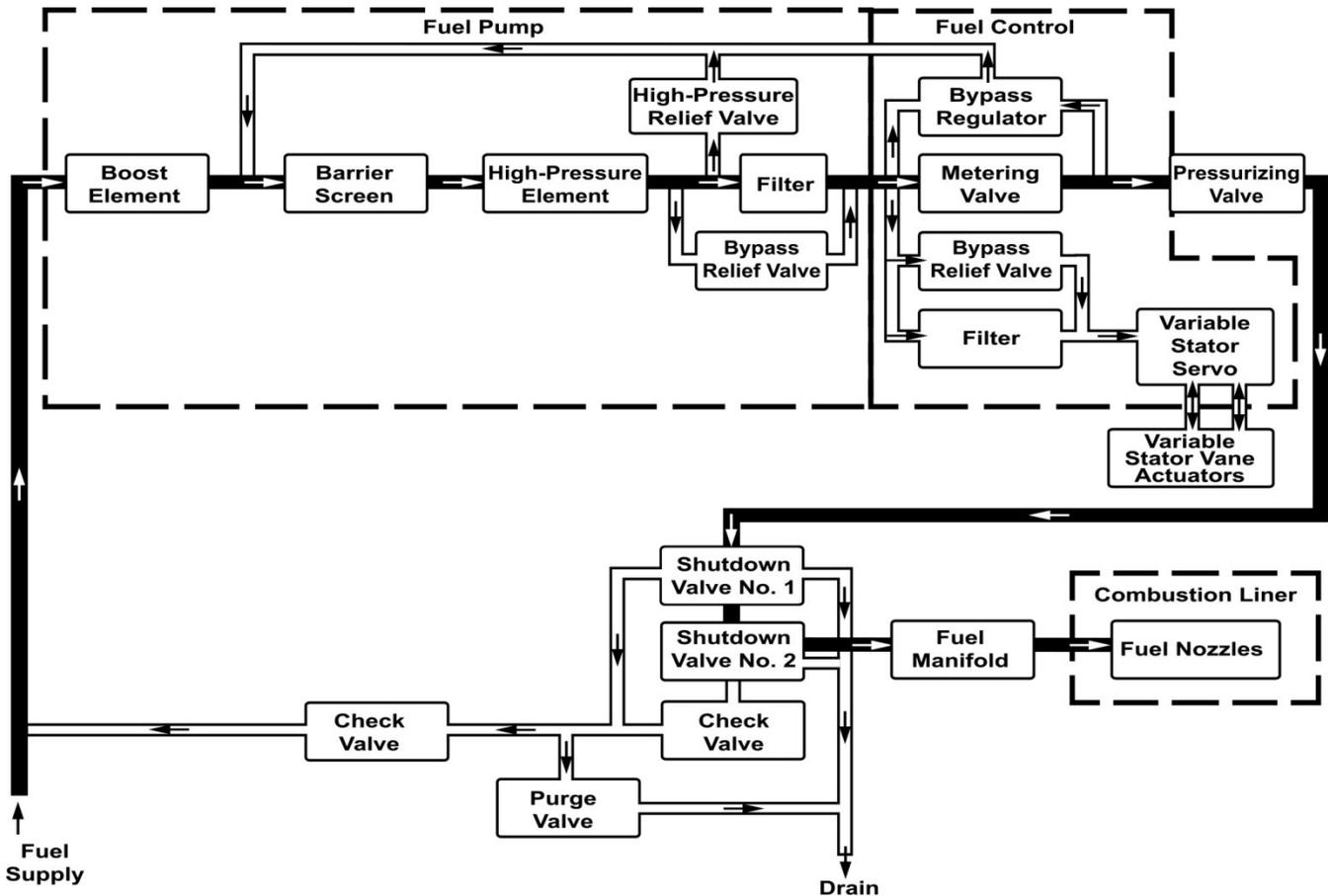
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## GT-0021

