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

   Correct answer: A

2. The acronym CDP stands for which of the following?

   A. Compressor Discharge Pressure
   B. Coupling Disassembly Point
   C. Compressor Discharge Pyrometer
   D. Choke Down Point

   Correct answer: A

3. Rankine is the temperature scale that corresponds to which of the following?

   A. Absolute reading of a measured temperature in degrees Fahrenheit + 273
   B. Absolute reading of a measured temperature in degrees Kelvin
   C. Absolute reading of a measured temperature in degrees Celsius
   D. Absolute reading of a measured temperature in degrees Fahrenheit

   Correct answer: D

4. 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 heat
   B. In the form of potential kinetic energy
   C. In the form of internal energy
   D. In the form of mechanical energy

   Correct answer: C

5. The term "divergent" is best described as which of the following?

   A. Maintaining an equal distance between edges
   B. Approaching nearer together, as the inner walls of a tube that is constricted
   C. Moving away from each other, as the inner walls of a tube that flare outward
   D. Thermal and kinetic energy being converted to mechanical energy

   Correct answer: C

6. Newton's Second Law of Motion states which of the following?

   A. The acceleration of a body is directly proportional to the mass.
   B. An unbalancing force on a body tends to produce an acceleration in the same direction of the force applied.
   C. An unbalancing force on a body tends to produce an acceleration in the opposite direction of the force applied.
   D. The acceleration of a body is inversely proportional to the applied force.

   Correct answer: B

7. While air is being compressed in a centrifugal flow gas turbine, what happens to the direction of air flow?

   A. Changes only once from inlet to outlet
   B. Changes only at the compressor discharge
   C. Changes only at the compressor inlet
   D. Changes at each separate component

   Correct answer: D

8. Which of the following is the main advantage of a split-axial compressor case?

   A. Cheaper to manufacture
   B. Stronger construction
   C. Easier to repair and inspect
   D. Simpler to disassemble

   Correct answer: C

9. An axial compressor basically consists of which of the following?

   A. Stationary vanes and rotating blades
   B. A stationary impeller and a rotating diffuser
   C. Rotating pistons and stationary liners
   D. A rotating impeller and a stationary diffuser

   Correct answer: A

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

    A. Direct air flow to rotor blades at the correct angle and are shaped to produce a velocity increase and maintain a constant pressure.
    B. Direct air flow to rotor blades at the correct angle and are shaped to maintain a constant velocity and produce a pressure increase.
    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 each rotor stage at the correct angle and deliver air to the combustor at the correct velocity and pressure.

    Correct answer: D

11. Which of the following terms refers to axial compressor stator blades?

    A. Vanes
    B. Roots
    C. Shrouds
    D. Nozzles

    Correct answer: A

12. Which of the following statements is true concerning axial compressor disk-type rotors?

    A. Rotor discs are shrunk fit onto a steel shaft.
    B. Rotor is only suitable for low-speed compressors.
    C. Rotor consists of rings that are flanged to fit one against the other.
    D. Rotor discs are held together by through bolts.

    Correct answer: A

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

    A. Can
    B. Can-annular
    C. Double-annular
    D. Annular

    Correct answer: A

14. In a gas turbine engine, the majority of the energy is added to the working fluid in which of the following components?

    A. Compressor
    B. High-pressure turbine
    C. Power turbine
    D. Combustor

    Correct answer: D

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

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

    Correct answer: A

16. 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. Nozzle assembly
    B. Diffuser assembly
    C. Rotor assembly
    D. Compressor assembly

    Correct answer: A

17. What are the two principle functions of the turbine nozzle guide vanes?

    A. Convert the heat energy of the hot gases into potential energy and direct the flow of gases to the turbine rotor blades.
    B. Convert the heat energy of the hot gases into kinetic energy and direct the flow of gases to the turbine rotor blades.
    C. Convert the heat energy of the hot gases into potential energy and direct the flow of gases to the compressor rotor blades.
    D. Convert the potential energy of the hot gases into heat energy and direct the flow of gases to the turbine rotor blades.

    Correct answer: B

18. To keep the exit pressures relatively constant across a HP turbine blade, which type of construction is generally utilized?

