U.S.C.G. Merchant Marine Exam

Assistant Engineer-MODU

Q715 Motor Plants

(Sample Examination)
Choose the best answer to the following Multiple Choice Questions

1. Which of the terms listed below represents the speed at which the natural period of vibration of a shaft or other machine part is in synchronism with the power impulses?
   - (A) Non-harmonic speed.
   - (B) Critical speed.
   - (C) Maximum speed.
   - (D) Design maximum speed.
   
   *If choice B is selected set score to 1.*

2. The most important factor in engine performance is the actual power output at the end of the crankshaft available for doing work. This is known as __________.
   - (A) indicated horsepower
   - (B) brake horsepower
   - (C) net horsepower
   - (D) friction horsepower
   
   *If choice B is selected set score to 1.*

3. Which of the bearings listed below is most widely used for the main and connecting rod bearings of a modern high-speed diesel engine?
   - (A) Split roller
   - (B) Precision insert
   - (C) Steel-lined
   - (D) Poured Babbitt, self-aligning
   
   *If choice B is selected set score to 1.*

4. One end of a cylinder for a medium or high-speed diesel engine is sealed by the piston and rings, the other end is sealed by the __________.
   - (A) crankcase
   - (B) cylinder head
   - (C) valve cover
   - (D) engine frame
   
   *If choice B is selected set score to 1.*
5. The piston pin shown in the illustration should be classified as __________. Illustration MO-0011
   - (A) anchored
   - (B) full floating
   - (C) semi-floating
   - (D) fixed
   
   If choice C is selected set score to 1.

6. The use of push rods becomes necessary in a diesel engine when __________.
   - (A) the camshaft is located some distance below the valve gear
   - (B) the rocker arms are pivoted near their centers
   - (C) two or more valves must be opened and closed at the same time
   - (D) hydraulic valve lash adjusters are used
   
   If choice A is selected set score to 1.

7. During diesel engine warm-up, which type of valve lash adjuster compensates for the change in length of the exhaust valve stem?
   - (A) Mechanical
   - (B) Hydraulic
   - (C) Pneumatic
   - (D) Electrical
   
   If choice B is selected set score to 1.

8. Which of the following represents the diesel engine camshaft shown in the illustration and its relative rotating speed? Illustration MO-0122
   - (A) "B" is the camshaft and its rpm will match that of the flywheel.
   - (B) "T" is the camshaft and its speed equals crankshaft speed.
   - (C) "Y" is the main camshaft drive and rotates at crankshaft speed.
   - (D) "B" is the camshaft and it rotates at one-half of the crankshaft speed.
   
   If choice A is selected set score to 1.

9. Which letter represents the top deck (valve) cover of the engine shown in the illustration? Illustration MO-0122
   - (A) "A"
   - (B) "H"
   - (C) "8"
   - (D) None of the above are correct.
   
   If choice A is selected set score to 1.
10. A two-stroke cycle diesel engine requires less starting air than a four-stroke cycle diesel engine, of equal displacement, because the two-stroke cycle diesel engine __________.
   - (A) has little or no internal friction
   - (B) has a lower effective compression ratio
   - (C) operates with scavenge air under a positive pressure
   - (D) operates without energy absorbing intake and exhaust strokes

   If choice D is selected set score to 1.

11. Starting a large low-speed propulsion diesel engine on diesel fuel during cold weather conditions will be made easier by __________.
   - (A) increasing the quantity of starting air
   - (B) increasing the lube oil pressure
   - (C) heating the engine fuel supply
   - (D) heating the engine coolant

   If choice D is selected set score to 1.

12. Air motors used for starting some auxiliary diesel engines are generally the type known as __________.
   - (A) gear motors
   - (B) accumulator motors
   - (C) plunger motors
   - (D) vane motors

   If choice D is selected set score to 1.

13. Which type of starter motor is sometimes utilized in a diesel engine hydraulic starting system?
   - (A) Turbine drive
   - (B) Precision gear
   - (C) Centrifugal
   - (D) Axial piston / swashplate

   If choice D is selected set score to 1.

14. In a direct cylinder admission air starting system, once the engine begins to fire, the air starting check valve illustrated, is closed by __________. Illustration MO-0107
   - (A) the starting air pressure
   - (B) the spring force and cylinder pressure
   - (C) a valve actuating cam
   - (D) a pneumatic bellows assembly

   If choice B is selected set score to 1.
15. Which of the following viscosity scales measures kinematic viscosity?

- (A) Centistokes (cSt)
- (B) Saybolt Universal Seconds (SSU)
- (C) Society of Automotive Engineers (SAE)
- (D) Furol Seconds

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

16. The TBN value of diesel engine lube oil refers to its ability to __________.

- (A) resist changes in viscosity with changes in temperature
- (B) resist emulsification
- (C) neutralize acids
- (D) resist oxidation at high temperatures

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

17. The lube oil strainer shown in the illustration is used on the reduction gear of a mid-size diesel engine. The strainer elements consist of __________. Illustration MO-0057

- (A) pleated paper
- (B) wire mesh
- (C) fibrous braid
- (D) metal disks

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

18. The Wartsila 64 engine is equipped with automatic backflushing lube oil filter systems. These type of filtration systems require __________.

