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. In a gas turbine, the air charge is permitted to be compressed adiabatically by what factor, process, or condition?
   - (A) Speed of the process
   - (B) Low-compression ratio
   - (C) Interstage cooling
   - (D) Rapid heat transfer

   If choice A is selected set score to 1.

2. The acronym MFC represents which of the following?
   - (A) Manifold fuel control.
   - (B) Midframe compressor.
   - (C) Main fuel control.
   - (D) Maritime fuel congress.

   If choice C is selected set score to 1.

3. Power is defined as which of the following?
   - (A) Work performed through a distance.
   - (B) The rate of applying a force.
   - (C) The rate of doing work.
   - (D) Force applied through a distance.

   If choice C is selected set score to 1.

4. What is the term given to a process that occurs without a loss or gain of heat?
   - (A) Isothermal
   - (B) Endothermic.
   - (C) Adiabatic
   - (D) Exothermic.

   If choice C is selected set score to 1.

5. 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 internal energy.
   - (C) In the form of heat.
   - (D) In the form of mechanical energy.

   If choice B is selected set score to 1.
6. Newton's First Law of Motion states which of the following?
   - (A) A body at rest will remain at rest when an external force is applied.
   - (B) 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.
   - (C) 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.
   - (D) A body in motion will continue to stay in motion, when an equal and opposite external force is applied.

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

7. Newton's Third Law of Motion states which of the following?
   - (A) For every acting force there is no reacting force in the up or down directions.
   - (B) For every acting force there is an unequal and opposite reacting force.
   - (C) For every acting force there is an equal and opposite reacting force.
   - (D) For every acting force there is an equal reacting force in the opposite direction.

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

8. A centrifugal compressor assembly consists of which of the following?
   - (A) Rotating pistons and stationary liners.
   - (B) A rotating impeller and a stationary diffuser.
   - (C) A stationary impeller and a rotating diffuser.
   - (D) Stationary vanes and rotating blades.

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

9. An axial compressor basically consists of which of the following?
   - (A) A stationary impeller and a rotating diffuser.
   - (B) Stationary vanes and rotating blades.
   - (C) A rotating impeller and a stationary diffuser.
   - (D) Rotating pistons and stationary liners.

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

10. Which of the following is the main advantage of a split-axial compressor case?
   - (A) Easier to repair and inspect.
   - (B) Cheaper to manufacture.
   - (C) Stronger construction.
   - (D) Simpler to disassemble.

   *If choice A is selected set score to 1.*
11. What is the term used to describe the stationary vanes preceding the first stage of an axial compressor?

- (A) Inlet guide vanes.
  - (B) Variable inlet vanes.
  - (C) Variable stator vanes.
  - (D) First stage stator vanes.

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

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

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

13. What is a compressor midspan shroud?

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

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

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

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

*If choice C is selected set score to 1.*
15. The three most common types of combustors used in gas turbine engines are which of the following?
   - (A) can, vortex, and can-vortex.
   - (B) can, angular, and can-angular.
   - (C) can, derivative, and can-derivative.
   - (D) can, annular, and can-annular.

   If choice D is selected set score to 1.

16. A turbine stage is represented by which of the following components and in which order?
   - (A) One set of stationary vanes, one set of rotating blades.
   - (B) One set of rotating blades, one set of stationary vanes.
   - (C) Two sets of stationary vanes, one set of rotating blades.
   - (D) One set of rotating vanes, one set of stationary blades.

   If choice A is selected set score to 1.

17. The turbine nozzle blades convert the combustion gases heat and pressure energy into what form of energy?
   - (A) Kinetic
   - (B) Chemical
   - (C) Electrical
   - (D) Thermal

   If choice A is selected set score to 1.

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

   If choice C is selected set score to 1.

19. Which of the following designs is the most satisfactory method for attaching turbine blades to the rotor disk?
   - (A) Pinning design.
   - (B) Fir-tree design.
   - (C) Locking tab design.
   - (D) Retaining ring design.

   If choice B is selected set score to 1.
20. 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

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

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

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

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

22. What type of engine starter motor is commonly found on the marine gas turbine shown in the illustration? Illustration GT-0006

- (A) DC series wound electric motor
- (B) AC synchronous motor
- (C) Hydraulic motor
- (D) AC induction motor

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

23. 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) Mechanical drive shaft
- (C) Starter
- (D) PT shaft

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

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

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

*If choice B is selected set score to 1.*
25. The electrostatic vent fog precipitator removes oil mist from which of the following areas?

- (A) Main reduction gear
- (B) Gas turbine engine
- (C) Synchronous self-shifting clutch
- (D) Lube oil storage tank

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

26. How is the lube oil supplied to each bearing in a gas turbine engine controlled?

- (A) Flow divider.
- (B) Lube oil pump.
- (C) Calibrated orifice.
- (D) Regulating valve.

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

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

- (A) Common drain sump
- (B) Oil mist recovery sump
- (C) Dry sump
- (D) Wet sump

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

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

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

29. Air used to cool the combustion liners and turbine components is referred to as which of the following?

- (A) Control air.
- (B) Primary air.
- (C) Secondary air.
- (D) None of the above.

*If choice C is selected set score to 1.*
30. How is the clutch shown in the attached illustration engaged? Illustration GT-0018

- (A) Clutch is engaged manually prior to start up.
- (B) Clutch engages automatically when input shaft flange is rotating faster than the output assembly.
- (C) Pneumatic pressure from the compressor engages the clutch.
- (D) Clutch engages automatically once the output assembly begins rotating.

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

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

- (A) Hydraulic suspension
- (B) Locked train
- (C) Independent suspension
- (D) Unlocked train

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

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

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

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

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) Voltage is produced when a ferrous material moves through a magnetic field.
- (C) Force is the product of mass and acceleration.
- (D) Variations in the earth’s magnetic field are caused by ferrous materials.

*If choice B is selected set score to 1.*
34. 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, NGG reaches idle RPM.
- (D) Power turbine reaches ignition RPM, gas temperature greater than 400 degrees F, power turbine reaches idle RPM.

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

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

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

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

36. Which of the following is NOT a gas turbine auto shutdown parameter?

- (A) High exhaust gas temperature.
- (B) Power turbine over speed.
- (C) High compressor discharge pressure.
- (D) Module enclosure fire.

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

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

- (A) Carbon
- (B) Nickel
- (C) Bronze
- (D) Silver

*If choice B is selected set score to 1.*
38. When conducting a borescope inspection, you must be aware of all of the following factors EXCEPT which?

- (A) The engineer’s experience.
- (B) The limitations of your equipment.
- (C) The internal reference points.
- (D) The inspection areas and ports.

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

39. 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.*

40. 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) Intake end, looking toward the exhaust end.
- (C) Left side of the power turbine to the right side.
- (D) Rear (exhaust end), looking toward the intake end.

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

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

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

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

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

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

*If choice B is selected set score to 1.*
43. Which of the following could cause compressor stall?

- (A) The angle at which the hot gases strike the turbine rotor blades is too high.
- (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 low.
- (D) The angle at which the air strikes the compressor rotor blades is too high.

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

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

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

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

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

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

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

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

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

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

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

*If choice D is selected set score to 1.*
48. 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.*

49. For the GE LM2500 gas turbine engine shown in the illustration, the HP turbine 1st stage nozzle vanes are cooled by which of the following? Illustration GT-0020

- (A) 8th stage compressor air.
- (B) 9th stage compressor air.
- (C) 13th stage compressor air.
- (D) 16th stage compressor air.

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

50. 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.*