    A. Impulse
    B. Impulse-Reaction
    C. Curtis
    D. Rateau

    Correct answer: B

19. Aboard ship, single-shaft gas turbines are used mostly as prime movers for which of the following applications?

    A. Auxiliary power units
    B. Single-screw ships
    C. Generators
    D. Multi-screw ships

    Correct answer: C

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

    A. Pneumatic carbon ring
    B. Fishmouth
    C. Lip-type
    D. Labyrinth-Honeycomb

    Correct answer: B

21. What is the purpose of the air/oil separator shown in the illustration of the gas turbine lube oil system? Illustration GT-0024

    A. Maintain oil pressure in the sumps
    B. Minimize oil consumption by separating oily vapors being vented to the atmosphere
    C. Reduce oil foaming
    D. All of the above

    Correct answer: B

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

    A. Starter
    B. Compressor extension shaft
    C. Mechanical drive shaft
    D. PT shaft

    Correct answer: A

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

    A. Hydraulic
    B. Electric
    C. Air turbine
    D. Pneumatic

    Correct answer: B

24. 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 minimum energy in minimum time
    C. Concentration of maximum energy in minimum time
    D. Concentration of maximum energy in maximum time

    Correct answer: C

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

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

    Correct answer: A

26. 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. RTD
    B. Transducer
    C. Probe
    D. Manometer

    Correct answer: B

27. The main lubrication system utilized by the gas turbine engine shown in the illustration is what type? Illustration GT-0017

    A. Dry sump
    B. Common drain sump
    C. Wet sump
    D. Oil mist recovery sump

    Correct answer: A

28. 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. Splash lubrication
    C. Self-contained partial oil bath
    D. Totally submerged oil bath

    Correct answer: A

29. 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%

    Correct answer: B

30. How do you manually lockout an SSS clutch?

    A. Remove the SSS clutch locking pawls
    B. Using air pressure
    C. Using the special wrench provided
    D. Calculate the engagement speed of the SSS clutch

    Correct answer: C

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

    A. Independent suspension
    B. Unlocked train
    C. Hydraulic suspension
    D. Locked train

    Correct answer: D

32. What is the purpose of the Controllable-Pitch Propeller (CPP) hydraulic oil power system?

    A. Supplies low-pressure oil for both pitch control and stern tube sealing
    B. Supplies low-pressure oil for propeller blade actuation and control oil for propeller pitch control
    C. Supplies high-pressure oil for blade actuation and control oil for propeller pitch control
    D. Supplies high-pressure oil for both propeller blade actuation and stern tube sealing

    Correct answer: C

33. Which of the following is the principle that a magnetic speed sensor/pickup operates on?

    A. Vibration caused by shaft rotation can determine the speed of rotation.
    B. Variations in the earth’s magnetic field are caused by ferrous materials.
    C. Force is the product of mass and acceleration.
    D. Voltage is produced when a ferrous material moves through a magnetic field.

    Correct answer: D

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

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

    Correct answer: A

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

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

    Correct answer: A

36. Compressor characteristics are normally summarized in the form of which of the following?

    A. Straight line graph
    B. Venn diagram
    C. Spread sheet
    D. Compressor map

    Correct answer: D

37. 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. Borescope
    D. Oscilloscope

    Correct answer: C

38. All clock positions, engine references, and enclosure references apply to viewing the gas turbine engine shown in the illustration, from which of the following locations? Illustration GT-0017

    A. Right side of the compressor to the left side
    B. Left side of the power turbine to the right side
    C. Rear (exhaust end), looking toward the intake end
    D. Intake end, looking toward the exhaust end

    Correct answer: C

39. Wrenches that are recommended for use on gas turbine engines should be plated with which of the following elements?

    A. Silver
    B. Carbon
    C. Nickel
    D. Bronze

    Correct answer: C

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

    A. Unplated
    B. Cadmium plated
    C. Bronze plated
    D. Silver plated

    Correct answer: A

41. Which of the following could cause compressor stall?

    A. The angle at which the air strikes the compressor rotor blades is too low.
    B. Air flow over the lower foil section becomes turbulent and destroys the pressure zone.
    C. The angle at which the air strikes the compressor rotor blades is too high.
    D. The angle at which the hot gases strike the turbine rotor blades is too high.

    Correct answer: C

42. 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. Wait for the harmonic vibration to dampen out.
    B. Switch to the secondary channel to confirm the alarm.
    C. Shut down the turbine.
    D. Change out the vibration transducer.