- (A) frequent monitoring of differential pressure gauges
- (B) minimal maintenance and no disposable filter cartridges
- (C) shifting of filter units on a daily basis
- (D) draining of sediment every watch

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

19. The lube oil cooler is located after the lube oil filter in order for __________.

- (A) the filter to operate more efficiently
- (B) the lube oil cooler to be bypassed
- (C) positive lube oil pump suction to be assured
- (D) galvanic action in the cooler to be minimized

*If choice A is selected set score to 1.*
20. The vessel to which you are assigned is fitted with a diesel driven generator engine of the type shown in the illustration. In terms of operating cycle and cylinder configuration, what statement is true? Illustration MO-0006

- (A) This is a two-stroke cycle, 45° V-type engine.
- (B) This is a four-stroke cycle, 45° V-type engine.
- (C) This is a four-stroke cycle, 90° V-type engine.
- (D) This is a two-stroke cycle, 90° V-type engine.

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

21. If the analysis of used lube oil indicates a high content of iron particles, this could indicate __________.

- (A) corrosive deterioration of a bearing
- (B) inadequate air filtration
- (C) excessive ring and liner wear
- (D) excessive cooling of lubricating oil

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

22. Which of the combustion chambers shown in the illustration is referred to as an "energy cell" used in some small diesel engines? Illustration MO-0068

- (A) A
- (B) B
- (C) C
- (D) D

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

23. Open combustion chambers are designed to __________.

- (A) eliminate carbon buildup
- (B) improve piston cooling
- (C) prevent air charge turbulence
- (D) provide proper fuel/air mixing

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

24. Pre-combustion chamber engines inject fuel into an antechamber located in the cylinder wall or cylinder head. What is the antechamber referred to when the injection nozzle is located in the main combustion chamber, outside of the antechamber?

- (A) charging cell
- (B) energy cell
- (C) pressure pocket
- (D) swirl chamber

*If choice B is selected set score to 1.*
25. The ignition quality of diesel fuel becomes LESS critical as __________.
   • (A) lube oil additives are increased
   • (B) designed piston speeds are increased
   • (C) designed injection pressures are decreased
   • (D) designed engine speeds are decreased

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

26. If a particular liquid has a specific gravity of 0.96 kg/dm³ at 77°F, what will be the specific gravity of the liquid, as determined from the graph shown in the illustration, if the temperature is increased to 167°F? Illustration MO-0113
   • (A) 0.910 kg/dm³
   • (B) 0.915 kg/dm³
   • (C) 0.920 kg/dm³
   • (D) 0.925 kg/dm³

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

27. The purpose of the delivery check valve used in a diesel fuel injection jerk pump is to __________.
   • (A) assist in a quick cutoff of fuel injection
   • (B) allow oil backflow from the injector to the helix
   • (C) reduce fuel oil pressure between injection strokes
   • (D) meter the quantity of fuel delivered

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

28. Fuel injector nozzles are usually of the multi-orifice type with the number and placement of the holes arranged according to the __________.
   • (A) type of piston rings
   • (B) pressure of the fuel system
   • (C) size of the pump plunger spring
   • (D) design of the combustion chamber

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

29. The amount of fuel delivered by a unit injector is controlled by the __________.
   • (A) camshaft
   • (B) main spring
   • (C) rack position
   • (D) engine speed

   *If choice C is selected set score to 1.*
30. What is the purpose of the "window" installed in the housing of an individual jerk pump?

- (A) To allow the pump to be timed to the engine.
- (B) To check for sludge on the pump barrel.
- (C) To check that fuel oil return passages are clear.
- (D) To set up the fuel rack calibration in cubic millimeters.

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

31. In the illustration shown, moving the component labeled "E", further to the left, will result in __________. Illustration MO-0061

- (A) a shorter effective stroke and less fuel injected
- (B) an increase in the cylinder mean effective pressure
- (C) an increase in fuel pump delivery pressure
- (D) a greater quantity of fuel injected

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

32. Which of the following is a benefit of the common rail fuel injection system?

- (A) Smoke reduction over the entire load range.
- (B) Nitrous oxide (emissions) reduction.
- (C) Lower specific fuel consumption.
- (D) all of the above

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

33. In a naturally aspirated diesel engine, the volume of air intake is directly associated with engine __________.

- (A) compression ratio
- (B) displacement
- (C) fuel pressure
- (D) cylinder clearance volume

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

34. Exhaust pipes for separate main propulsion diesel engines can be combined only when __________.

- (A) space limitations prevent separately run pipes
- (B) the engines are small auxiliary units
- (C) they are arranged to prevent gas backflow to each engine
- (D) a waste heat boiler is installed

*If choice C is selected set score to 1.*
35. What is the function of the device labeled "3" shown in the illustration? Illustration MO-0111

- (A) The device specifically serves to remove the latent heat of vaporization from the jacket water.
- (B) The cooler removes sensible heat from the jacket water.
- (C) The heat exchanger serves to heat the jacket water during cold water operation.
- (D) The jacket water cooler is used to raise the temperature of the sea water flowing through it.

