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. The load is always placed on the lower half of the main bearings in a __________.
   - (A) two-stroke cycle engine
   - (B) four-stroke cycle engine
   - (C) reverse cycle engine
   - (D) double acting engine

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

2. The ratio of the brake horsepower to the indicated horsepower of a diesel engine is its __________.
   - (A) thermal efficiency
   - (B) mechanical efficiency
   - (C) brake thermal efficiency
   - (D) volumetric efficiency

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

3. A characteristic of a bearing material which permits small dirt particles to become embedded in the bearing surface is __________.
   - (A) desirable, as it will minimize damage to the journal surface
   - (B) desirable, as it will assist in keeping the lube oil filters clean
   - (C) undesirable, since the embedded particles will score the journal
   - (D) undesirable, since the particles will interfere with lube oil flow

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

4. Honing of a cylinder liner is performed to retrain a certain amount of lubricating oil which reduces the wear on the piston rings and cylinder liner. A two-step honing process consists of pre-honing and __________.
   - (A) Post-honing
   - (B) Finish honing
   - (C) Conventional honing
   - (D) Plateau honing

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

5. The piston shown in the illustration is a __________. Illustration MO-0011
   - (A) single-acting crosshead piston
   - (B) double-acting trunk piston
   - (C) single-acting trunk piston
   - (D) double-acting crosshead piston

   *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. The valve stem expansion associated with engine warm-up is allowed for by the __________.
   - (A) valve springs
   - (B) hydraulic governor
   - (C) valve lash adjusters
   - (D) cooling system

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

8. The diesel engine connecting rods shown in the illustration are distinctively named __________.
   Illustration MO-0226
   - (A) fork and blade
   - (B) hook and nail
   - (C) male and female
   - (D) left hand and right hand

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

9. Device "E" shown in the illustration is known as the __________. Illustration MO-0122
   - (A) over speed trip shaft
   - (B) fuel manifold
   - (C) extrusion tube assembly
   - (D) lube oil manifold

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

10. 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.*
11. An accumulator used in a hydraulic starting system is generally located between the _________.

   - (A) pump and the compressor
   - (B) storage tank and the pump
   - (C) starting motor and the reserve tank
   - (D) pump and the starting motor

   If choice D is selected set score to 1.

12. In a diesel engine starting motor equipped with a Bendix drive, the pinion moves and meshes with the flywheel ring gear due to _________.

   - (A) electromotive force developed at the flywheel
   - (B) the shaft sleeve spiral helix and relative rotation between pinion and starter shaft
   - (C) shifting levers of solid mechanical linkage
   - (D) centrifugal force developed from rotation

   If choice B is selected set score to 1.

13. Which internal combustion engine starting system uses a vane type fluid motor?

   - (A) Compressed air
   - (B) Jet flow
   - (C) Centrifugal
   - (D) Electric

   If choice A 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. Proper lubrication of the main bearings is more easily obtained in a single acting four-stroke cycle diesel engine than in a single acting two-stroke cycle diesel engine because _________.

   - (A) pressure on the journals of a four-stroke cycle single acting diesel engine is continually reversed
   - (B) pressure on the journals of a two-stroke cycle single acting diesel engine is continually reversed
   - (C) the maximum bearing pressure is higher in a single acting two-stroke cycle diesel engine
   - (D) two-stroke cycle diesel engines require more complicated lubrication piping

   If choice A is selected set score to 1.
16. The most crucial time for any bearing with regards to diesel engine lubrication is __________.
   
   - (A) during periods of low load
   - (B) during first warm up
   • (C) during initial starting
   - (D) after load reversals
   
   *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. What type of engine lubrication oil filter system sends filtered oil directly to the high-pressure supply gallery?
   
   - (A) centrifugal purifier system
   - (B) bypass system
   • (C) shunt system
   - (D) batch system
   
   *If choice C is selected set score to 1.*

19. Which of the following statements is true concerning a main diesel engine oil cooler?
   
   - (A) The oil temperature is less than the cooling water temperature.
   - (B) The oil pressure is less than the cooling water pressure.
   • (C) The oil pressure is greater than the cooling water pressure.
   - (D) The oil flow control valve is always installed in the oil input line.
   
   *If choice C is selected set score to 1.*

20. The vessel to which you are assigned is fitted with generator engines as shown in the illustration. What statement is true concerning the cylinders? Illustration MO-0163
   
   - (A) The cylinder walls are integral (non-replaceable) to the cylinder block.
   - (B) The cylinder liners are of the jacketed type and are replaceable inserts.
   • (C) The cylinder liners are of the wet type and are replaceable inserts.
   - (D) The cylinder liners are of the dry type and are replaceable inserts.
   
   *If choice C is selected set score to 1.*
21. Which of the following test indicators should be considered the most significant factor in determining as to whether or not a diesel-generator's lube oil should be drained and renewed?

- (A) An extremely high neutralization number.
- (B) An extremely low precipitation number.
- (C) The oil appears black in color.
- (D) An increase in flash point.