    Correct answer: C

43. What is the term given to the condition in which cyclic pressure changes result in a repetitive failure and recovery of compressor air flow?

    A. Turbulence
    B. Laminar
    C. Surge
    D. Stall

    Correct answer: C

44. How is the HP turbine rotor of the GE LM2500 gas turbine cooled?

    A. By an air-to-air heat exchanger
    B. By a continuous flow of compressor discharge air
    C. By synthetic lube oil
    D. By the ship's service sea water cooling system

    Correct answer: B

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

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

    Correct answer: A

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

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

    Correct answer: A

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

    Correct answer: C

48. In order to get a ready indication for a normal start with a GE LM2500 gas turbine engine, what permissive(s) must be met?

    A. Bleed air valve must be closed.
    B. GG speed must be less than 1200 RPM and all engine trips reset.
    C. Fuel supply pressure must be greater than 8 psig.
    D. All of the above

    Correct answer: D

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

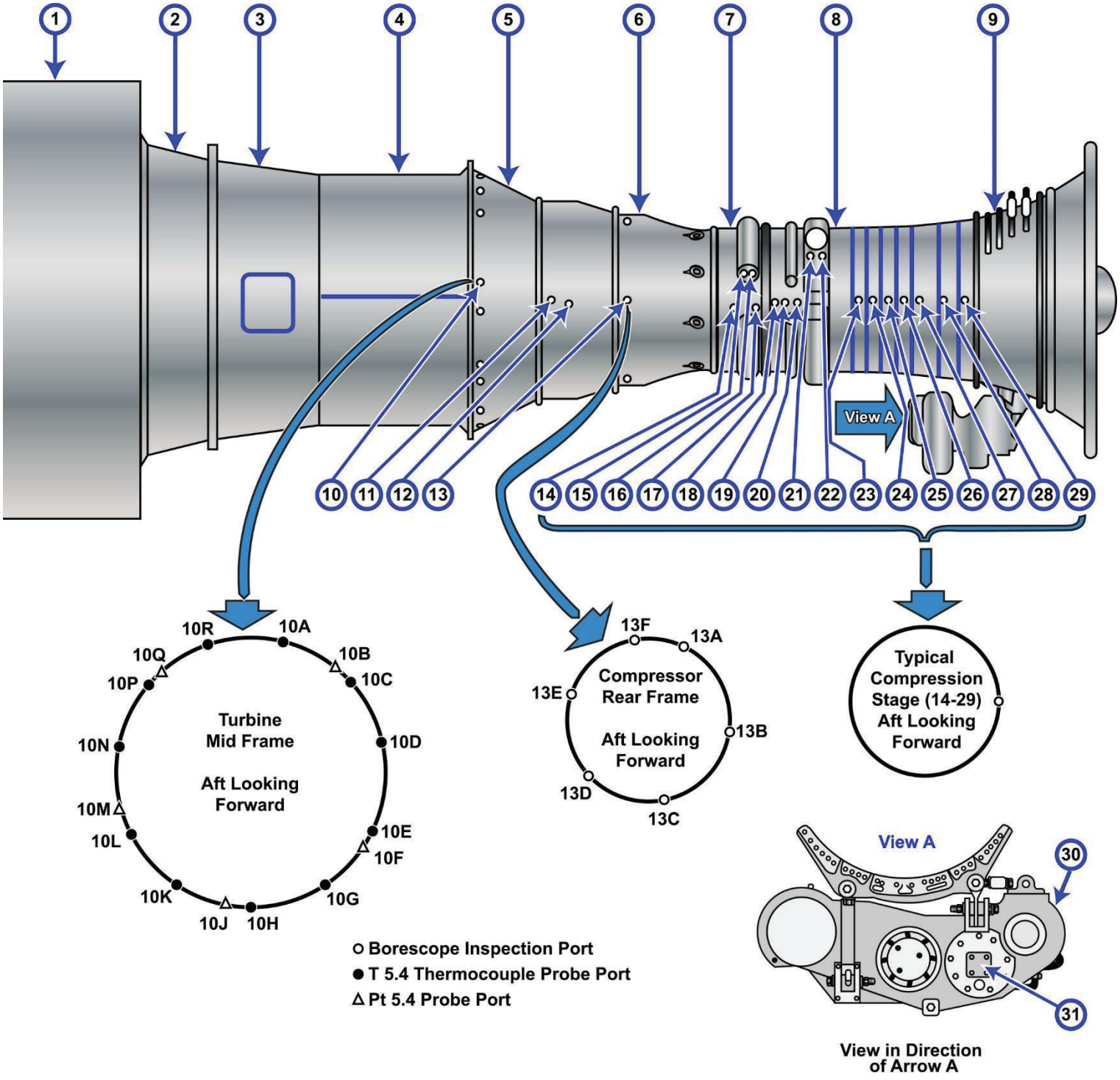
    Correct answer: D

50. The six borescope ports located in the compressor rear frame casing of the marine propulsion gas turbine shown, can be used to inspect all EXCEPT which of the following components? Illustration GT-0006

    A. Fuel nozzles
    B. 1st stage turbine nozzle
    C. Combustor
    D. 14th stage compressor blades

    Correct answer: D

GT-0006



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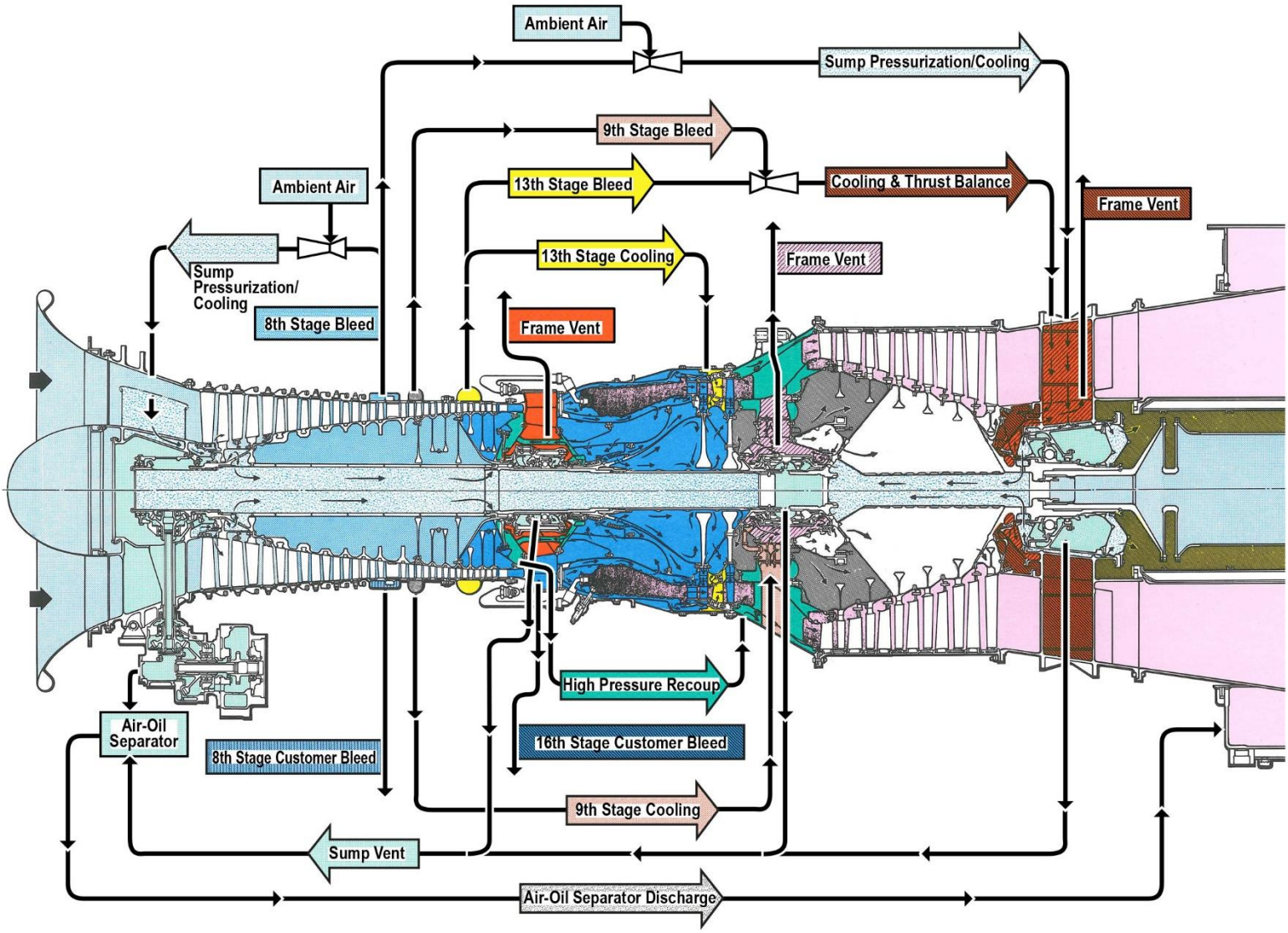