A

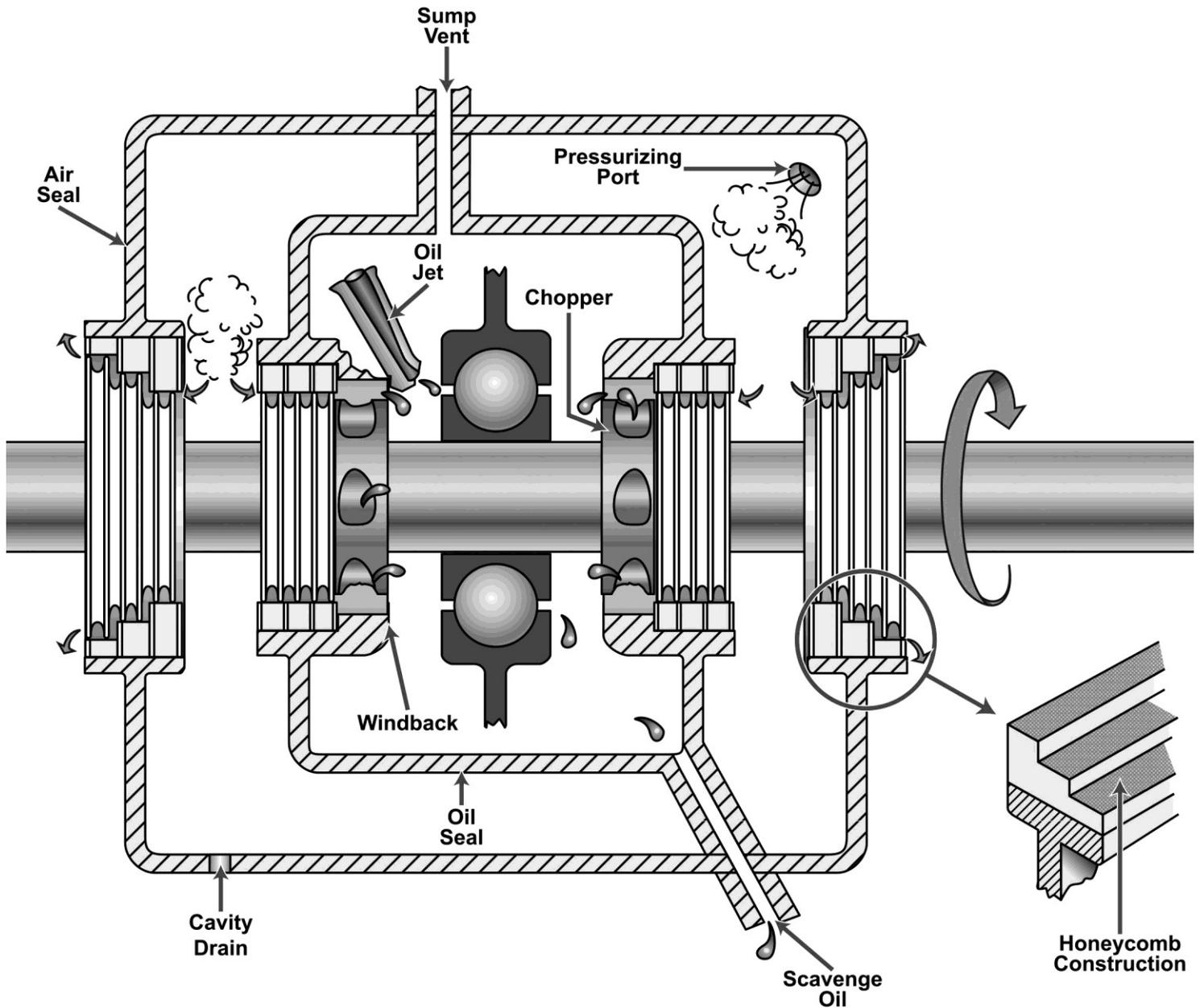


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## GT-0023



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