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

22. Pre-combustion chambers and energy cells in high-speed, small bore diesel engines all serve to increase ________.

- (A) firing pressure
- (B) ignition quality of fuel
- (C) fuel/air ratio during compression
- (D) turbulence

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

23. A multi-orifice fuel injection nozzle is usually used with which of the listed types of combustion chamber?

- (A) Open combustion chamber
- (B) Pre-combustion chamber
- (C) Turbulence chamber
- (D) Energy cell

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

24. Pre-combustion chambers differ from turbulence chambers in that pre-combustion chambers ________.

- (A) allow fuel injection directly into the space above the piston
- (B) do not contain the fuel injector nozzle tip
- (C) contain the major portion of the total clearance volume
- (D) contain a smaller portion of the total clearance volume

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

25. The cetane number is the index used to measure a fuel oil’s ________.

- (A) antiknock characteristics
- (B) ignition quality
- (C) rate of vaporization
- (D) viscosity

*If choice B is selected set score to 1.*
26. In terms of the diesel fuels burned in auxiliary and main propulsion diesel engines onboard vessels, which of the listed fuel properties would be most critical to consider when transferring and forwarding fuel in extremely low ambient temperature conditions?

   o (A) Flash point
   • (B) Pour point
   o (C) Heating value
   o (D) Ash content

   *If choice B 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
   o (B) allow oil backflow from the injector to the helix
   o (C) reduce fuel oil pressure between injection strokes
   o (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 __________.

   o (A) type of piston rings
   o (B) pressure of the fuel system
   o (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 __________.

   o (A) camshaft
   o (B) main spring
   • (C) rack position
   o (D) engine speed

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

30. As shown in the illustration of the fuel injection pump, the component labeled "N" would be identified as the __________. Illustration MO-0061

   • (A) barrel
   o (B) sleeve
   o (C) plunger
   o (D) control rack

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

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

32. Injection pressure in a common rail fuel system is controlled by __________.
   - (A) engine speed
   - (B) varying the fuel pump piston stroke
   - (C) varying the injector needle valve clearance
   - (D) a bypass valve

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

33. In a naturally aspirated diesel engine, the volumetric efficiency of the intake air charge is mainly influenced by the __________.
   - (A) valve size
   - (B) compression ratio
   - (C) cylinder mean effective pressure
   - (D) fuel injection pressure

   *If choice A 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. In the engine shown in the illustration, the part labeled "W" is cooled by __________. Illustration MO-0003
   - (A) lube oil
   - (B) sea water
   - (C) air
   - (D) convection

   *If choice B is selected set score to 1.*
36. The process of scavenging a two-stroke cycle diesel engine serves to __________.
   - (A) improve fuel flow volume
   - (B) cool the exhaust valves
   - (C) reduce the intake air charge density
   - (D) increase the temperature of exhaust gases

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

37. The power consumed during the scavenging process of a diesel engine is known as the __________.
   - (A) compression loss
   - (B) valve loss
   - (C) back pressure loss
   - (D) pumping loss

   *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. In a turbocharger, inlet air velocity is increased in the __________.
   - (A) inlet nozzle ring
   - (B) stationary diffuser passages
   - (C) compressor outlet volute
   - (D) rotating impeller vanes

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

40. Most practical diesel engines today operate on a cycle which is a combination of the Diesel and Otto cycles. In this process, compression ignition __________.

   - (A) begins on a constant volume basis
   - (B) begins on a constant pressure basis
   - (C) ends on a constant volume basis
   - (D) begins and ends on a constant volume basis

   *If choice A 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. Opposed-piston diesel engines are classified as __________.
   - (A) two-stroke cycle single acting
   - (B) two-stroke cycle double acting
   - (C) four-stroke cycle single acting
   - (D) four-stroke cycle double acting

   If choice A is selected set score to 1.

43. Which segment of the two-stroke cycle engine diagram shown in the illustration represents 'supercharging'? Illustration MO-0037
   - (A) I
   - (B) II
   - (C) III
   - (D) IV

   If choice C is selected set score to 1.

44. On an opposed-piston engine, increasing the lower crank lead will result in which of the listed operating conditions?
   - (A) Exhaust ports will uncover after the air intake ports
   - (B) Exhaust ports will uncover before the air intake ports
   - (C) Duration of air intake will increase
   - (D) Duration of air intake will decrease

   If choice B is selected set score to 1.

45. In the illustration, the intake valve closes at what point on the four-stroke cycle engine diagram shown? Illustration MO-0084
   - (A) 45 degrees after BDC
   - (B) 55 degrees before BDC
   - (C) 75 degrees before TDC
   - (D) 85 degrees after TDC

   If choice A is selected set score to 1.
46. In a diesel engine, after ignition of the fuel occurs, but before the piston reaches TDC, there is little change in the cylinder _________.

- (A) temperature
- (B) volume
- (C) pressure
- (D) energy

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

47. Heat for igniting the fuel oil in the cylinder of a diesel engine is generated by the _________.

- (A) electronic ignition system
- (B) compression of air by the piston
- (C) friction in the fuel injector
- (D) fuel oil heating system

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

48. What is the term given to the process of breaking up fuel oil into very fine particles for better combustion?

- (A) Settling
- (B) Straining
- (C) Spraying
- (D) Atomizing

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

49. A diesel engine operating at a light load, when compared to operating at heavy load has an air/fuel ratio that is _________.

- (A) higher
- (B) lower
- (C) equal
- (D) directly proportional

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

50. The time between injection and ignition of the fuel is known as _________.

- (A) turbulence lag
- (B) afterburning ratio
- (C) injection lag
- (D) ignition delay

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