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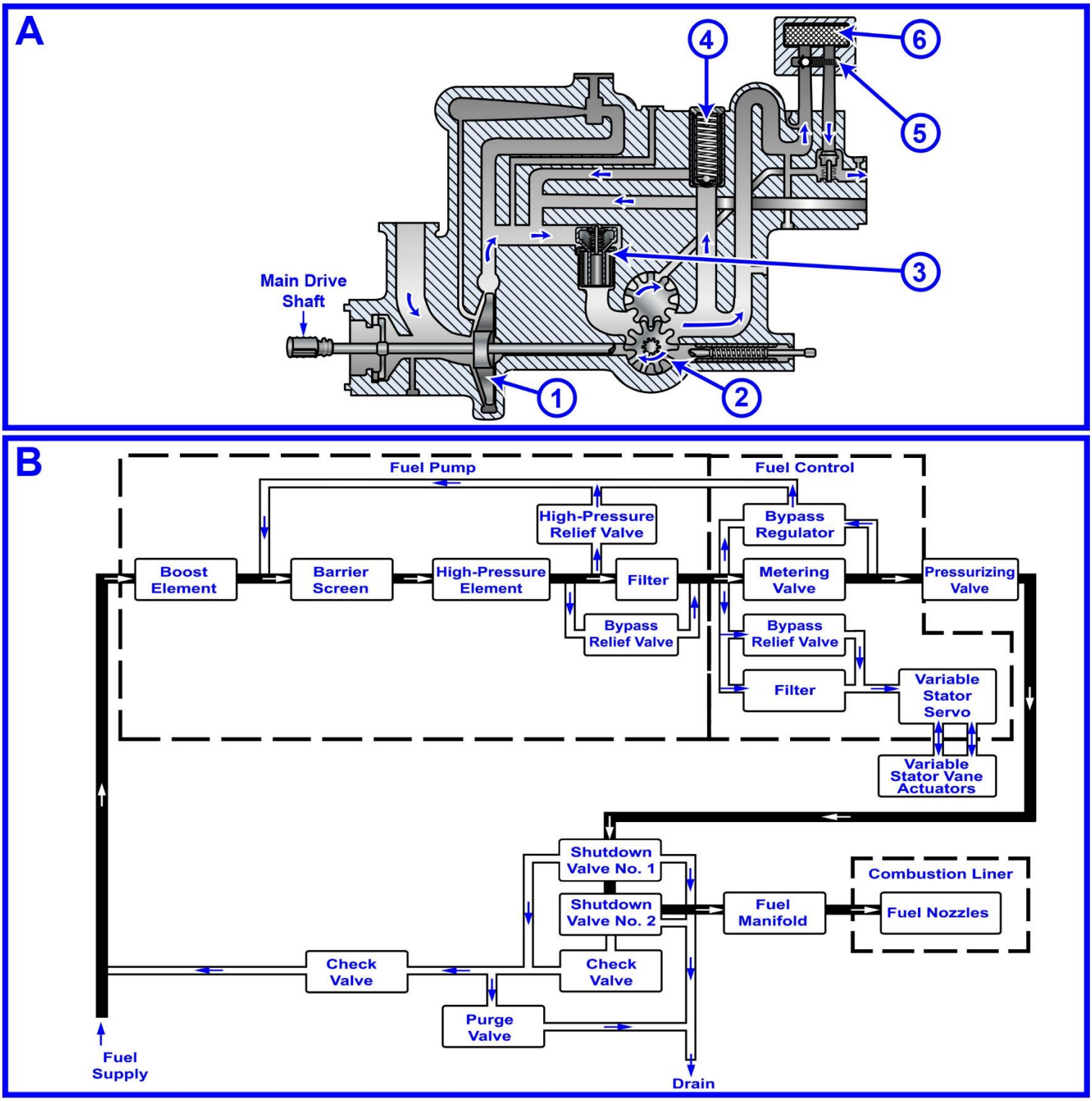