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

36. The average exhaust temperature of a two-stroke cycle diesel engine with a turbine-driven supercharger is lower than a similar four-stroke cycle diesel engine at equal loads because __________.

- (A) two-stroke cycle diesel engines have a higher M.E.P. than four-stroke cycle diesel engines
- (B) four-stroke cycle diesel engine exhaust is cooled by scavenging air
- (C) two-stroke cycle diesel engines have a lower M.E.P. than four-stroke cycle diesel engines
- (D) the opening of the two-stroke cycle diesel exhaust ports or valves occurs much later than in four-stroke cycle diesel engines

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

37. What is the function of the after coolers installed in the diesel engine air intake system?

- (A) Decrease the air density.
- (B) Increase the exhaust temperature.
- (C) Decrease the lube oil temperature.
- (D) Increase the air density.

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

38. Which of the designs listed will keep the lobes from making contact in a Roots-type blower?

- (A) Drive chain
- (B) Blower timing gears
- (C) Air trapped between blower lobes
- (D) Oil filter between blower lobes

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

39. Regarding the turbocharger shown in the illustration, the part labeled "B" would be attached to the __________. Illustration MO-0228

- (A) exhaust manifold
- (B) aftercooler inlet
- (C) nozzle ring
- (D) silencer outlet

*If choice B is selected set score to 1.*
40. The pressure-volume diagrams illustrated are of four internal combustion engine cycles. Which one represents the theoretical diesel cycle? Illustration MO-0102

- (A) A
- (B) B
- (C) C
- (D) D

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

41. The direct acting mechanical governor used with some small diesel engines, controls fuel flow to the engine by __________

- (A) governor flyweight action on a pilot valve which controls fuel injection
- (B) positioning a butterfly valve in the fuel delivery system
- (C) governor flyweight motion acting on fuel controls through suitable linkage
- (D) positioning a servomotor piston attached to the fuel controls

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

42. Which segment of the two-stroke cycle engine diagram shown in the illustration represents the exhaust event? Illustration MO-0037

- (A) I
- (B) II
- (C) III
- (D) IV

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

43. The exhaust ports shown in the illustration are initially uncovered in figure __________. Illustration MO-0025

- (A) 3
- (B) 4
- (C) 5
- (D) 6

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

44. A four-stroke eight cylinder in-line medium-speed diesel engine has a firing order of 1-5-2-6-8-4-7-3. If No.4 piston is at TDC and firing, how many degrees of crankshaft rotation will occur when No.5 piston reaches TDC and fires?

- (A) 120 degrees
- (B) 180 degrees
- (C) 240 degrees
- (D) 360 degrees

*If choice D is selected set score to 1.*
45. The start of fuel oil injection into the cylinder of a four-stroke cycle diesel engine occurs during the __________.
   - (A) intake stroke
   - (B) exhaust stroke
   - (C) power stroke
   - (D) compression stroke

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

46. The main operating characteristic of diesel engines which distinguishes them from other internal combustion engines is the __________.
   - (A) method of supplying air
   - (B) cooling system
   - (C) method of igniting fuel
   - (D) valve operating mechanism

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

47. The greatest turbulence in a diesel engine cylinder is created by the __________.
   - (A) shape of the combustion chamber
   - (B) fuel injection spray pattern
   - (C) cylinder swept volume
   - (D) degree of penetration of the fuel oil droplets

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

48. Proper atomization of fuel in diesel engine combustion chambers will __________.
   - (A) affect the injection pressure
   - (B) improve combustion
   - (C) reduce compression pressure
   - (D) decrease power output

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

49. As engine RPM is increased from idle speed to full load speed, which of the conditions listed will decrease?
   - (A) Compression ratio
   - (B) Air/Fuel ratio
   - (C) Compression pressure
   - (D) Lube oil pressure

   *If choice B is selected set score to 1.*
50. What event triggers the end of the steady combustion period in a diesel engine?

- (A) completion of injection
- (B) piston reaching top dead center
- (C) piston reaching bottom dead center
- (D) intake valve or port closing

*If choice A is selected set score to 1.*
MO-0113

Separating Temperature
In Celsius (C) and Fahrenheit (F)

- Q - Water
- Q - Oil
- Ø - Regulating Ring Size

Q (kg/dm³)

0,76 0,78 0,8 0,82 0,84 0,86 0,88 0,9 0,92 0,94 0,96 0,98 1,00

Separating Temperature
In Celsius (C) and Fahrenheit (F)

60 70 80 90 100 110 120 130 140 150 160 170 180 190 - 212°F

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Adapted for testing purposes only from Instruction Manual and Parts List,
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