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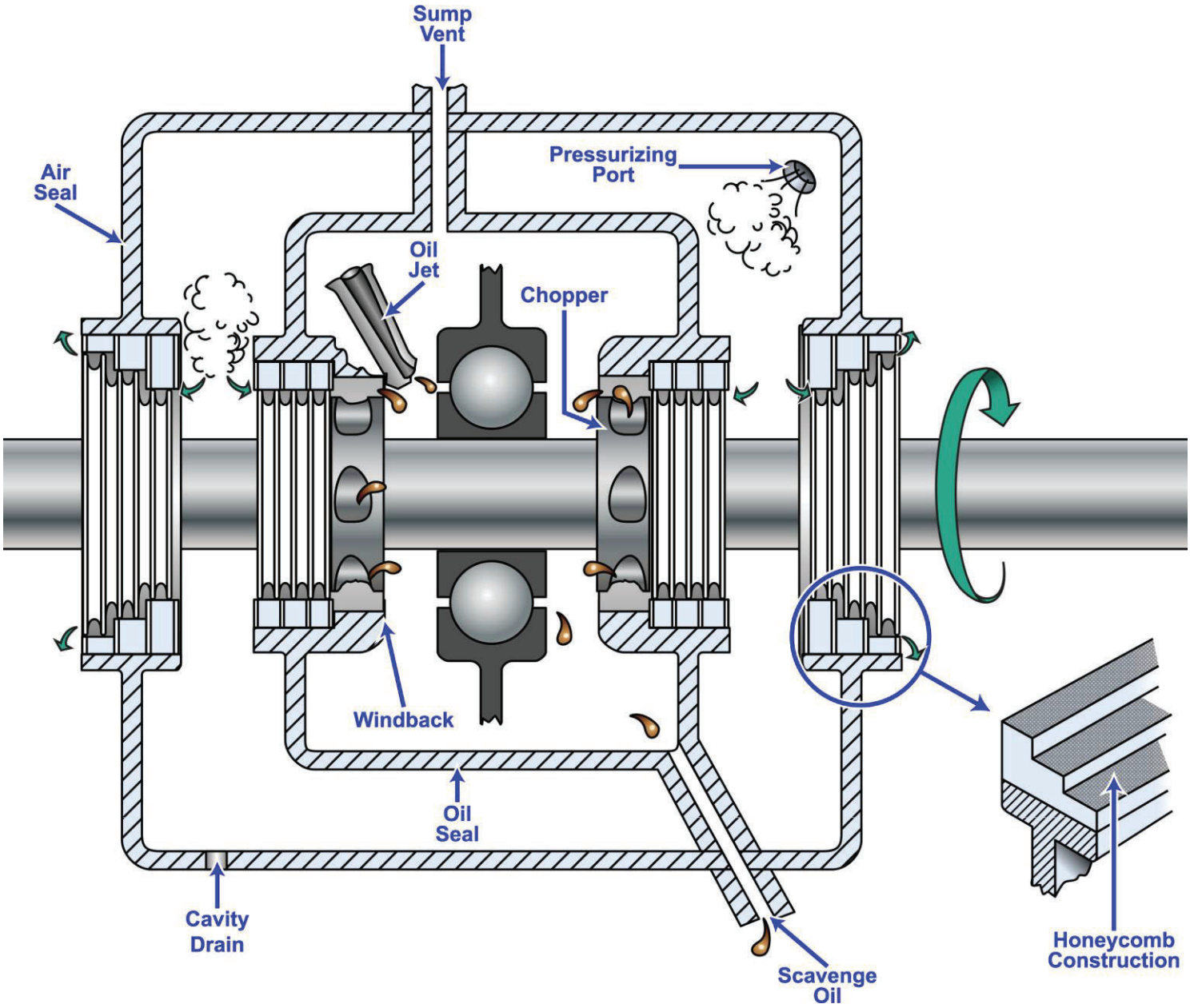

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